Hamworthy Chesil

Wall Hung & Floor Standing Pressurisation Units

For Heating, Chiller and Solar Sealed Systems

CE

Hamworthy

Heating *at work.*

Chesil

Sealed System
Pressurisation Units

The new range of Hamworthy Chesil pressurisation units offer a choice of floor standing or wall hung configurations with standard or electronic controls.

Designed to maintain the minimum pressure requirements of modern low / medium temperature hot water sealed systems, the Chesil range can also be used for the constant pressure requirements of chiller systems and pressurised circuits to solar heating collectors.

The Chesil pressurisation units will provide automatic replacement of water losses from both hot and cold sealed systems, and are available for systems with cold fill pressure requirements up to 3.4 bar. The units are enclosed in a robust lightweight steel casing, ensuring the units perform effectively and quietly during operation.

The floor standing range has been designed to reduce space requirements and each of the 3 models are extremely compact in size. The basic unit has standard controls with a single pump, whilst the electronic control models are available in single or twin (duty/ standby) pump versions.

The wall hung range also has a standard or electronic control version, each with single pump configuration. In addition there is a wall hung solar model which is designed for maintaining pressure in sealed system solar heating circuits, where a glycol mix is required.

Chesil pressurisation units with electronic controls provide a user interface though a simple control fascia which features a 16 character back-lit LCD display for viewing operating and system information.

Options

- **Floor standing or wall hung**
- **Standard or electronic controls**
- **Single or twin pumps**
- **Heating or chiller circuits**
- **Solar collector circuits**
- **Expansion vessels**

BENEFITS

- **Compact design saves space**
- **Choice of configurations**
- **Increases security of heating system**
- **BEMS compatible for system integration**
- **Easy access for operation and settings**
- **Reduces installation costs**

A pumped pressurisation unit removes the need for cold water header tanks with associated pipe work, or eliminates reliance on mains pressure to provide the system head.

Chesil floor standing models in compact casings

Specification

Chesil Pressurisation Units

Totally enclosed in a robust powder coated steel casing, Chesil pressurisation units have a removable cover providing access to all internal components, whilst reducing noise from the unit during operation.

System Safety

The pressurisation units incorporate comprehensive safety circuits to shut down the boiler, chiller or solar transfer station in the event of a fault, ensuring that systems operate within health and safety requirements at all times.

Key Features - all models

- 7.6 litres capacity break tank
- Pump non return valve
- Plant interlock circuit
- Volt-free contacts for :
  - Low system pressure
  - High system pressure

Additional Features - standard control models

- Class AF air gap and overflow
- Float valve
- Single pump
- System pressure gauge
- Low system pressure switch
- High system pressure switch
- Pump pressure switch

Additional Features - electronic control models

- Class AF air gap and overflow
- Float valve
- Single or twin pumps
- Low level switch in break tank
- Intelligent control unit
- 16 character back-lit LCD display
- Pressure transducer
- Additional volt-free contacts for :
  - General fault with LCD interrogation

Additional Features - solar control models

- Glycol mix reservoir (break tank)
- System pressure gauge
- Low level switch in break tank
- Low system pressure switch
- High system pressure switch
- Pump pressure switch

Chesil Pressurisation Units Wall Hung Models

System	Pump	Controls	Controls
Heating or Chiller	Single	Standard	WSS
Heating or Chiller	Single	Electronic	WSE
Solar	Single	Standard	SOLAR

Chesil Pressurisation Units Floor Standing Models

System	Pump	Controls	Controls
Heating or Chiller	Single	Standard	FSS
Heating or Chiller	Single	Electronic	FSE
Heating or Chiller	Twin	Electronic	FTE

Break Tank

There is a make-up (break) tank providing a buffer water store, eliminating problems associated with mains water isolation. Units for heating and chiller systems feature float valves in the make-up tank, providing automatic mains cold water top up. Electronic models have an additional low water level interlock.

Solar Make-up Tank

On the solar model, the make-up tank functions as a glycol mix reservoir, and is provided with a low level float switch interlock, to indicate manual top up required.

Pump Layout

The lower part of the unit houses the pump(s) with associated flow and pressure controls, plus all interconnecting pipe work.

Wall mounted and floor standing models share a common layout.

A twin pump model is available in floor standing electronic units only, providing a duty / standby or shared duty configurations.

Expansion Vessels

Hamworthy Heating also offer a wide range of expansion vessels to accommodate the expanded system water. These vessels are designed to complement the pressurisation units and ensure that the design pressures are maintained. Vessel sizes range from 5 litres to 2000 litres with most operating up to working pressures of 10 bar. To ensure reliable and safe operation Hamworthy Heating utilise EPDM diaphragms which are suitable for temperatures of 100°C at the vessel.

Details of expansion vessel operation are shown on page 9, and guidance for expansion vessel sizing is given on pages 16 & 17.

Controls

Chesil Pressurisation Units

Chesil pressurisation units are available with a choice of either standard or electronic controls, both of which are compatible with Building Management Systems and provide differing levels of sophistication, depending on the application requirements.

Standard Control and Operation

Standard controls are designed to maintain and monitor system pressure using pressure switch control. These units are equipped with pressure switches to control pump operation, low system pressure alarm and high system pressure alarm.

Cold fill pressure is regulated by the pump pressure switch, operating the pump to ensure a positive pressure at the highest circulation point at all times. When pressure falls below the pressure switch setting, the pump will continue to operate until the switch set point is reached.

Should operating conditions fall outside of normal parameