

TWIN BOARD

Systemate III

**A sealed central heating and mains
pressure hot water supply system
incorporating a thermal store.**

Design, Installation and Servicing Instructions

**PLEASE LEAVE THESE
INSTRUCTIONS ADJACENT TO THE
APPLIANCE.**

**ALL MODELS COMPLY WITH THE
WATER HEATER MANUFACTURERS
ASSOCIATION SPECIFICATION FOR
HOT WATER ONLY THERMAL
STORES.**



GLEDHILL SYSTEMATE III SPECIFICATION

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These instructions should be read in conjunction with the "Installation and Servicing Instructions" issued by the manufacturer of the heat source e.g. the boiler used. Any water distribution systems and central heating installations must be in accordance with the requirements of the relevant regulations and should also comply with the relevant recommendations of the British Standards also listed below:-

Regulations

- Gas (Safety in use Regulations)
- Building Regulations
- I.E.E Wiring Regulations
- Water Regulations

British Standards

BS6798, BS5449, BS5546, BS5440:1, BS5440:2, CP331:3, BS6700, BS5258 and BS7593:1992

A competent person as stated in the Gas Safety Regulations must install the Systemate heating system. The manufacturer's notes must not be taken as overriding statutory obligations.

The Systemate III is not covered by section G3 of the 1985 Building Regulations and is therefore not notifiable to Building Control.

Although the domestic water supply to the Systemate III is at mains pressure, it is not necessary to fit an expansion vessel, pressure or temperature relief valve. The Systemate III is only suitable for use with sealed primary i.e. central heating system.

The information in this manual is provided to assist generally in the selection of equipment. The responsibility for the selection and specification of our equipment must however remain that of our customer and any designers or consultants concerned with the design and installation.

Please Note: We do not therefore accept any responsibility for matters of design, selection or specification for the effectiveness of an installation containing one of our products.

All goods are sold subject to our Conditions of Sale, which are set out at the rear of this manual.

In the interest of continuously improving the Systemate range, Gledhill Water Storage Ltd reserve the right to modify the product without notice, and in these circumstances this document, which is accurate at the time of printing, should be disregarded.

The Gledhill Systemate range is a WBS listed product.

THIS PRODUCT IS MANUFACTURED UNDER A BS EN ISO 9002 QUALITY SYSTEM AUDITED BY BSI

DESCRIPTION

INTRODUCTION

The SysMate III based heating system is schematically shown in Figure 1.1. The SysMate III unit is based on an indirectly heated hot water only thermal store and is supplied with factory fitted controls and equipment as shown schematically in Figure 1.2. The SysMate III is designed for use in a sealed primary heating circuit to provide space heating as well as mains pressure hot water at high flow rates and it can be used with any remotely sited boiler suitable for a sealed system. The vented thermal store is indirectly heated by an efficient primary heat exchanger to give very fast recovery. The space heating circuit is standard and the 3-Port valve supplied with the unit is normally configured to function as a flow share valve to heat the thermal store and radiator circuit simultaneously. However this can be configured as a diverter valve with hot water priority if required. The system is controlled by a dedicated electronic control system complete with a programmer to which an external room thermostat can be wired. An important feature of this concept is that hot water can be supplied directly from the mains at conventional flow rates without the need for temperature and pressure relief safety valves or expansion vessels. This is achieved by passing the mains water through a plate heat exchanger (PHE), which is heated instantaneously by the primary water circulated by a pump through the PHE. The outlet temperature of the domestic hot water is maintained by a printed circuit board, which controls the speed of the pump circulating the primary water from the store through the plate heat exchanger. A boiler of up to a maximum of about 30kW (approximately 100,000BTU/hr) can be linked to any suitable model of SysMate III (see Table 1.1, page 5) and the deciding factor is the space heating and the hot water requirements of a dwelling.

THERMAL STORE

The copper thermal store contains primary water, which is maintained at a temperature of approximately 70°C in winter by the electronic control system. The store temperature can be reduced in the summer time by the user by means of the controls on the front panel of the SysMate III. The standard version has a manually filled top up cistern.

An automatic filling version with a ball valve and warning pipe connection is also available and in this case the overflow/warning pipe must be terminated at a suitable location outside the dwelling.

SysMate III is efficiently insulated with Rockwool CFC free insulation and finished in a steel case to minimise standing losses.

DOMESTIC HOT WATER

Cold Water Supply

The SysMate III units are designed to be fed directly from the mains water supply as shown schematically in Figure 1.3. They fulfil the requirements of Water Bylaw 91, and therefore do not require a check valve to be fitted to the supply pipe. The performance of the SysMate is directly related to the adequacy of the cold water supply to the dwelling. This must be capable of providing for those services, which could be required to be supplied simultaneously, and this maximum demand should be calculated using procedures defined in BS6700. SysMate will operate at mains pressures as low as 1 bar and this must be available when the local demand is at its maximum, but the preferred range is between 2 and 3 bar. As a general guideline, although a 15mm external service may be sufficient for smaller dwellings with one bathroom, a 22mm service (25mm MDPE) is preferred and should be the minimum for larger dwellings. If a water meter is fitted in the service pipe, it should have a nominal rating to match the maximum hot and cold water peak demand calculated in accordance with BS 6700. This could be up to 50 litres/min. in some properties.

The unit must be fitted strictly in accordance with the requirements of the Local Water Undertaking who should be consulted prior to the installation. In the event of any difficulty please contact us as the manufacturers. The equipment used in the system should be suitable for a working pressure of 8 bar and approved by the WBS or other relevant standard. If this is not the case a pressure limiting valve will be required which is suitable for the item of equipment with the lowest maximum working pressure.

Safety Fittings

It is not necessary to fit control and safety equipment normally associated with mains pressure hot water storage appliances e.g. temperature and pressure relief valves and expansion vessel. SysMate is WBS listed and a non-return valve is not required. However if the ancillary equipment fitted in the supply to these appliances require a non-return valve then the valve must be fitted directly after the branch to the drinking water i.e. a kitchen sink, as shown schematically in Figure 1.3.

Domestic Hot Water Flow Rates

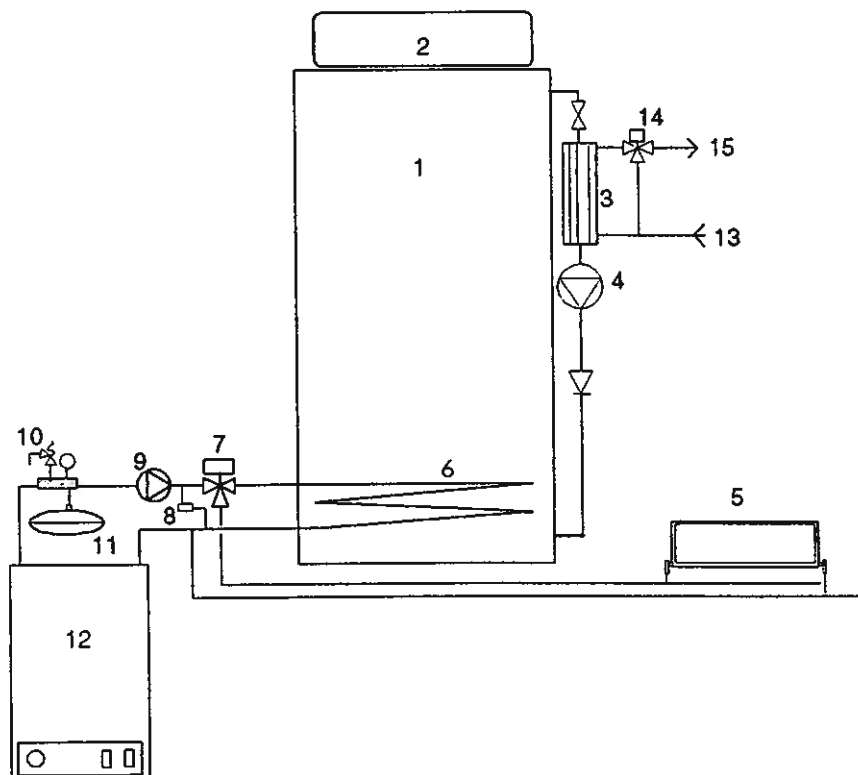
Provided the pipe sizing and the supply pressure is adequate the hot water flow rate should be up to 22 litres/min. for model SM118 and up to 35 litres/min. for models SM144, SM178, SM205 and SM238 (see table 1.1). The domestic hot water outlet temperature is regulated to 52°C by the electronic control system and is not user adjustable.

Use in Hard Water Areas

There are two options for the pump speed control. Option 'H' must be used in hard water areas above 200ppm. Option 'S' can be used in soft water areas below 200ppm. A patented control system within the Option 'H' microprocessor offers a more sophisticated level of pump speed control and will help prevent the formation of scale. Both options ('H' or 'S') prevent domestic hot water from exceeding 52°C for most of the operational times of the appliance.

It is not necessary to fit any form of scale inhibiting equipment in the domestic cold water supply to the SysMate when using option 'H'.

If scale should become a problem the plate heat exchanger is easily isolated and can be replaced with a service exchange unit.



- | | |
|------------------------------|-----------------------------|
| 1 Thermal store | 2 Top up for thermal store |
| 3 Plate heat exchanger | 4 Plate heat exchanger pump |
| 5 Space heating circuit | 6 Primary heat exchanger |
| 7 3-Port diverter valve | 8 Automatic bypass valve |
| 9 System/boiler pump | 10 Pressure relief valve |
| 11 Expansion vessel | 12 Boiler |
| 13 Mains cold water inlet | 14 Mixing Valve |
| 15 Domestic hot water outlet | |

Figure 1.1 A SysMate III Sealed Primary Heating System

DESCRIPTION

PACKAGED CONTROL SYSTEM

Standard Equipment

The standard configuration of the SysMate III is shown in Figure 1.2 and it is supplied with the following factory fitted equipment: -

- Boiler/space heating system pump
- Domestic hot water primary (plate heat exchanger) pump
- Automatic bypass valve
- Storage appliance control PCB and panel
- Hot water control PCB
- 3-Port valve (normally supplied as a flow share valve but can be configured to function as a full diverter valve if required).
- Primary i.e. heating circuit expansion vessel.
- Primary circuit pressure relief valve.
- Primary circuit pressure gauge
- System filling loop
- Electro-mechanical clock (Figure 1.6) to control the space heating (in conjunction with a room thermostat- if fitted).
- Plate heat exchanger.
- DHWS flow switch.
- DHWS temperature sensor.
- Mixing Valve.

The two printed circuit boards (PCBs) mounted inside the appliance control the operation of the complete heating system. The system control PCB also acts as a wiring centre for the factory fitted components and any external user controls fitted on site. A typical connection arrangement of the SysMate III components is shown in Figure 1.4

Optional Equipment

- A seven-day digital clock/programmer (Figure 1.6) to control the space heating (in conjunction with a room thermostat if fitted).
- A kit to remotely site the clock/programmer shown in Figure 1.6.
- A no clock option - to be used with any two channel clock for controlling both the operation of the space heating (in conjunction with a room thermostat if fitted) and the charging of the thermal store.
- Feed and expansion cistern ball valve and warning/overflow pipe connection - for automatic fill option only.

ELECTRICAL IMMERSION HEATER

If an electric immersion heater is fitted then it must: -

- Be set to operate at 75°C.
- Be wired to a separate 13A fused and switchable power supply.
- Not be wired into any of the terminals on the appliance printed circuit boards.
- Should be 14" long low watts density units with an incolloy 825 sheath and 11" rod thermostat.

This can be supplied and fitted at the time of order as an extra. Replacement immersion heaters should be obtained only from Gledhill Water Storage Ltd.

TECHNICAL SPECIFICATION

The principal dimensions of the SysMate III model range and the minimum dimensions for the cupboard are shown in Figure 1.5 and the technical specification of the units is given in Table 1.1.

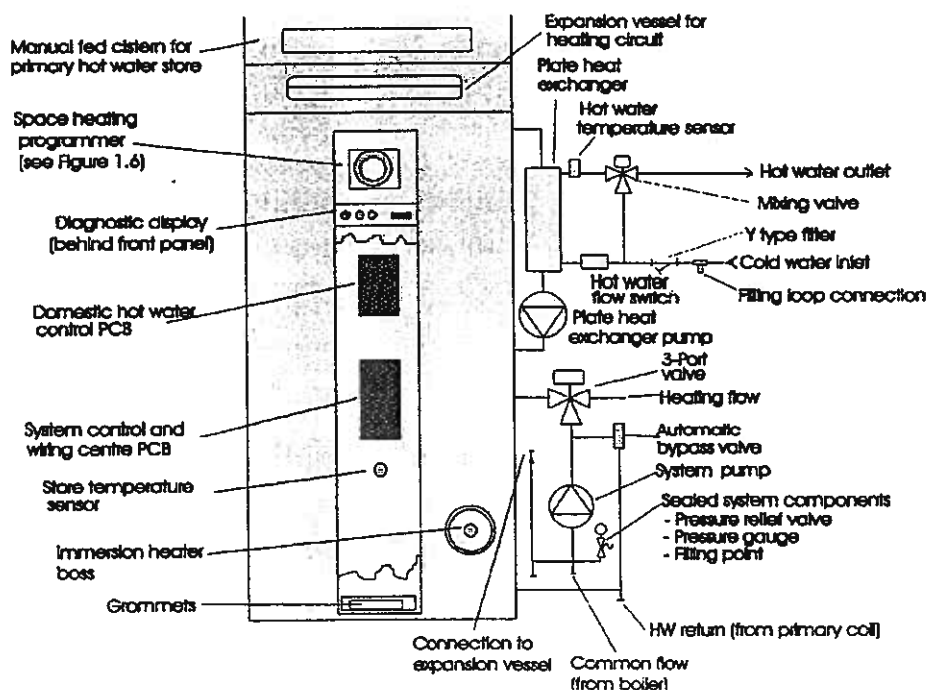


Figure 1.2 Standard SysMate III Packaged Unit

DESCRIPTION

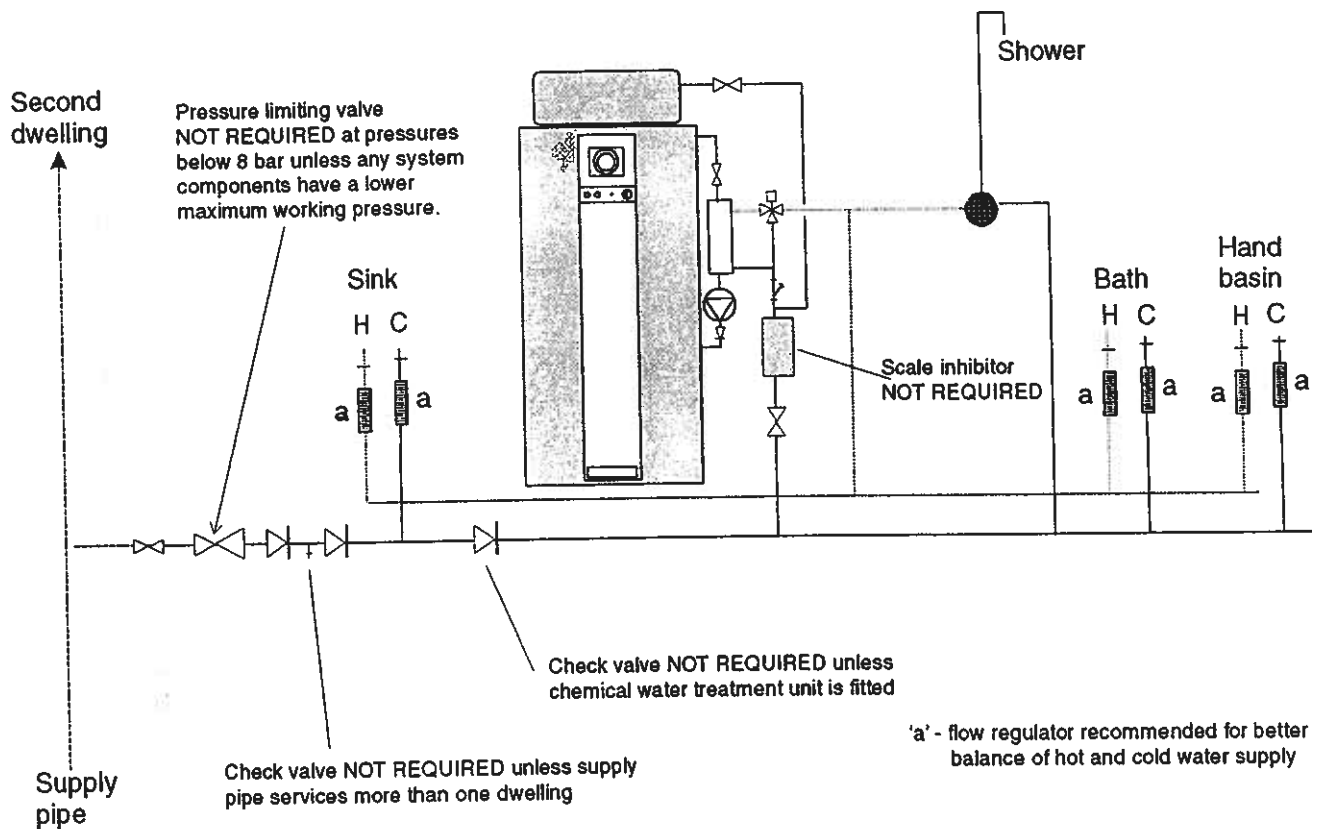


Figure 1.3 Typical hot and cold water distribution network

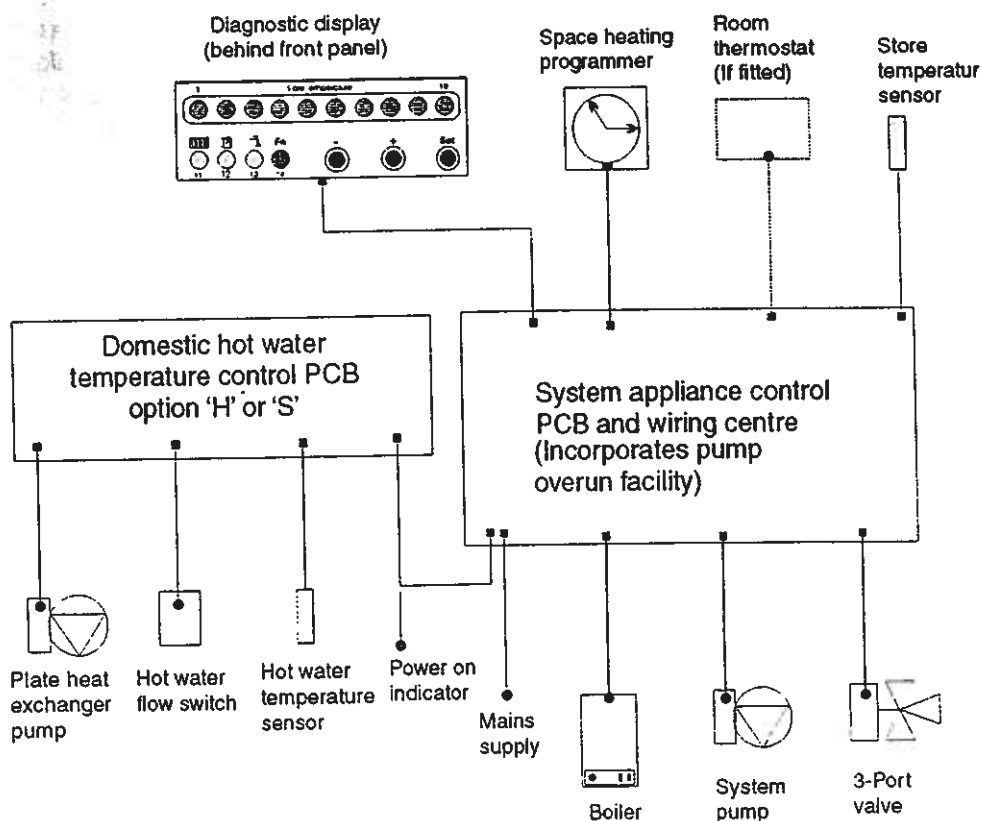


Figure 1.4 SystemMate III Standard Control Package

DESCRIPTION

Table 1.1 Technical specification of SysteMate III

	SM118	SM144	SM178	SM205	SM238
Overall dimensions of standard unit (Height x diameter)	1475 x 475	1475 x 500	1510 x 550	1690 x 550	1805 x 550
Minimum cupboard size (Width x depth)	700 x 550	715 x 600	770 x 650	770 x 650	770 x 650
Primary store capacity (litres)	100	115	145	175	190
Volume of primary coil (litres)	3.4	3.8	4.5	6.2	7.5
Weight (kg)					
• Empty	48	49	51	54	58
• Full	148	164	196	229	248
Pipe connections	•All pipe connections 22mm copper compression fittings •Drain connection : R½"			• All pipe connections 28mm copper compression fittings • Drain: R½"	
Maximum working pressure	6m – Fitted with integral feed and expansion cistern 3 bar – Suitable for sealed system only 8 bar				
Pressure relief valve	½" – set to operate at 3 bar				
Expansion Vessel	Nominal volume of the vessel: 10 litres				
P1	P2	Maximum permitted system volume (litres)			
0.5	0.5	120			
	1.0	71			
1.0	1.5	38			
	1.0	91			
	1.5	52			
	2.0	24			
1.5	1.5	64			
	2.0	30			
Pumps	Grundfoss UPS 15-50 Grundfoss UPS 15-50			Grundfoss UPS 15-60 Grundfoss UPS 15-60	
• System					
• Plate heat exchanger					
3-Port Valve	22mm Danfoss HS3DB22			28mm Danfoss HS3DB28	
Hot water flow rate (litre/min)	22	35	35	35	35
Maximum boiler size (kW)	15	20	20	30	30
Typical dwelling types					
• Bedrooms	1 – 2	2 – 3	2 – 3	2 – 4	3 – 5
• Bathrooms	0	1	1	2	2
• En-suite shower rooms	1	1	2	2	3

NOTES

1. P1= Vessel charge pressure (bar), P2= Initial system pressure (bar)
2. The flow rates are for 35°C average temperature rise and assume normal pressure and adequate flow to the appliance.
3. All standard units are supplied complete with an integral manual fill feed and expansion cistern which is only for the primary water in the thermal store.
4. All units are supplied with a nominal 10 litre expansion vessel for the primary boiler/space heating circuit. If the system requires additional capacity then another expansion vessel should be fitted.
5. All units are supplied with $\frac{1}{2}$ " pressure relief safety valve for the space heating circuit.
6. All SysteMate III units meet the appropriate requirements of the WMA Specification for 'Hot Water Only' Thermal Stores.
7. 28mm 3 port valve/primaries and 15/60 system pumps are available on the SM118, 144 and 178 models at the time of order as an extra.
8. For hard water areas use Suffix 'H' for soft water areas use Suffix 'S' after the model number eg. SM118/H = SysteMate III model 118 for hard water area.
9. Non standard sizes are available to suit smaller cupboard dimensions.
10. If the boiler is fitted with an anti-cycling device we recommend that the size of the appliance used is one size larger than normally recommended by the typical dwelling type column in table 1.1 above.

SYSTEM DESIGN

METHOD OF BOILER SIZING

It is only necessary to calculate the heating requirements in accordance with BS 5449. The allowance for domestic hot water (shown in Table 2.1) depends upon the operating mode selected for the 3-port valve. For example; if the system is designed to operate with priority to domestic hot water then no additional allowance for hot water is required for sizing the boiler.

Table 2.1 Allowance for domestic hot water

Model	Allowance for Domestic Hot Water (kW)	
	Diverter valve mode	Flow share mode
SM118	0	2
SM144	0	3
SM205	0	3.5
SM238	0	4
SM178	0	3

The primary pipework connecting the boiler and the thermal store should be sized to achieve a maximum of 11°C rise across the boiler or the maximum temperature rise specified by the boiler manufacturer. But in any instance it should not be less than 22mm copper tube.

Notes:

- (1) There should be no valves or other devices in the pipework connecting the boiler to the Systemate III which could be accidentally closed.
- (2) The Systemate III is only suitable for sealed heating systems and is supplied fitted with all the appropriate components.
- (3) Only boilers approved for sealed systems i.e. fitted with overheat thermostat should be used with Systemate III.
- (4) If the boiler is a condensing type the primary system must be set to operate as a normal 80°C flow 70°C return system.

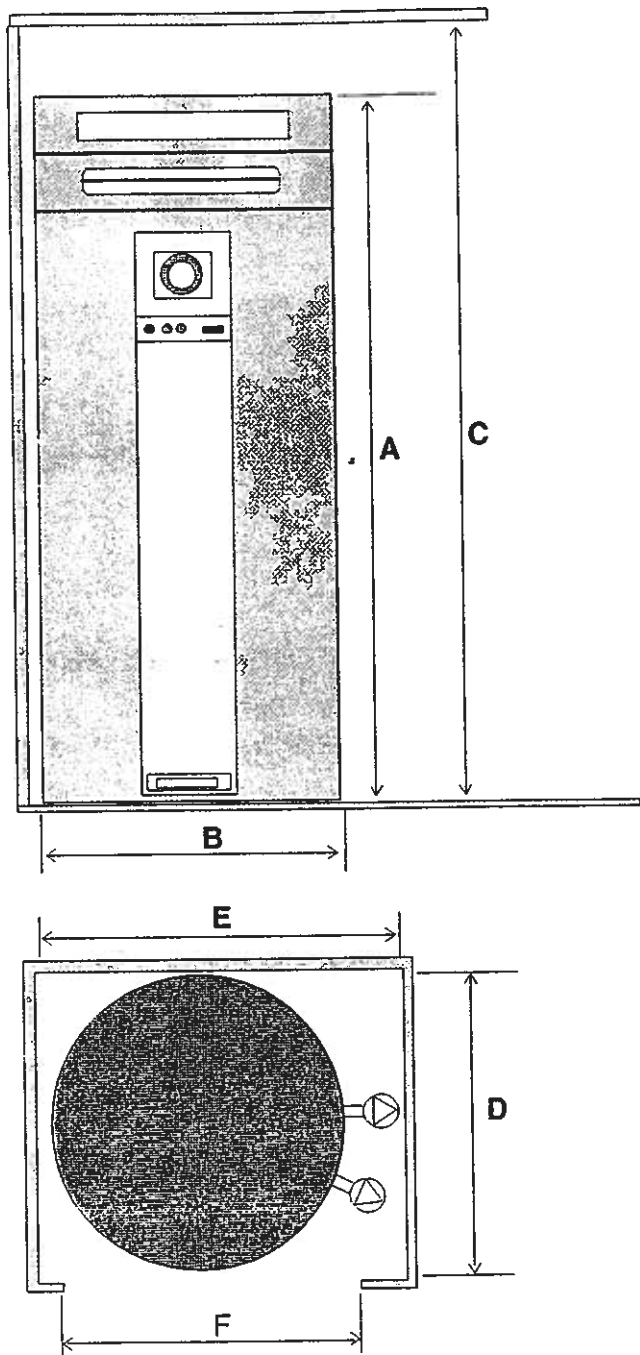
SYSTEM TEMPERATURES

The heating circuit operates on the normal primary boiler temperatures i.e. 82°C flow and 71°C return. Therefore any traditional hot water radiators or convectors can be used with this system and no special over sizing of the heat emitters is necessary.

SYSTEM LAYOUTS

The Systemate III is designed to be installed with any boiler, which is suitable for a sealed heating system and the boiler must be capable of delivering hot water at minimum of 80°C. The unit is supplied with a factory fitted and pre-wired package consisting of: -

- Boiler/space system heating pump
- Domestic hot water primary (plate heat exchanger) pump
- Automatic bypass valve
- Storage appliance control PCB and panel
- Hot water control PCB



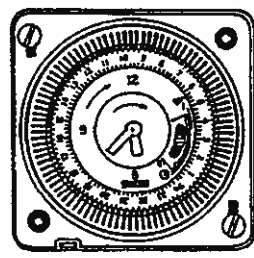
For automatic ballvalve fill models add 65mm to dimension A and 90mm to dimension C in each case.

Model	Dimensions (mm)					
	A	B	C	D	E	F
SM118	1475	475	1675	550	675	600
SM144	1475	500	1675	600	700	625
SM178	1510	550	1710	600	750	675
SM205	1690	550	1920	600	750	675
SM238	1805	550	2035	600	750	675

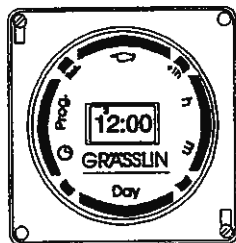
Note. Systemate III is normally supplied with the components on the right hand side (as shown) but can be supplied left handed if required.

Figure 1.5 Principal dimensions of Systemate III (see also Table 1.1)

- f) 3-Port valve. Normally supplied as a flow share valve but can be configured to function as a full diverter valve with hot water priority if required.
- g) Primary i.e. heating circuit expansion vessel (nominal volume 10 litres)
- h) Primary circuit pressure relief valve (set to operate at 3 bar).
- i) Primary circuit pressure gauge (0 – 4 bar)
- j) System filling loop
- k) Electro-mechanical clock (Figure 1.6) to control the space heating (in conjunction with a room thermostat if fitted).
- l) Plate heat exchanger.
- m) DHWS flow switch.
- n) DHWS temperature sensor.



Electro-mechanical
Clock - Standard



Digital Clock - Optional

Figure 1.6 Front Panel Mounted
Clock Options for Systemate III

Boiler Sited Below the Systemate III Unit

A typical system layout with boiler sited below the Systemate unit and the recommended controls to give the most energy efficient operation is shown in Figure 2.1.

- a) The flow pipe from the boiler to the Systemate must rise continuously and NO part of the flow pipe should contain a valve or other device (which can be accidentally closed), as this forms the safety vent pipe to the pressure relief valve.
- b) The pipework connecting the boiler to the Systemate must not be less than 22mm copper tube (or that specified by the boiler manufacturer).
- c) If the length of the flow pipe connecting the boiler to the Systemate unit exceeds 6m, then the pressure relief safety valve must be removed from the unit and fitted to the boiler or the flow pipe adjacent to the boiler as shown in Figure 2.2.

Boiler Sited above the Systemate III Unit (Dipped Flow & Return)

A typical system layout with boiler sited above the Systemate unit and the recommended controls to give the most energy efficient operation is shown in Figure 2.2.

- a) **The pressure relief valve must be removed from the unit and fitted to the boiler or the flow pipe adjacent to the boiler.**
- b) NO part of the flow pipe connecting the boiler to the Systemate should contain a valve or other device (which can be accidentally closed), as this forms the expansion pipe to the expansion vessel located inside the Systemate III casing.
- c) The pipework connecting the boiler to the Systemate must not be less than 22mm copper tube (or that specified by the boiler manufacturer).
- d) The boiler/Systemate pipe circuit must be designed to prevent gravity circulation between the store and the boiler when the boiler is not firing e.g. a gravity check valve may be fitted in the boiler return pipe as shown in Figure 2.2.

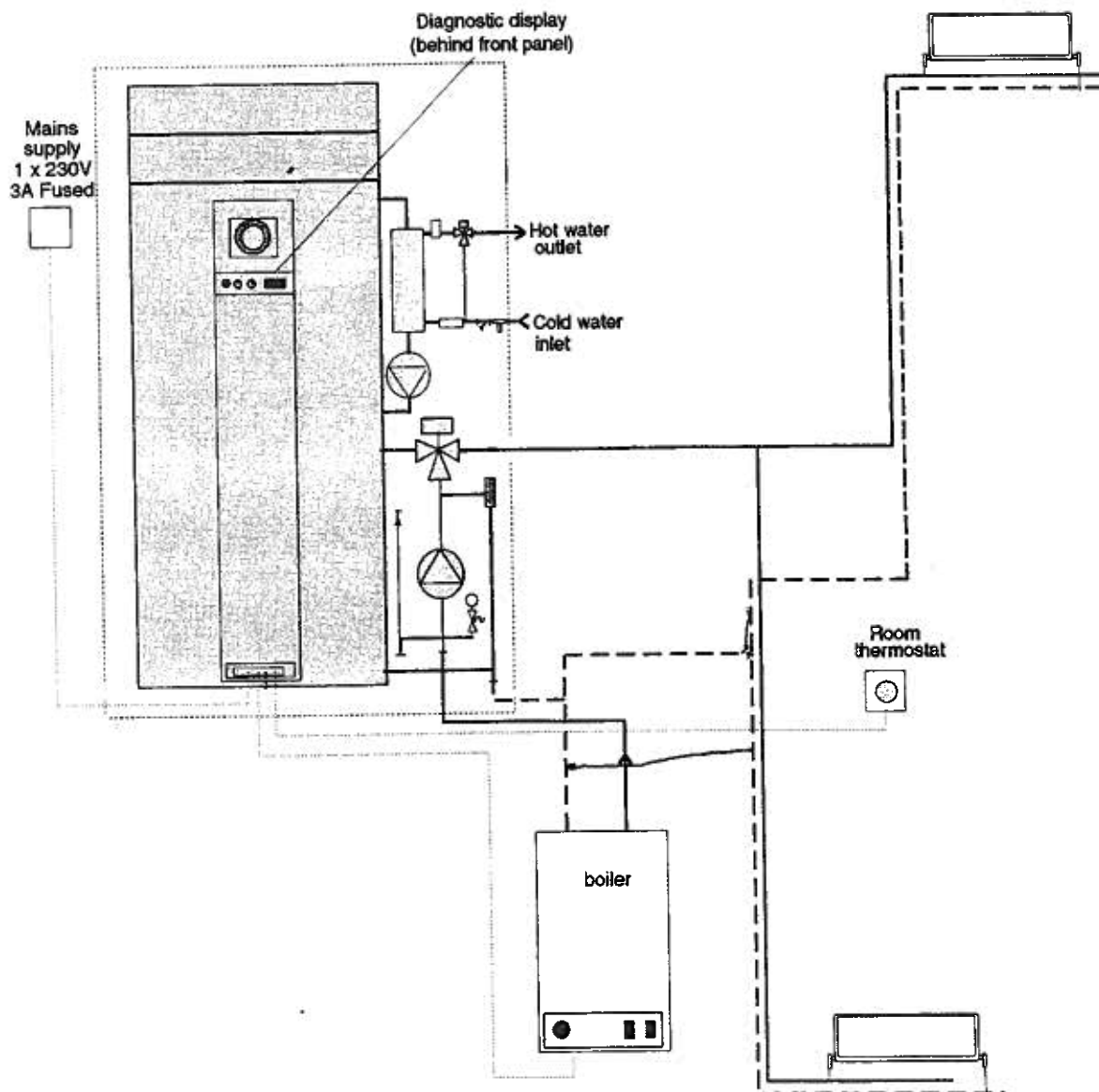


Figure 2.1 A typical SysteMate III heating system with boiler below the store (radiators or radiator pipework can be at higher level than the store providing adequate air vents are fitted)

SYSTEM DESIGN

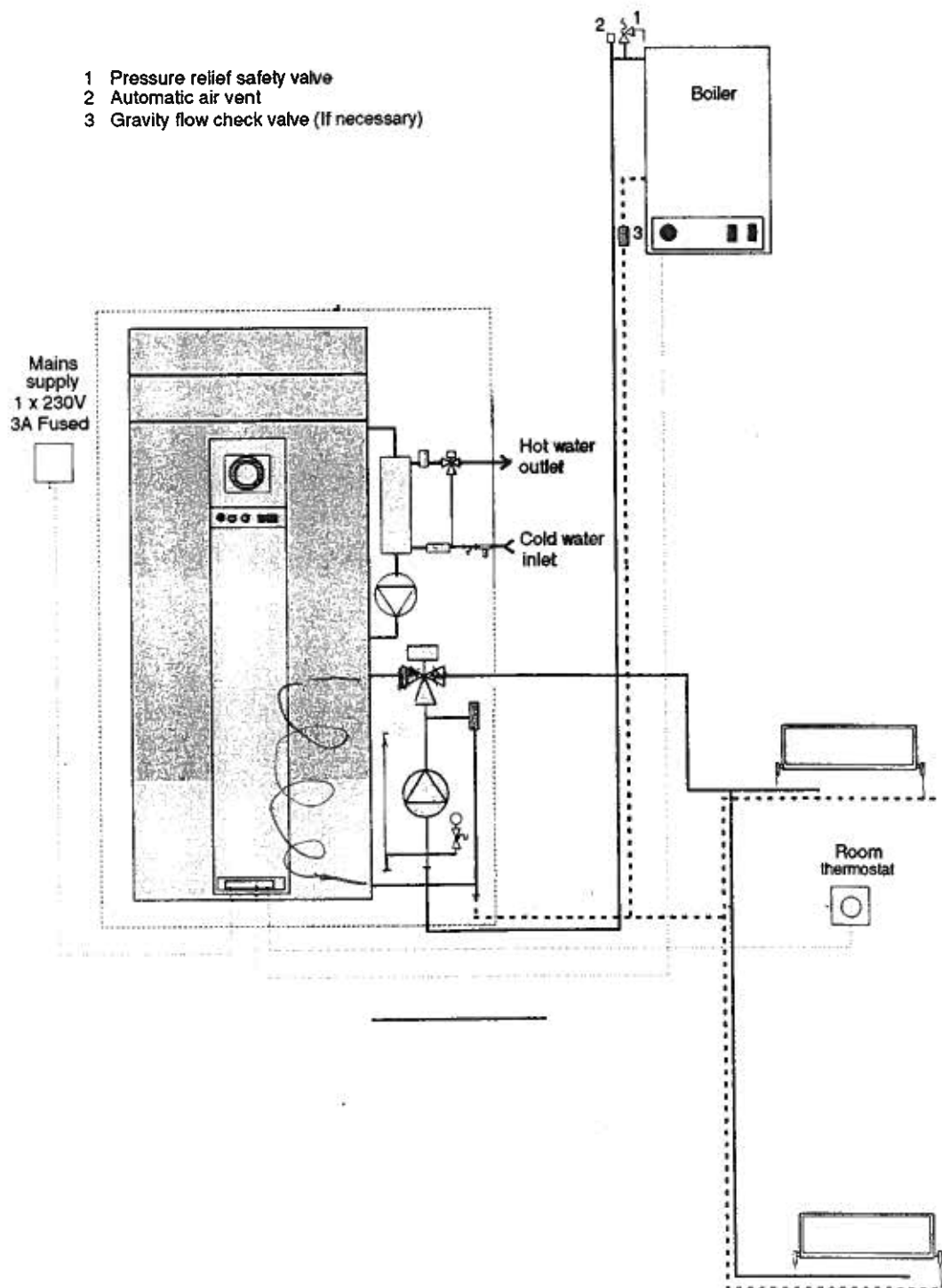


Figure 2.2 A typical SysteMate III heating system with boiler above the store (radiators or radiator pipework can be at higher level than the store providing adequate air vents are fitted)
(Safety pressure relief valve mounted adjacent to the boiler)

SYSTEM DESIGN

EXPANSION VESSEL REQUIREMENTS

The Systemate is supplied with a 10 litre expansion vessel pre-charged to 1.0 bar. The maximum water content of the heating system (boiler + radiators + connecting pipework + primary coil but NOT store volume) must not be greater than those shown in Table 2.2.

- a) The values presented in Table 2.2 are based on maximum boiler flow temperature of 93°C. The expansion vessel must be suitable to accommodate the change in volume of the water in the system when heated from 10°C to 110°C as specified in BS 5449: 1990 clause 16.2.
- b) Allow the following volumes for the primary heating coil and pipework:

SM118	3.4 litre	SP205	6.2 litre
SM144	3.8 litre	SP238	7.5 litre
SM178	4.5 litre		
- c) In normal circumstances an initial vessel and system charge pressure of 1 – 1.2 bar is suitable for most domestic properties.
- d) The minimum system pressure should not be less than the static head plus 0.5 bar i.e. the height of the highest point in the system above the expansion vessel plus a margin of 0.5 bar.
- e) If the system volume is greater than that shown in Table 2.2 at the selected operating conditions then an additional expansion vessel must be fitted.

Table 2.2 The Maximum Recommended Heating System Volumes

Safety valve setting (bar)	3.0							
Vessel charge pressure (bar)	0.5			1.0			1.5	
Initial system pressure (bar)	0.5	1.0	1.5	1.0	1.5	2.0	1.5	2.0
Maximum permitted system volume (litres)	120	71	38	91	52	24	64	30

SYSTEM DESIGN

GENERAL GUIDANCE NOTES ON SYSTEM DESIGN

HEATING SYSTEM

A schematic layout of the heating system in a typical small dwelling is shown in Figure 2.5

- a) The performance of the system pump and the pressure losses through the Systemate III primary coil circuit are shown in Figures 2.3, 2.3a and 2.4 respectively. The nett pump head available for heating circuit can be determined from these figures and this net pump head should be used for sizing the heating circuit pipework.

For example: At 0.5 litres/sec primary flow rate, the pressure loss through the Systemate model SM205 (coil+fittings+3-port valve) is 12kPa (from Figure 2.4). The maximum pump head available at 0.5 litres/sec and setting 3 is 32kPa (3.2m H_2O), therefore 20kPa is available for the boiler circuit.

- b) If the boiler is fitted at a higher level than a Systemate then it may be necessary to fit a gravity check valve in the primary circuit to prevent reverse circulation during dormant period.
- c) All units come complete with their own feed and expansion tank for the primary water in the store, which is used for generating hot water only. The water level in this tank should be adjusted to the level mark.
- d) The Systemate is only suitable for a sealed heating system and therefore heating circuit pipework can run at a higher level than the store e.g. to cross a doorway etc, providing adequate air vents are fitted in the pipework.
- e) With sealed heating systems air is released during the first few weeks of operation. This will need to be vented and the system re-pressurised.
- f) The overflow /warning pipe should be installed in a material suitable for a heating system feed and expansion cistern in accordance with BS 5449.
- g) An automatic bypass is fitted on the Systemate III to compensate for pressure (i.e. flow) rate changes in the heating circuit e.g. when the thermostatic radiator valves close. The system does not require any other bypass valves on the boiler circuit.

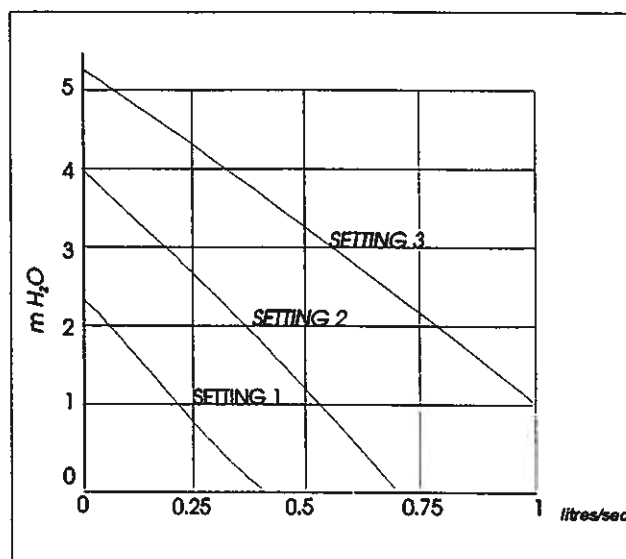


Figure 2.3 Performance Characteristics of Grundfos UPS 15-50 Pump

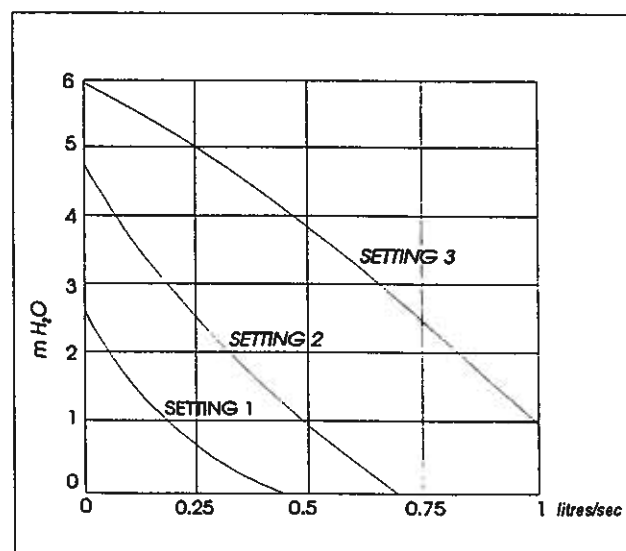


Figure 2.3a Performance Characteristics of Grundfos UPS 15-60 Pump

- h) There shall be no permanent connection to the mains water supply for filling the system, even through a non-return valve without the approval of the Local Water Authority. An approved filling loop is supplied with the Systemate and this should be disconnected after commissioning the system.

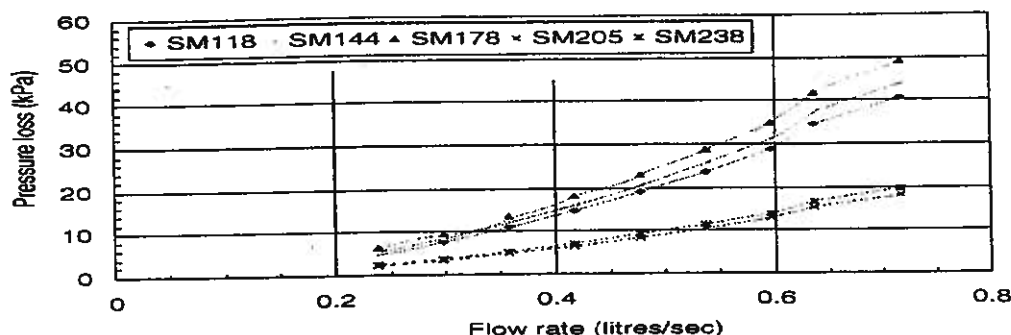


Figure 2.4 Pressure loss through the primary coil, fittings and the 3-port valve fitted to SysteMate III units

HOT AND COLD WATER SERVICES

A schematic layout of the hot and cold water services in a typical small dwelling is shown in Figure 2.5.

SysteMate III will operate at mains pressures as low as 1 bar and as high as 8 bar although the preferred range is 2-3 bar. It is also important to check that all other equipment and components in the hot and cold water system are capable of accepting the mains pressure available to the property.

If the mains pressure can rise above the maximum working pressure of any items of equipment or component to be fitted a suitable pressure limiting (reducing) valve will be required.

For properties with a higher supply pressure than 8 bar it is recommended that a pressure limiting valve set at 3 bar is fitted.

Note: Hot and cold distribution pipework should be designed and installed to prevent heating of the cold supply pipes.

Taps and Valves

- Aerated taps are recommended for all mains pressure systems to prevent splashing.

Pipe Sizing

To achieve even distribution of the available supply of hot and cold water, it is important in any mains pressure system that the piping in a dwelling should be sized in accordance with BS6700. This is particularly important in a large property with more than one bathroom. However the following rule of thumb guide lines should be adequate for most typical property types: -

- A 15mm copper or equivalent external service may be sufficient for smaller 1 bathroom dwellings (depending upon the flow rate available), but the minimum size for larger dwellings must be 22mm (25mm MDPE).
- The internal cold feed from the main stop tap to the SysteMate should be run in 22mm pipe. The hot draw-off should also be run in 22mm as far as the branch to the bath tap.

- The final branches to the hand basins and sinks should be in 10mm and to the shower in 15mm.
- The final branches to taps in existing properties, which are in 15mm, **should be restricted** to balance the flow to each outlet.
- Best results for a balanced system are achieved by fitting appropriate flow regulators to each hot and cold outlet (see Appendix).

Showers

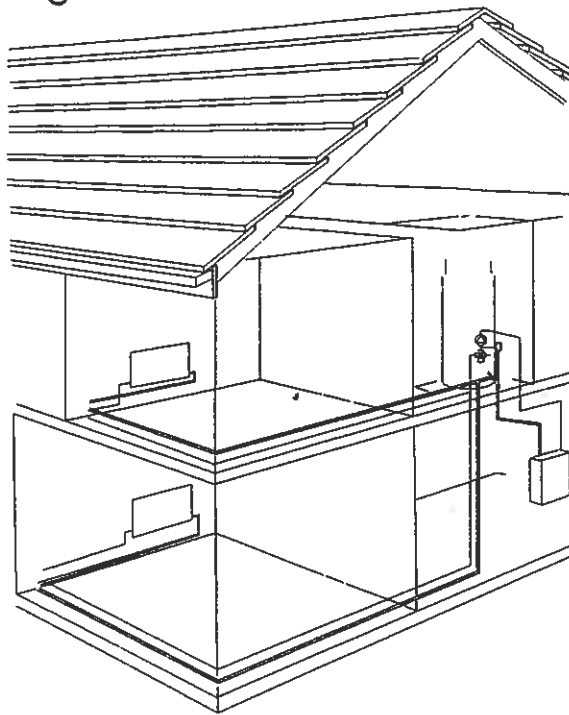
- Showers with either thermostatic or manual mixing valves can be used as long as they are suitable for mains pressures and both the hot and the cold are mains fed. However the thermostatic valves will provide better control.
 - The hot water supply to a shower mixing valve should, wherever practical, be fed directly from the SysteMate III or be the first draw-off point on the hot circuit.
 - The cold supply to a shower mixing valve should be fed directly from the rising mains via an independent branch.
 - Fixed head type showers:** No back-syphonage arrangements are necessary.
 - Loose or flexible head type showers:** If a loose head shower with a flexible hose is used over a bath then: -
 - The hose must be fixed so that the head cannot fall closer than 25mm above the top edge of the bath as specified in Model Byelaw 16 of the Water Supply Byelaws.
- Or
- The shower must incorporate or be fitted with an acceptable means of back-syphonage protection in accordance with the Model Water Byelaws.

Bidets

- The supply of hot and cold mains water directly to a bidet is permitted provided that it is of the over-rim flushing type and that a type 'A' air gap is incorporated.
- It must not include either an ascending spray or provision to attach a hand spray.

SYSTEM DESIGN

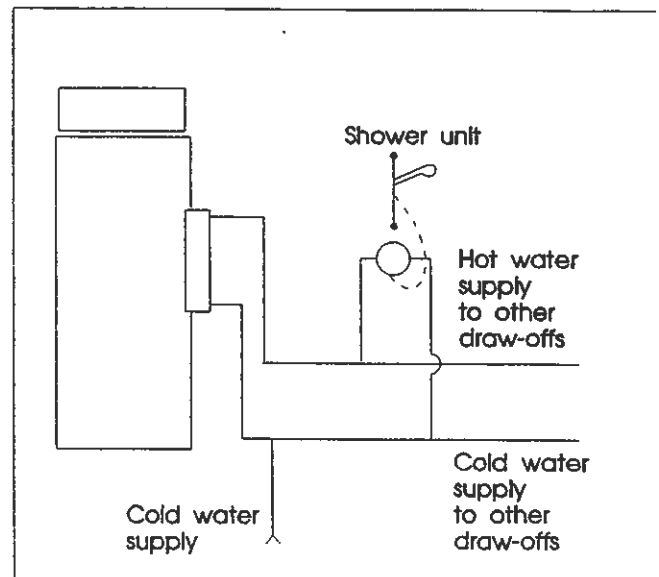
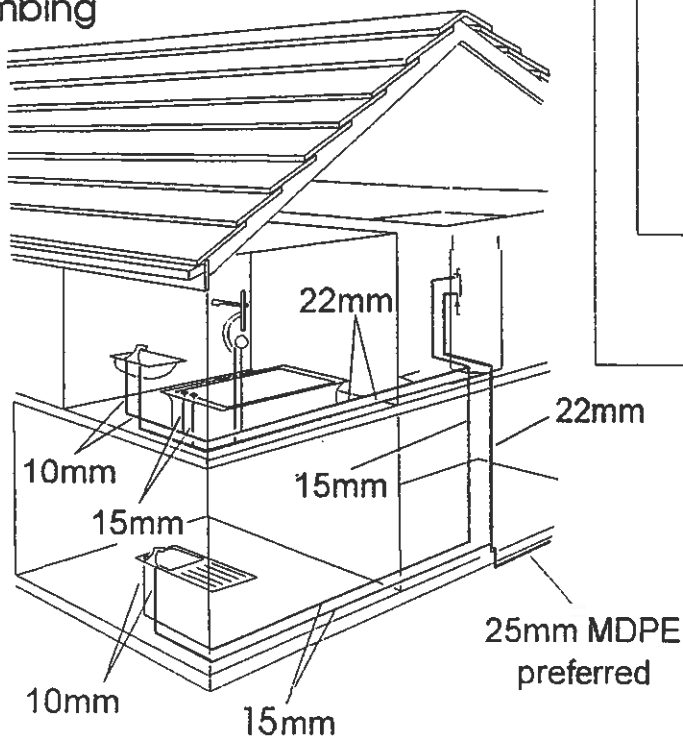
Heating



The flow and return from the boiler run directly to the connections provided on the Systemate III and the flow should rise continuously to aid venting.

— return
— flow

Plumbing



— cold
— hot

Figure 2.5 Schematic layout of typical heating and domestic water services

INSTALLATION

INSTALLATION INSTRUCTIONS

IMPORTANT NOTES

- Only boilers suitable for sealed i.e. closed heating systems and fitted with additional safety thermostat must be used with SystemeMate III.
- For good hot water service, it is important that the boiler selected must be able to deliver hot water at 82°C.
- It is recommended that any surface mounted heating and hot and cold water system pipework in the SystemeMate III cupboard **must be insulated** to reduce the standing losses and to prevent unnecessarily high cupboard temperatures. More heat is lost from the first metre of pipework connected to the store than from the store itself.

NOTE It is a requirement of Part L of the Building Regulations that all hot water pipework within 1 metre of a hot water appliance is insulated.

- Notwithstanding the above, the cupboard temperatures are normally higher than in a conventional system and therefore the design of both the cupboard and the door should take this into account.
- The heating system operates on the normal primary flow and return temperatures of 82°C flow and 71°C return of the boiler and should be installed and balanced in exactly the same way as any traditional heating system with an indirect vented cylinder and hot water radiators or convectors.
- All SystemeMate III models are for sealed primary i.e. closed systems only.

Plumbing Connections

- Make all water connections in accordance with the labelling on the thermal store and the associated pipework as shown in Figure 3.1.
- If a boiler is fitted above the thermal store, and there is a risk of gravity circulation, then a gravity check valve should be incorporated in the connecting pipework leading from the SystemeMate to the boiler i.e. the boiler return.
- All factory made joints should be checked after installation in case they have been loosened during transit.
- Ensure that the boiler/heating flow and return pipes and the domestic hot water pipes are run such that they do not heat the cold water distribution pipes in a dwelling.

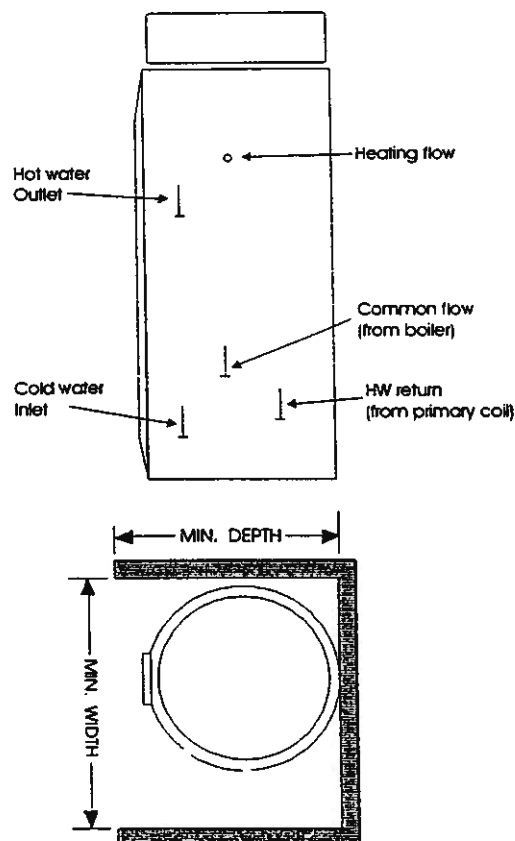


Figure 3.1 SystemeMate III Connection arrangement
(For minimum cupboard dimensions see Table 1.1)

Thermal Store Feed and Expansion Cistern

- With the manual fill model it is most important to fill with cold water so that the water level is in line with the mark on the inside of the feed and expansion cistern. This is to allow adequate room for expansion, and is marked by a corrugation in the wall of the cistern.
- With the automatic fill model it is important to adjust the ballvalve to the same level as the above.
- Sufficient space should be left above the unit to allow access to the ballvalve for servicing and adjustment. (see Figure 1.5)
- With the automatic fill models a 22mm compression fitting is provided as standard in the feed and expansion cistern for the overflow/warning pipe, which should be no less than 20mm internal diameter.
- The overflow/warning pipe should be fitted to discharge clear of the building and be sited so that any overflow can be easily observed.
- The overflow/warning pipe should be installed in a material suitable for use with heating feed and expansion cisterns in accordance with BS 5449 (such as copper) and should not have any other connections to it.

INSTALLATION

Pressure Relief Safety Valve

The valve should be installed into a discharge pipe which permits the safe discharge of steam and hot water such that no hazard to persons or damage to electrical components is caused. **NOTE.** The valve incorporates plastic components which will be adversely affected by heat. For this reason we recommend the use of compression fittings for joints adjacent to the valve.

Domestic Hot Water Temperature

The electronic control system automatically regulates the domestic hot water outlet temperature to approximately 52°C and no adjustment or setting is necessary during installation.

The Boiler Thermostat

This should always be set to *maximum* to give the best hot water and heating service and to achieve the highest efficiency and reduced boiler cycling by ensuring that the store thermostat will be controlling the boiler.

Pump Settings/ Replacement

- a) The boiler/system pump should be set at the speed at which the temperature difference across the boiler is not greater than 11°C i.e. the nominal design parameters. The performance of the pump is shown in Figures 2.3 and 2.3a.
- b) The domestic hot water plate heat exchanger pump should always be set at maximum speed.
- c) If it is necessary to replace either of the two pumps fitted to the appliance the pump head (motor pack) only should be removed as recommended by the manufacturer (Grundfos). Assuming it is within warranty this will be accepted by the merchant as being under warranty as long as a complete pump i.e. alleged faulty motor pack and new base is left with the merchant. It is important when a pump has been replaced to ensure that any air is adequately vented.

INSTALLATION IN NINE EASY STEPS

The SysMate III installation is easier and quicker than a conventional vented system because there is no secondary feed and expansion cistern to install and no time is wasted in the planning and installation of the controls and pumps in the cylinder cupboard.

- 1) Inspect the position in which SysMate III is to be fitted and that the width and depth are at least in accordance with the measurements detailed in Table 1.1.
- 2) Plan the pipe connections. Each fitting on the SysMate has its own label. You need to connect the following pipes: -
 - Pumped flow from the connection provided on the SysMate to the radiators.
 - Pumped flow and return pipes from the connections provided on the SysMate to the boiler.
 - Cold mains water supply connections to the inlet side of the plate heat exchanger (and to the ball valve in the F & E cistern if it is the automatic fill model).
 - Domestic hot water supply pipe from the plate heat exchanger outlet to the taps.
 - Overflow warning pipe from the F & E cistern to discharge in a conspicuous position externally (if the automatic fill model).

NOTE: All the radiator return circuits need to be connected together prior to the appliance and the single heating return branched into the hot water return from the appliance to form a common return to the boiler (see Figure 2.1).

- 3) Decide at what stage in your installation work you are going to fit the SysMate. We would suggest that the SysMate should be fitted first and the pipes run from it to the boiler, radiators and domestic hot water supply system subsequently in that order. If the SysMate III is installed as part of the first fix it should be adequately protected or removed and refixed later in the construction process.
- 4) Remember that the automatic bypass is already fitted and no additional bypass should be fitted in the system.
- 5) Carry out the rest of the installation work, i.e. boiler radiators and hot water supply pipework. Connect the cold water supply pipework.
- 6) Fill the SysMate, and fill the radiators, boiler and pipework with water through the filling loop provided. For the standard model, fill manually to the level mark on the inside of the F and E cistern. Adjust the ball valve to fill to the same level on the automatic fill model. Flush the system out, fill and vent again.

- 7) Open the domestic hot water isolating tap and establish flow through the taps etc. Check that the flow through all hot and cold water taps etc. is stopped when the mains water stop valve is closed.
- 8) The system is now required to be electrically connected.
- 9) The system is now ready to be commissioned.

WIRING THE SYSTEM

Two printed circuit boards (PCBs) control the complete system and all the Systemate III components are pre-wired to these PCBs (see page 17), therefore plumbers are well able to complete the electrical installation provided they adhere strictly to the IEE Regulations.

Note: Do not attempt the electrical work unless you are competent to carry it out to the above standards.

Fused Isolator

- a) Connection to the electrical supply must allow complete electrical isolation by installing a double pole switch having a 3mm separation on both sides.
- b) The isolating switch must only serve the Systemate III space heating and hot water system together with its controls.
- c) The supply to the Systemate III must be fused at 3A.

To Wire the Systemate III

Before commencing, ensure that the power source to which the Systemate is to be connected is isolated. The generic wiring procedure for the Systemate is described below and example-wiring diagrams for some of the boilers with special requirements are given in Appendix 1.

- a) Remove the white cover plate (4 screws) and run the external wiring through the grommets provided at the bottom of the white control panel.
- b) Wire the mains power supply from the 3A fused and switched connection unit as follows:-

'Live' to terminal '1'
'Neutral' to terminal '2'
'Earth' to terminal '3'

Note: The mains power supply to the domestic hot water temperature control PCB is already connected to the storage appliance control PCB.

- c) Wire the boiler to the Systemate III storage appliance control PCB as follows:-
 - Take a 'Live' from the Systemate III PCB terminal '5' to boiler 'Switched Live' terminal.
 - Take a 'Neutral' from the Systemate PCB terminal '7' to the boiler 'Neutral' terminal.
 - Take an 'Earth' from the Systemate PCB terminal '6' to the boiler 'Earth' terminal.
 - If the boiler requires a permanent live other than for a pump over-run, then this should be taken from terminal '4' on the Systemate PCB.
- d) The link between Systemate III PCB terminals '25' and '28' should be removed if a room thermostat is to be fitted.
- e) Remove the link between terminals '23' and '24' if a 'no clock model' has been ordered and it is proposed to fit a remote single channel clock to control the space heating.
- f) The link between the terminals '22' and '23' should be removed if an extra single channel clock or a dual channel programmer is to be fitted for controlling both space heating and hot water. Also the brown live supply to terminal '6' on the pump speed control board should be removed from terminal '23' and connected into terminal '22' on the storage appliance control PCB..
- g) When the wiring is complete, replace the front cover plate (4 screws).

To Wire the Room Thermostat

- a) Remove the link_3 joining the Systemate III control PCB terminals '25' and '28' and wire the room thermostat to the Systemate III control PCB as follows:-

From the Systemate PCB terminal '25' take a 'live' to the 'live connection' on the room thermostat.

From a room thermostat 'switched live' connection take a 'live' to the Systemate PCB terminal '28'.

Connect the Systemate PCB terminal '27' to the room thermostat 'Neutral' terminal.

If required, connect the Systemate PCB terminal '26' to the room thermostat 'Earth' terminal.

INSTALLATION

Frost Protection

- a) When frost protection is required for the whole house or where a base temperature is required during cold weather, then a frost thermostat should be wired across Systemate PCB terminals '22' and '28'.
- b) When a frost protection is required for the boiler circuit only, then the frost thermostat should be wired across Systemate PCB terminals '22' and '23'.
- c) An alternative to fitting a frost thermostat would be to set the programmer to constant during the cold weather period and adjust the room thermostat to a suitable setting.

Delay Timer

This facility is provided within the storage appliance control PCB and is set for 180 seconds.

Overnight Shut Down

The most effective service from the thermal storage system (Systemate) is achieved when the boiler is on demand for twenty four hours under the control of the store thermostat.

In special circumstances the system can be wired to isolate the boiler overnight using one of the methods described below.

Using Two Single Channel Programmers

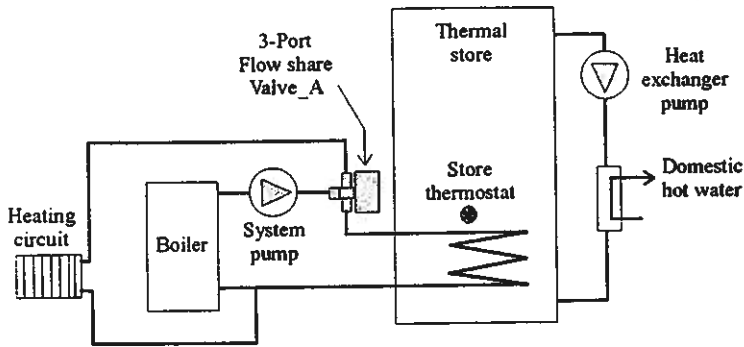
This method is suitable if the Systemate III is already fitted or supplied with a space heating programmer e.g. single channel Grasslin. The second single channel programmer is wired by removing the link between terminal 22 and 23 and taking the switched live to terminal number 23. The live neutral and earth connections can be taken from terminals 22, 20 and 21 respectively if required. The second single channel programmer can then be set to shut down the appliance overnight.

Using a Two Channel Programmer

If the Systemate III is supplied as a 'no clock option', then a remote two-channel programmer can be used.

This should be wired with the HW output wired to terminal 23 and the heating output wired to terminal 24. The existing link between these two terminals shall be removed.

INSTALLATION



Jumpers SAC PCB

1_ON 2_OFF 3 ON
4_ON 180s pump overrun
5_OFF

A_ON Horizontal

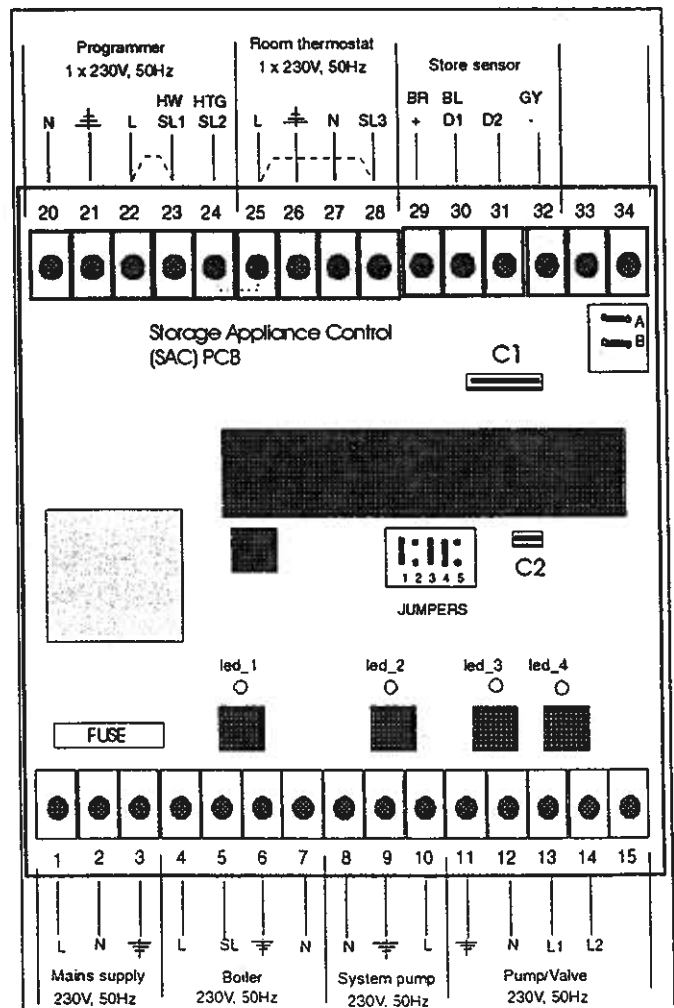
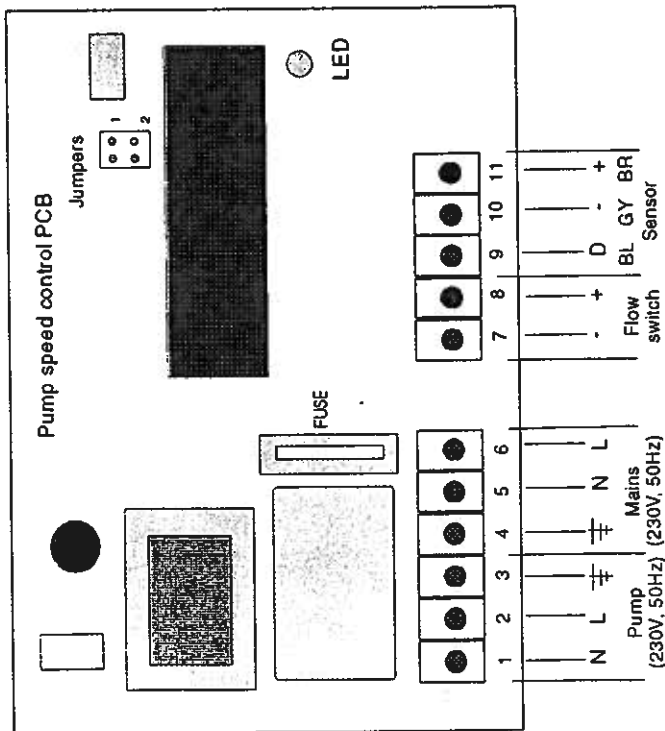
B_ON Horizontal

Jumpers DHW Pump speed control PCB

1_OFF
2_OFF

NOTES

1. If no programmer is fitted, a link will be also provided in terminals 23 & 24



COMMISSIONING

COMMISSIONING THE SYSTEM

It is essential that the system functions properly for optimum performance. To achieve this, the system should be commissioned in accordance with good practice and generally in accordance with the requirements of BS6798, BS5449 and BS7593: 1992.

INITIAL FILLING AND CLEANSING THE SYSTEM

- a) Ensure that the F & E cistern is filled with cold water to the level indicated by the swage line. If an automatic fill model is being used check the ball valve is correctly adjusted to shut off at this level.
- b) Check and adjust the expansion vessel air pressure if necessary to the initial charge pressure of 1.0 bar or to a figure specified by the designer.
- c) Fill the thermal store through the F & E cistern and flush cold.
- d) Open any isolating valves and fill the heating system i.e. boiler and radiator circuits using the filling loop and flush cold.
- e) Refill both the thermal store and the heating system and purge air.
- f) Add a cleanser such as Sentinel X300 or Fernox Superfloc to ensure that flux residues and installation debris are removed from the system.
- g) Commission the boiler.
 - If the boiler is range rated, then adjust it to the **specified** or **maximum** heat input.
 - Set the boiler/system pump speed so that the temperature difference across the boiler is **not more than 11°C**.
 - Set the boiler thermostat to **maximum**.
- h) To ensure full cleansing, the circulation to all parts of the system should continue for a minimum of 1 hour.
- i) Flush both the thermal store and the heating system hot having checked that there is no overflow from the F & E cistern of the Systemate III appliance and that the heating system pressure is not greater than 2.5 bar when the system is up to temperature.

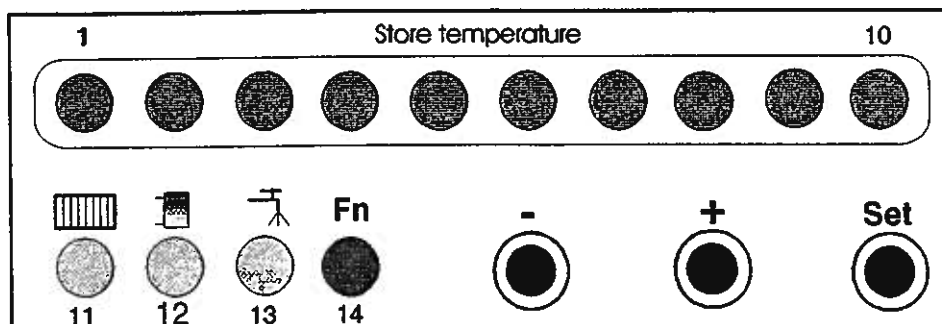
- j) Refill both the systems i.e. thermal store and the heating system.
- k) Switch on and check the operation of the immersion heater (if fitted). **NOTE: Do not switch on the boiler or immersion heater before first checking that the F & E cistern of the thermal store is filled with water.**
- l) With sealed heating systems air is released during the first few weeks of operation. This will need to be vented and the system repressurised.

Primary Water Treatment

- a) Although the standard Systemate has no special water treatment requirements, the radiators and other parts of the circuit will benefit from the application of scale and corrosion inhibitor such as Sentinel X100 or Fernox MBI.
- b) Please remember that if water treatment is applied then it must be introduced separately into the thermal store (via the feed and expansion cistern) as well as being injected into the sealed heating system.

COMMISSIONING

DESCRIPTION OF DIAGNOSTIC DISPLAY AND CONTROLS



The brief description of the functions of the diagnostic display and controls is described below. The details of the individual functions are described in the Fault Finding/Diagnostic section of this document. LED = light emitting diode.

Green LEDs 1 – 10:

- a) The 'Green LED 1-10' indicates the temperature of the water in the store. When the store temperature is below the minimum pre-set value, the 'LED-1' will flash. When the store temperature is higher than the maximum pre-set value LED's 1 to 9 will be 'ON' and LED-10 will flash.
- b) One or more 'Green LED's together with a permanently 'ON' Red LED-14' will indicate a fault on the system.

Orange LED-11

- a) The 'Orange LED-11' when constantly 'ON' indicates demand for space heating from the programmer and room thermostat.
- b) The 'Orange LED-11' when 'FLASHING' indicates demand for space heating from the programmer and room thermostat AND the boiler is in the firing mode.

Orange LED-12

- a) The 'Orange LED-12' when constantly 'ON' indicates that the store sensor is satisfied and the programmer (if fitted) is in timed hot water mode.
- b) The 'Orange LED-12' when 'FLASHING' indicates a demand for hot water from the store sensor, the programmer (if fitted) is in timed hot water mode AND the boiler is in the firing mode.

Red LED-14

- a) The 'Red LED-14' when 'FLASHING' indicates that the system is in the 'SET UP' mode and is ready to receive the data from the user.
- b) The 'Red LED-14' when constantly 'ON' together with one or more 'Green LEDs 2-9' indicates the type of system fault.

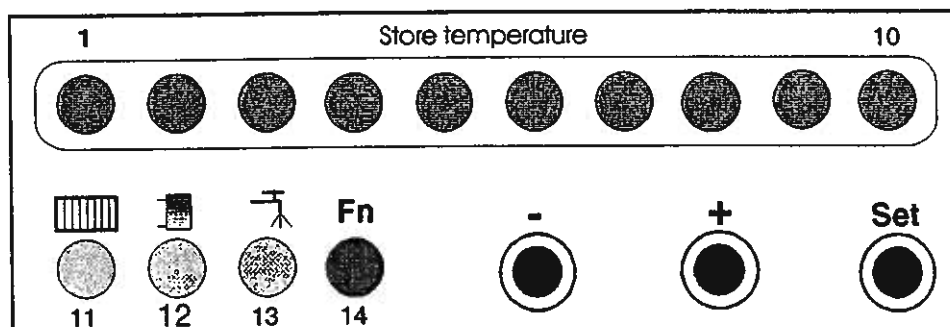
Push buttons '+', '-', and 'Set'

These buttons are used to change and set the hot water store temperature and other parameters.

COMMISSIONING

COMMISSIONING THE STORE TEMPERATURE SETTING

For maximum system efficiency the store thermostat must not allow the boiler to cycle more than about 4 times when the store is being charged.



The control system in this appliance has been programmed to automatically commission the store thermostat setting. However matching the control settings to the installed boiler can enhance the performance of the system.

k) If, after this procedure, the 'Red LED-14' and the 'Green LED-9' are permanently on then the boiler is not delivering water at the right temperature. Check the boiler and boiler thermostat setting and repeat the commissioning procedure.

- Ensure that the boiler thermostat is set at maximum.
- Ensure that the space heating is switched 'Off' on the programmer i.e. the 'Orange LED-11' is 'Off'.
- Ensure that the domestic hot water is switched 'On' on the programmer if fitted i.e. the 'Orange LED-12' is 'On'.
- Leave the appliance to heat up. At this stage 'Green LED 1' and 'Orange LED 12' will flash.
- As the store rises in temperature the 'Green LED's' will progressively switch 'ON' and 'Orange LED 12' will continue to flash.
- When the store is satisfied 'Orange LED 12' will stop flashing (but remain 'ON') and the boiler will switch off.
- Draw off just enough hot water for the boiler to re-fire.
- Whilst the boiler is still firing put the system controller into the commissioning mode by pressing the three push buttons marked '-', '+', and 'Set' simultaneously until the 'Red LED-14' begins to flash.
- When the boiler has done about 4 cycles or has been cycling for about 15 minutes, press the buttons marked '-' and '+' simultaneously until the 'Red LED-14' is 'OFF'.
- The system is now commissioned to match the installed boiler and the greater number of LED's ON will indicate this.

Note: If an attempt is made to commission the system below the minimum pre-set store temperature, then a fault will be indicated (see 'k' above) but the system will continue to work at the preset values.

IMPORTANT DO'S AND DON'TS

- a) **DO** check the incoming mains water pressure. The preferred range of mains pressure is 2 – 3 bar.
- b) **DO** check that all connections are in accordance with the labelling on the thermal store.
- c) **DO** check the water level is correctly set in the F & E cistern when cold and adjust if necessary
- d) **DO** make sure on the automatic fill models that there is adequate clearance above the F & E cistern to service the ballvalve.
- e) **DO** ensure that any range rated boilers are set at **output** specified by the designer (or maximum).
- f) **DO** ensure that the boiler thermostat is set to maximum.
- g) **DO** insulate any exposed pipework in the Systemate cupboard.
- h) **DO** plumb the overflow/warning pipe in a 20mm internal diameter pipe and ensure it discharges in a conspicuous external position. Ensure it is a material which is suitable for use with a heating F & E cistern in accordance with BS 5449 (such as copper).
- i) **DO** check the pump settings.
 - Adjust the boiler/system pump to give a temperature difference across the boiler of 11°C or less.
 - The hot water plate heat exchanger pump should be set at **maximum**.
- j) **DON'T** use pipework smaller than 28mm between the boiler and the Systemate when the boiler rating exceeds 20kW (about 68,000 Btu/hr).

FAULT FINDING/DIAGNOSTICS

FAULTS AND THEIR CAUSES

Any fault in the system design and malfunction of system components will generate customer complaints. These complaints can be grouped into the following three main categories: -

- a) The system is noisy
- b) Hot water service is unsatisfactory
- c) Space heating service is unsatisfactory

Causes of a Noisy System

- a) Noisy System pump operation
 - Check the pressure in the heating system, which should not be less than 1.0 bar when cold – refill and vent the pump and system if necessary.
 - Check the pump speed setting - reduce if necessary but ensure that the temperature rise across the boiler does not exceed 11°C.
 - If system is noisy when in heating mode – check and adjust if necessary the system bypass valve.
 - Check that the radiator/system is correctly balanced.
 - Check and vent any air in the system and recharge the water pressure if necessary.
- b) Noisy boiler operation
 - Check the flow rate through the boiler at full gas rate by measuring the temperature rise across the boiler. If the temperature rise is 11°C or less then contact the manufacturer. If the temperature rise is greater than 11°C, then increase the pump speed.
 - Check pressure of water in the system – refill if necessary to 1.0 bar when cold.
 - Check and vent the system if necessary.
 - Check and adjust the automatic bypass valve if necessary.
- c) Noise when hot water tap is opened
 - If the plate heat exchanger pump is noisy when the hot water tap is opened, then check the level of the water in the F & E cistern and vent the pump if necessary.
 - Water hammer – loose pipework and/or tap washers.

Causes of Unsatisfactory Hot Water Service

- a) Check boiler thermostat – this should be set at maximum.

- b) Check that the boiler flow temperature before it is switched off by its internal or the store thermostat is adequate – it should not be less than 80°C.
- c) If a separate hot water programmer or a two channel programmer is fitted, then check that the hot water 'on time' periods are set correctly to match the demand pattern in a dwelling.
- d) Check that the store is charging to at least 70°C – if not then recommission.
- e) Check that the hot water plate heat exchanger pump stops and starts when the hot water tap is opened and closed.
- f) Check that the plate heat exchanger pump is set at maximum speed.
- g) Check that the hot water outlet temperature does not change significantly when the hot water flow rate is increased from say 5 litres/min to 15 litres/min.
- h) Check that the filter before the flow switch is not blocked – clean if necessary.
- i) Check that the space heating and hot water load is not greater than the boiler output and that the Systemate III model is suitable for the type of dwelling.
- j) If (a) to (i) are correct then it is possible that the performance of the heat exchanger is impaired by scale. If this is the case the hot water flow rate will be reduced. Replace it with a factory exchange unit and re-check hot water performance.

Causes of Unsatisfactory Space Heating

- a) Check boiler thermostat – this should be set at maximum.
- b) Check that the boiler flow temperature before it is switched off by its internal or the store thermostat is adequate – it should not be less than 80°C.
- c) Check the operation and the settings of the heating programmer and the room thermostat.
- d) Check that the 3-port flow share valve is functioning and that the system/boiler pump is circulating the water to the radiator circuit.
- e) If some rooms are not being heated properly, then increase the pump speed and if necessary balance the system.

FAULT FINDING/DIAGNOSTICS

Over/low from Feed & Expansion Cistern

Automatic fill models only

- a) Check that the controlled level of water in the cistern is no higher than the indentation mark. Adjust if necessary.
- b) If a replacement ballvalve is required, then this should be obtained only from Gledhill Water Storage Ltd.

Discharge from the Pressure Relief Safety Valve

- a) Check that the system is not over-pressurised when cold – nominal charge pressure should be about 1.0 bar.
- b) Check that the air pressure inside the expansion vessel is correct – refill with air if necessary to nominal value of 1.0 bar.
- c) Check that the expansion vessel is correctly sized for the system volume.
- d) Check the pressure relief valve seat – replace if necessary.

MAINTENANCE

With the manual fill model we recommend that the water level in the Feed and Expansion cistern is checked annually at the same time as the boiler is serviced and water added if required.

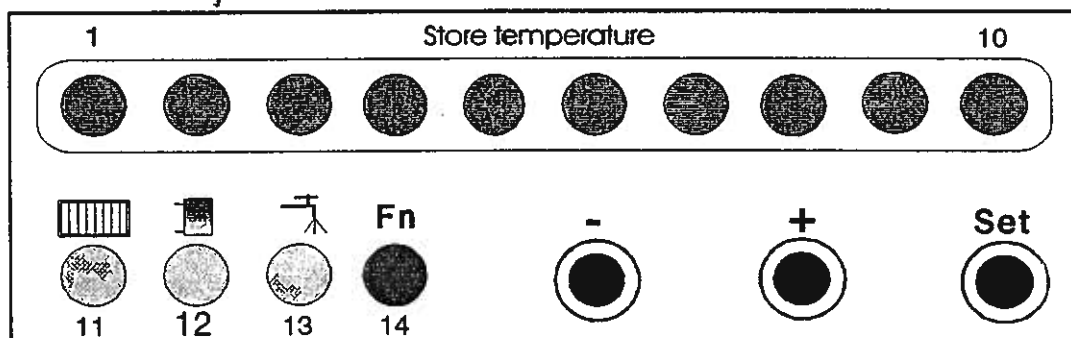
FAULT FINDING/DIAGNOSTICS

SYSTEM FAULT INDICATION AND DIAGNOSTICS

The SAC control PCB does not control or override any safety controls of the heating system.

The SAC control PCB detects the faults in the system and these are displayed on the LED display panel.

Even when the SAC control PCB is in the fault indication mode i.e. when the 'RED LED-14' is continuously 'ON', the heating system will continue to function although all the services may not be available or will only be available at lower level and efficiency.



Fault Indication Table (Diagnostic Display)	
LEDs ON	Fault
• Red + Green No 3	Store sensor not connected – system will not function
• Red + Green No 5 + Orange No 13 ON when no hot water tap is opened.	Domestic hot water flow switch stuck in the closed position i.e. hot water heat exchanger pump is permanently ON.
• Red + Green No 9	Boiler not delivering water at required temperature – check boiler thermostat
Further Information on Faults <ul style="list-style-type: none"> • Further faults relating to the Pump Speed Controller are indicated on the PCB and these are described in detail on the following pages. • Further faults relating to the Storage Appliance Controller are indicated on the SAC PCB and these are also described in detail on the following pages. 	

Clearing the Faults

It is important that the system is reset after the faults have been rectified. The procedure for clearing the fault registers is:

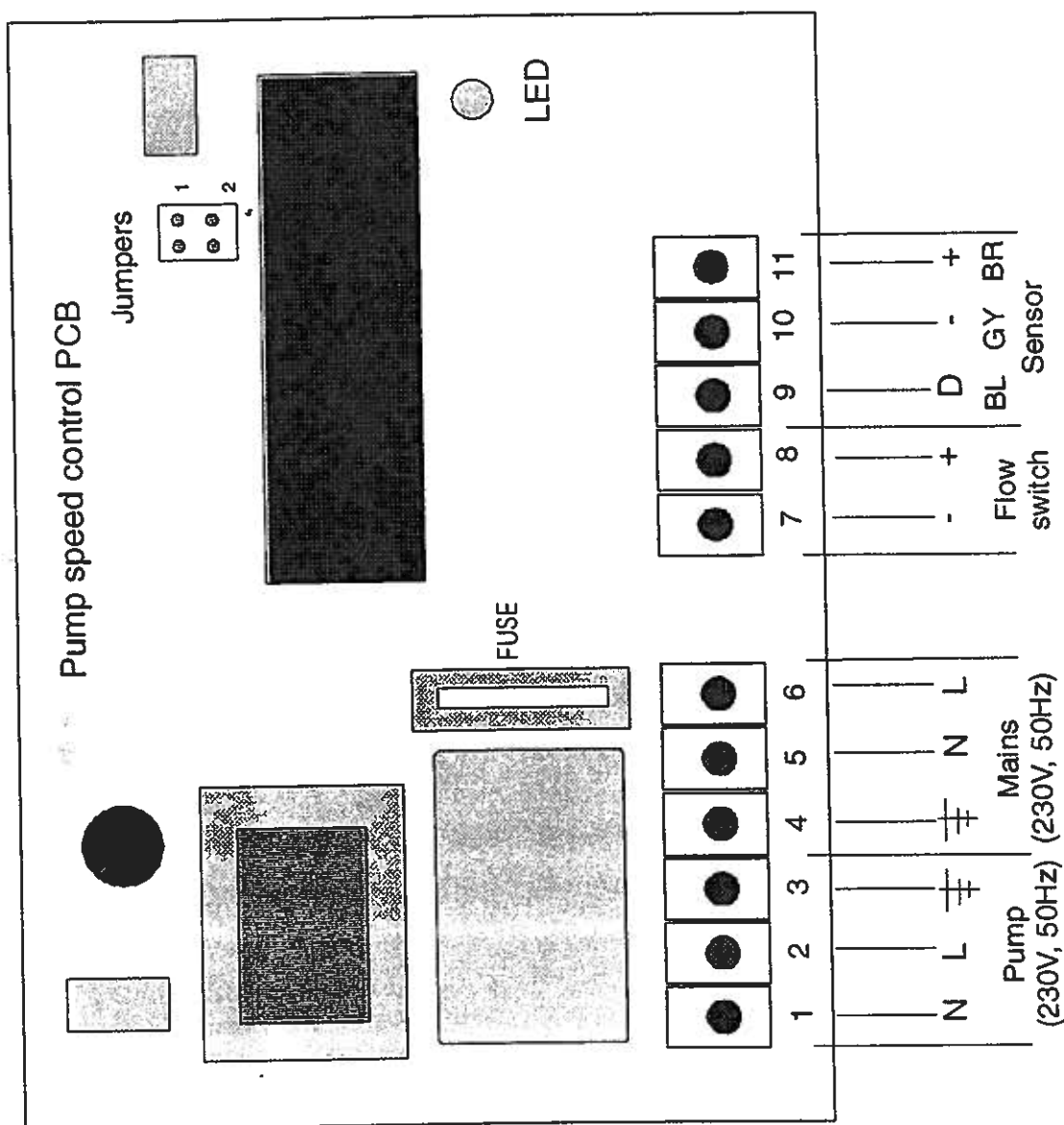
- Press the two push buttons marked '+' and 'Set' simultaneously until the 'RED LED-14' starts to 'flash'.
- Press the push button marked 'Set' until the 'RED LED-14' switches off. The Green LEDs will now indicate the store temperature.

It is possible to re-boot the Store Appliance Control PCB to clear it and re-establish the default conditions. Please speak to our Technical Sales Office if you consider this to be necessary.

FAULT FINDING/DIAGNOSTICS

DHW PUMP SPEED CONTROL PCB

The layout of the pump speed control PCB is shown in the figure below. 4



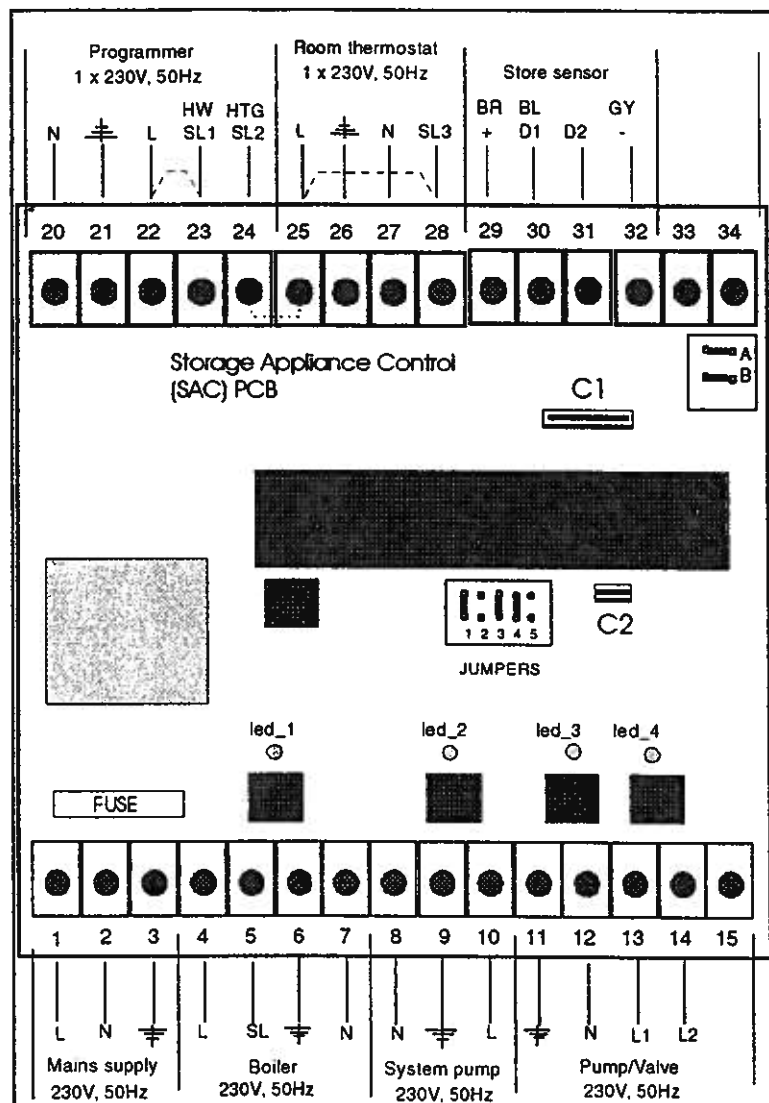
Function Indicating LED

Off:	No mains power supply - check fuse
Flashing - Low frequency:	System status is OK
Flashing - High frequency:	Temperature measurement error - check sensor or wiring
On - Permanent:	Processor related fault - no control of hot water - change board

FAULT FINDING/DIAGNOSTICS

STORAGE APPLIANCE CONTROL PCB (SAC)

The layout of the SAC PCB is shown in the figure below and is designed to control all the operations of the appliance.



LEDS - when ON

LED_1 Indicates that there is mains voltage (230V, 50Hz) at terminal '5' i.e. the boiler is ON.

LED_2 Indicates that there is mains voltage (230V, 50Hz) at terminal '10' i.e. the boiler/system pump is ON.

LED_3 Indicates that there is mains voltage (230V, 50Hz) at terminal '13' i.e. the 3 port flow share valve connected to terminals 11, 12 and 13 is ON - heating and hot water (i.e. mid position).

LED_4 Indicates that there is mains voltage (230V, 50Hz) at terminal '13 and 14' i.e. the 3 port flow share valve connected to terminals 11, 12, 13 and 14 is ON - heating only.

CONNECTIONS

The front display panel is connected into C1. The PSC PCB is connected to terminals 20, 21 and 23.

JUMPERS

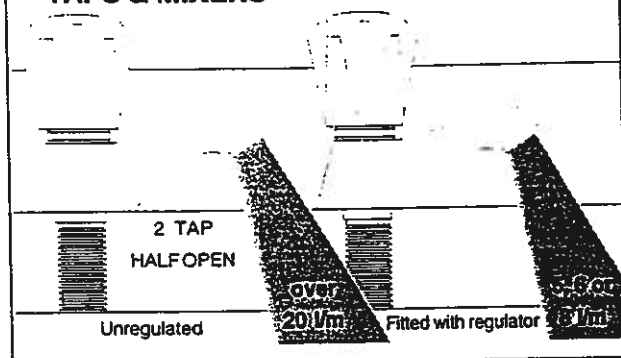
Should be in accordance with the details on page 18

APPENDIX

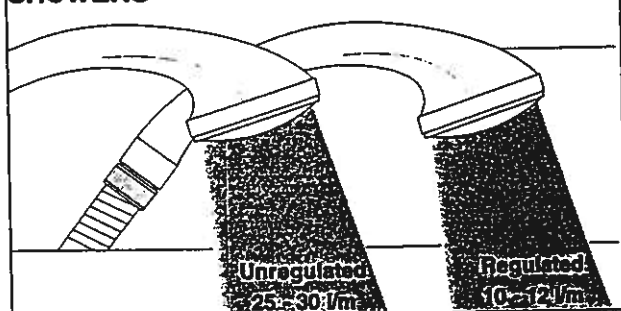
WATER SAVINGS

WATER RELATED COSTS CAN BE REDUCED BY GOOD PLUMBING PRACTICE.

TAPS & MIXERS



SHOWERS



Vast quantities of water are needlessly run off to waste due to Taps, Mixers and Showers discharging flow rates far in excess of the rates required for them to perform their duties.

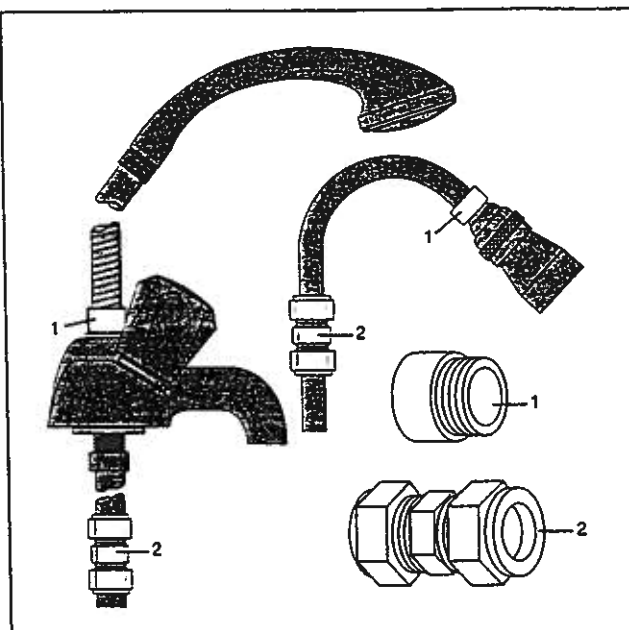
The contrasting flow rates shown on this leaflet clearly illustrate the savings that can be made whilst still providing a good performance.

British made AQUAFLOW REGULATORS provide constant flow rates by automatically compensating for supply pressure changes between 1 bar & 10 bars.

To facilitate installation into the wide range of plumbing equipment which is encountered in the U.K., FOUR FIXING OPTIONS are available:-

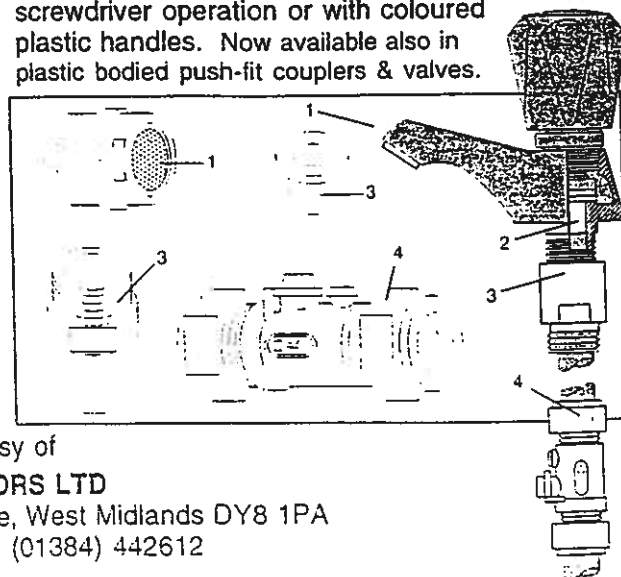
OPTIONS FOR SHOWERS

1. MXF "DW" RANGE - For fitting behind Fixed Shower Heads or onto Flexible Hoses for Handshowers (preferably onto the inlet end when lightweight hoses are used).
2. COMPRESSION FITTING RANGE. "In Line" regulators as in Option 4 for Taps & Mixers.



4 FIXING OPTIONS FOR TAPS & MIXERS

1. MK RANGE - Combined Regulators & Aerators for screwing onto Taps & Mixers with internal or external threads on their noses. Anti Vandal models also available.
2. MR05-T RANGE - Internal Regulators. Push fit into Tap or Mixer seats. Produced in three sizes - 12.5mm (BS1010), 12mm & 10mm, Flangeless models also available for Taps with Low Lift washers.
3. MXF STANDARD RANGE - Screw on tail models for Taps & Mixers. Fix onto the tails before fitting the tap connectors. Available in 3/8", 1/2", 3/4" and 1" BSP.
4. COMPRESSION FITTING RANGE - "In Line" regulators housed in 15mm & 22mm CXC COUPLERS & ISOLATING VALVES. "UK WFBS LISTED BY THE WATER RESEARCH CENTRE. Isolation valves available for slotted screwdriver operation or with coloured plastic handles. Now available also in plastic bodied push-fit couplers & valves.



Information by courtesy of

AQUAFLOW REGULATORS LTD

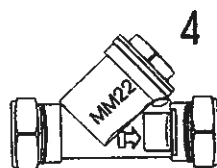
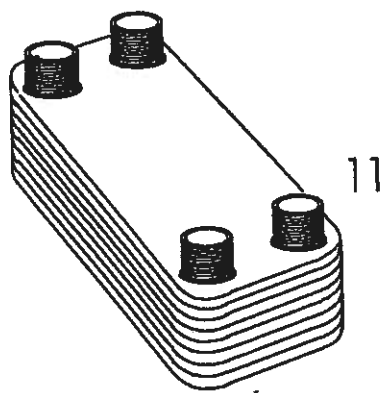
Haywood House, 40 New Road, Stourbridge, West Midlands DY8 1PA

Telephone (01384) 442611 Fax: (01384) 442612

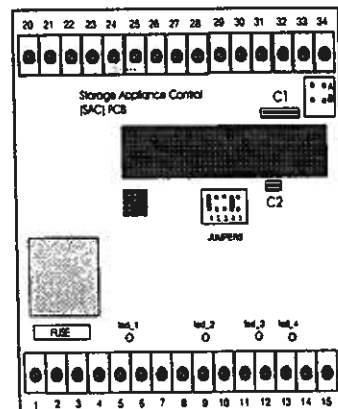
SHORT PARTS LIST

Key No.	Description	Manufacturer	Stock Code No.	Gas Council Part No.
1	Ball float		FT429	
2	Ballvalve		FT207	
3	22mm ball-o-fix valve		GT024	
4	Y type strainer		XB314	
5	3/4" F/F single check valve		GT041	
6	Grundfos 15/50 pump with 1" connections		GT105	
7	Grundfos 15/50 pump with 1 1/2" connections		XB001	
8	22mm ball type pump valve		XB121	
9	28mm ball type pump valve		XB122	
10	Flow switch		GT106	
11	Plate heat exchanger		GT017	
12	Store appliance controller SAC		GT151	
13	Store sensor		GT149	
14	Pump speed controller PSC		GT152	
15	Pump speed sensor		GT153	
16	Grasslin electro-mechanical clock		XB215	
17	Grasslin digital clock		XB216	
18	22mm 3 port mid position valve	Danfoss HS3B	XG130	
19	28mm 3 port mid position valve	Danfoss HS3B28	XG142	
20	Grundfos 15/60 pump		XB241	
21	22mm By-pass valve		XG156	
22	L.E.D. Display panel		GT150	
23	Water mixing valve - Brawa		XC007	

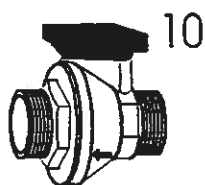
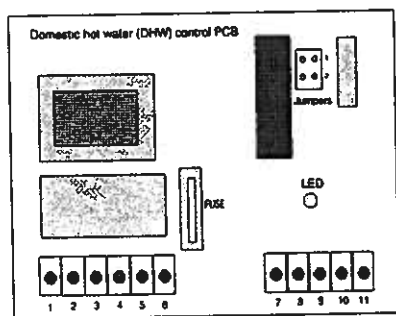
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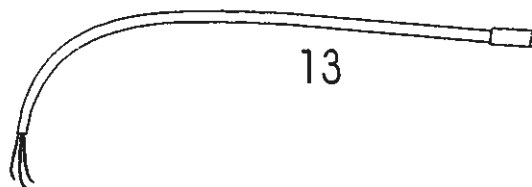
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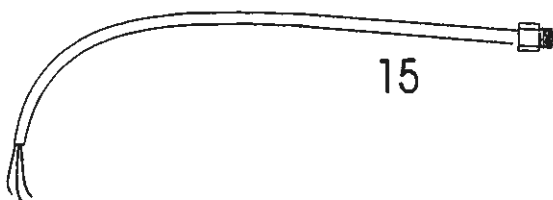
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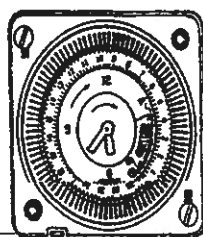
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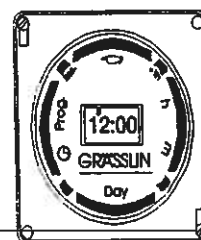
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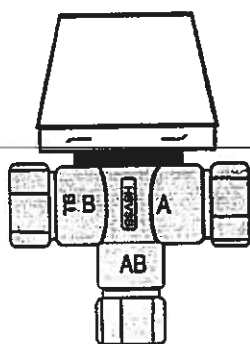
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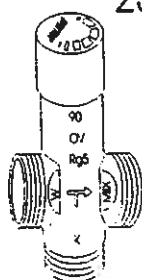
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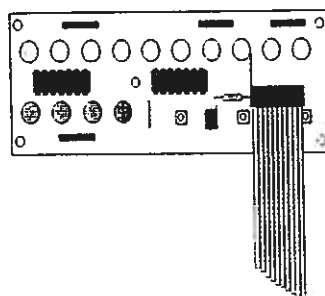
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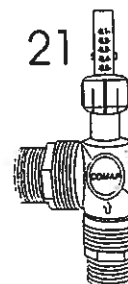
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Gledhill (Water Storage) Ltd

AMD. MAY 2007

CONDITIONS OF SALE & WARRANTY TERMS

1. We only do business upon the Conditions which appear below and no other. Unless we so agree in writing these Conditions shall apply in full to any supply of goods by us to the exclusion of any Conditions or terms sought to be imposed by any purchaser. These Conditions of Sale and Warranty Terms override those which are contained on the Invoice Forms and all Sales are now subject to these Conditions of Sale and Warranty terms only.

2. PRICE

Once an order or call off has been accepted the price will be held for three months but if delivery is extended beyond that period at the customer's request, then we reserve the right to amend the price when necessary. The company reviews its pricing annually to adjust for changes in our cost base. We reserve the right to alter prices at any time for severe movements in raw materials (mainly copper and steel). If there is to be a change we will give customers at least four weeks notice but anything delivered after that date will be at the revised price. An order may not be cancelled or varied after acceptance without the written consent of the company. Such cancellation or variation shall be subject to such reasonable charges as may be appropriate.

3. SPECIFICATION

The goods are supplied in accordance with the Specifications (if any) submitted to the Purchaser and any additions and alterations shall be the subject of an extra charge. Any goods not so specified shall be in accordance with our printed literature or the literature of any of our component suppliers (subject to any modifications made since publication). If we adopt any changes in construction or design of the goods, or in the specification printed in our literature, the Purchaser shall accept the goods so changed in fulfilment of the order.

4. PAYMENT

The invoice price of goods shall be payable within 30 days of despatch by us of our invoice for the goods or such longer time as may be stated by our quotation or invoice. If we receive payment in full on or before the due date we will allow an appropriate settlement discount except where we have quoted a special net price. If payment is not received in full on or before the due date we shall be entitled in addition to the invoice price to:

- (i) payment of a sum equal to any increase in the copper price supplement applicable to the particular goods sold between the date of receipt of order and the date of receipt of payment in full; and
- (ii) interest on any part of the invoice price unpaid after the due date at the rate of 3% per annum over the base rate for the time being of HSBC Bank plc.

5. TIME

We give estimates of delivery dates in good faith and time of delivery is not nor shall be made of the essence of any contract nor shall we be liable for any loss or damage occasioned by delay in delivery.

6. DELIVERY

We deliver free normally by our own vehicles within 25 miles of any of our manufacturing depots. Delivery to any place more than 25 miles from one of our manufacturing depots may be subject to our quoted delivery charges. We reserve the right to make delivery of goods contained in one order by more than one consignment and at different times. Where a period is agreed for delivery and such period is not extended by our Agreement, the Purchaser shall take delivery within that period. If the Purchaser fails to take delivery, we shall be entitled at the Purchaser's risk and expense to store the goods at the Purchaser's premises or elsewhere and to demand payment as if they had been despatched. Off loading at point of delivery shall be the responsibility of and be undertaken by the Purchaser.

7. SHORTAGES OR DAMAGE

Goods must be inspected before signature of delivery note and any damage, shortage or discrepancy noted on the delivery note and the goods returned on the same vehicle. The buyer must also give us immediate written notice of the damage, shortage or discrepancy so that we may prompt investigation.

8. RETURN OF GOODS

Goods may not be returned to the Company except by prior written permission of an authorised officer of the Company and such return shall be subject to payment by the Purchaser of handling and re-stocking charges, transport and all other costs incurred by the Company.

9. COMPANY LIABILITY

All our goods are made of the best materials from reputable manufacturers and where stated are manufactured to the appropriate British or European Standard. Complaints must be given to us immediately, before any action is taken, as responsibility cannot be accepted if repairs or renewals are attempted on site without our written authority.

Defects caused by corrosion or scale deposits are not covered by this guarantee save as expressly provided in paragraph (f) of this Condition 9.

Where we agree to rectify any defect, we reserve the right to undertake the work on our own premises.

The following guarantee covers faulty materials and manufacture for the stated period, **provided that:**

- The unit has been installed in accordance with our installation and service instructions and all relevant codes of practice and regulations in force at the time of installation.
- That all necessary inlet controls and safety valves have been fitted correctly.
- It has only been used for the storage of potable water supplied from the public mains.
- Where appropriate the unit has been regularly maintained as detailed in the installation and service instructions.

(a) Domestic and Commercial Open Vented Cylinders and Tanks.

The copper storage vessel is guaranteed for ten years and if it proves to be defective either in materials or workmanship, we will either repair or supply replacement at our option with the closest substitute in the case of any obsolete product to any address in Great Britain.

- (i) free of all charge during the first year after delivery by us.

- (ii) thereafter at a charge of one-tenth of the then current list price and any copper price supplement and delivery charge during the second year after delivery by us and increasing by a further one-tenth on the second and subsequent anniversary of delivery by us.

(b) Domestic Mains Fed Products (Primary Stores)

The copper storage vessel is guaranteed for five years and if it or any integral pipework as part of the storage vessel assembly proves to be defective either in materials or workmanship, we reserve the right to either repair or supply replacements or the closest possible substitute in the case of any obsolete product and will collect and deliver to any address in England, Wales and Scotland (excluding all Scottish Islands).

- (i) free of all charge during the first year after delivery by us.

- (ii) thereafter at a charge of one-fifth of the then current list price or any copper price supplement and delivery charge during the second year after delivery by us increasing by a further one-fifth on the second and subsequent anniversary of delivery by us.

(c) Integrated Boiler and Storage Vessel Products and Stand Alone Boilers

In the case of the GulfStream range of products and the Gledhill boiler range of products, Gledhill guarantees the heat exchanger (boiler) for material and construction faults for two years and FURTHER we will meet the installer/contractors reasonable costs in removing and replacing any DEFECTIVE heat exchanger up to a MAXIMUM of one third of the extent of our liability in regard to the replacement product.

THE RESPONSIBILITY FOR THE EXECUTION OF THIS GUARANTEE LIES WITH THE INSTALLER.

The guarantee becomes null and void if the appliance is used incorrectly, or in the event of proven negligence or incorrectly implemented repairs OR FAILURE TO CARRY OUT THE RECOMMENDED INSPECTION/MAINTENANCE. The guarantee also becomes null and void if changes are made to the appliance without our knowledge, or if the serial number on the appliance is removed or made illegible.

The annual service must be carried out by a competent installer in accordance with the advice given by Gledhill and using Gledhill approved parts.

(d) Stainless Steel Unvented Cylinders

Gledhill guarantee the components including controls, valves and electrical parts for two years from the date of purchase. IT SHOULD BE NOTED THAT THE FACTORY FITTED TEMPERATURE AND PRESSURE RELIEF VALVE MUST NOT BE REMOVED OR ALTERED IN ANY WAY OR THE GUARANTEE WILL NOT BE VALID. GLEDHILL WILL NOT BE RESPONSIBLE FOR ANY CONSEQUENTIAL LOSS OR DAMAGE HOWEVER IT IS CAUSED.

The guarantee for the stainless steel vessel is for twenty five years if the original unit is returned to us **AND PROVIDED THAT:**

- (i) It has been installed as per the Design, Installation & Servicing Instructions, relevant standards, regulations and codes of practice.
- (ii) It has not been modified, other than by Gledhill.
- (iii) It has not been subjected to wrong or improper use or left uncared for.
- (iv) It has only been used for the storage of potable water.
- (v) It has not been subjected to frost damage.
- (vi) The benchmark log book is completed after each annual service.
- (vii) The unit has been serviced annually.

It should be noted that the guarantee does not cover:

- the effects of scale build up
 - any labour charges associated with replacing the unit or parts.
- If the stainless steel vessel proves to be defective either in materials or workmanship we reserve the right to either repair or supply replacements or the closest possible substitute in the case of any obsolete product and will collect and deliver to any address in England, Scotland and Wales (excluding all islands):

- (i) free of charge during the first year after delivery by us.
- (ii) thereafter at a charge of one twenty fifth of the then current list price during the second year after delivery by us and increasing by a further one twenty fifth on the second and subsequent anniversary of delivery by us.

ACTION IN THE EVENT OF FAILURE

If the Stainless Lite develops a leak we will ask for a deposit against the supply of a new one. This will be refunded if the failure is within the terms of the warranty when it has been examined by us.

(e) Solar Panels and ancillary equipment

Gledhill provides a five year warranty for defects in the collectors (except broken glass and collector accessories eg metal edgings). If the collector demonstrably fails to meet one of the requirements of the standard DIN 4757 part 3 we will replace it free of charge based on the date of invoice. We can not be responsible for damage caused by mechanical stress and/or changes caused by weather related influences. The warranty excludes minor surface damage that does not affect performance or malfunction due to improper assembly or installation.

Please note:

- Installation must have been carried out by a licensed special-ized company (heating contractor or plumber) following the version of installation instructions in force.
- Gledhill or its representative was given the opportunity to check complaints on site immediately after any defect occurred.
- Confirmation exists that the system was commissioned properly and that the system was checked and maintenance was performed annually by a specialised company licensed for this purpose.

(f) Components of our products other than Storage Vessels and Integral Pipework.

We will either extend to the purchaser the same terms of warranty as we are given by the manufacturer of the component or if the manufacturer does not give any warranty, replace free of charge any component which becomes defective within two years after the date of the delivery by us and is returned to us at the purchaser's expense but we shall not meet the cost of removal or shipping or return of the component or any other cost charges or damages incurred by the purchaser.

If the appliance manufactured by Gledhill incorporates a factory fitted scale inhibitor then during the period of three years from the date of delivery Gledhill will replace, free of charge, any plate heat exchanger fitted in the appliance as original equipment in which scale formation occurs that materially reduces the effectiveness of the plate heat exchanger. This guarantee does not extend to any other component installed within the Gledhill appliance or elsewhere in the Purchaser's domestic water system.

(g) General

In the case of goods manufactured solely in accordance with our specification and designs and in respect of any installation work carried out by or on our behalf, our entire liability and the purchaser's sole remedies (subject to (a) - (f) above) shall be as follows:

(a) we accept liability for death or personal injury to the extent that it results from our negligence that of our employees agents or subcontractors.

(b) subject to paragraph (d) below, we accept liability for direct physical damage to tangible property to the extent that such damage is caused by our negligence that of our employees agents or subcontractors.

(c) our total liability to the purchaser over and above any liability to replace under (1 - 4) above (whether in contract or in tort including negligence) in respect of any one cause of loss or damage claimed to result from any breach of our obligations hereunder, shall be limited to actual money damages which shall not exceed £20,000 provided that such monetary limit shall not apply to any liability on the part of ourselves referred to in paragraph (a) above.

(d) except as provided in paragraph (a) above but otherwise notwithstanding any provision herein contained in no event shall we be liable for the following loss

or damage howsoever caused and even if foreseeable by us or in our contemplation :-

(i) economic loss which shall include loss of profits, business revenue, goodwill or anticipated savings.

(ii) damages in respect of special indirect or consequential loss or damage (other than death, personal injury and damage to tangible property).

(iii) any claim made against the purchaser by any other party

(save as expressly provided in paragraph (b) above).

(e) except in respect of our liability referred to in paragraph (a) above no claim may be made or action brought (whether in contract or in tort including negligence) by the purchaser in respect of any goods supplied by us more than one year after the date of the invoice for the relevant goods.

(f) nothing in these Conditions shall confer on the purchaser any rights or remedies to which the purchaser would not otherwise be legally entitled.

10. LOSS OR INJURY

Notwithstanding any other provision contained herein the Purchaser hereby agree to fully indemnify us against any damages losses costs claims or expenses incurred by us in respect of any claim brought against us by any third party for :-

(a) any loss injury or damage wholly or partly caused by any goods supplied by us or their use.

(b) any loss injury or damage wholly or partly caused by the defective installation or sub-standard workmanship or materials used in the installation of any goods supplied by us.

(c) any loss injury or damage in any way connected with the performance of this contract.

PROVIDED that this paragraph (6) will not require the Purchaser to indemnify us against any liability for our own acts of negligence or those of our employees agents or sub-contractors.

FURTHER in the case of goods supplied by us which are re-sold to and installed by a third party by the Purchaser it will be the sole responsibility of the Purchaser to test the goods immediately after their installation to ensure that inter alia they are correctly installed and are in proper working order, and are not likely to cause any loss injury or damage to any person or property.

11. VARIATION OF WARRANTY AND EXCLUSION

Should our warranty and exclusion be unacceptable we are prepared to negotiate for variation in their terms but only on the basis of an increase in the price to allow for any additional liability or risk which may result from the variation.

Purchasers are advised to insure against any risk or liability which they may incur and which is not covered by our warranty.

12. RISK AND RETENTION OF TITLE

(a) goods supplied by us shall be at the Purchaser's risk immediately upon delivery to the Purchaser or into custody on the Purchaser's behalf or to the Purchaser's Order. The Purchaser shall effect adequate insurance of the goods against all risks to the full invoice value of the goods, such insurance to be effective from the time of delivery until property in the goods shall pass to the Purchaser as hereinafter provided.

(b) property in the goods supplied hereunder will pass to the Purchaser when full payment has been made by the Purchaser to us for :-

(i) the goods of the subject of this contract.

(ii) all other goods the subject to of any other contract between the Purchaser and us which, at the time of payment of the full price of the goods sold under this contract, have been delivered to the Purchaser but not paid for in full.

(c) until property in the goods supplied hereunder passes to the Purchaser in accordance with paragraph (2) above.

(i) the Purchaser shall hold the goods in a fiduciary capacity for us and shall store the same separately from any other goods in the Purchaser's possession and in a manner which enables them to be identified as our goods.

(ii) the Purchaser shall immediately return the goods to us should our authorised representative so request. All the necessary incidents associated with a fiduciary relationship shall apply.

(d) the Purchaser's right to possess the goods shall cease forthwith upon the happening of any of the following events, namely :-

(i) if the Purchaser fails to make payment in full for the goods within the time stipulated in clause 4 hereof.

(ii) if the Purchaser, not being a company, commits any act of bankruptcy, makes a proposal to his or her creditors for a compromise or does anything which would entitle a petition for a Bankruptcy Order to be presented.

(iii) if the Purchaser, being a company, does anything or fails to do anything which would entitle an administrator or an administrative receiver or a receiver to take possession of any assets or which would entitle any person to present a petition for winding up or to apply for an administration order.

(e) the Purchaser hereby grants to us an irrevocable licence to enter at any time any vehicle or premises owned or occupied by the Purchaser or in the possession of the Purchaser for the purposes of repossessing and recovering any such goods the property in which has remained in us under paragraph (2) above. We shall not be responsible for and the Purchaser will indemnify us against liability in respect of damage caused to any vehicle or premises in such repossession and removal being damaged which it was not reasonably practicable to avoid.

(f) notwithstanding paragraph (3) hereof and subject to paragraph (7) hereof, the Purchaser shall be permitted to sell the goods to third parties in the normal course of business. In this respect the Purchaser shall act in the capacity of our commission agent and the proceeds of such sale :-

(i) shall be held in trust for us in a manner which enables such proceeds to be identified as such, and ;

(ii) shall not be mixed with other monies nor paid into an overdrawn bank account

We, as principal, shall remunerate the Purchaser as commission agent a commission depending upon the surplus which the Purchaser can obtain over and above the sum, stipulated in this contract of supply which will satisfy us.

(g) in the event that the Purchaser shall sell any of the goods pursuant to clause (6) hereof, the Purchaser shall forthwith inform us in writing of such sale and of the identity and address of the third party to whom the goods have been sold.

(h) if, before property in the goods passes to the Purchaser under paragraph (2) above the goods are or become affixed to any land or building owned by the Purchaser it is hereby agreed and declared that such affixation shall not have the effect of passing property in the goods to the Purchaser. Furthermore if, before property in the goods shall pass to the Purchaser under paragraph (2) hereof, the goods are or become affixed to any land or building (whether or not owned by the Purchaser), the Purchaser shall:-

(i) ensure that the goods are capable of being removed without material injury to such land or building.

(ii) take all necessary steps to prevent title to the goods from passing to the landlord of such land or building.

(iii) forthwith inform us in writing of such affixation and of the address of the land or building concerned.

The Purchaser warrants to repair and make good any damage caused by the affixation of the goods to or their removal from any land or building and to indemnify us against all loss damage or liability we may incur or sustain as a result of affixation or removal.

(i) in the event that, before property in the goods has passed to the Purchaser under paragraph (2) hereof, the goods or any of them are lost, stolen, damaged or destroyed :-

(i) the Purchaser shall forthwith inform us in writing of the fact and circumstances of such loss, theft, damage or destruction.

(ii) the Purchaser shall assign to us the benefit of any insurance claim in respect of the goods so lost, stolen, damaged or destroyed.

13. NON-PAYMENT

If the Purchaser shall fail to make full payment for the goods supplied hereunder within the time stipulated in clause 4 hereof or be in default of payment for any other reason then, without prejudice to any of our other rights hereunder, we shall be entitled to stop all deliveries of goods and materials to the Purchaser, including deliveries or further deliveries of goods under this contract. In addition we shall be entitled to terminate all outstanding orders.

14. RISK

All goods sold by us shall be at the sole risk of the Purchaser from the date of despatch by us of the invoice for their price.

15. VALUE ADDED TAX

All prices quoted are exclusive of Value Added Tax which will be charged at the rate ruling at the date of despatch of invoice.

16. TRADE SALES ONLY

We are only prepared to deal with those who are not consumers within the terms of the Unfair Contract Terms Act 1977, the Sale of Goods Act 1979 and the Supply of Goods and Services Act 1982. Accordingly any person who purchases from us shall be deemed to have represented that he is not a consumer by so purchasing.

17. JURISDICTION

The agreement is subject to English/Scottish law and any dispute arising hereunder shall be settled in accordance therewith dependent upon the location.

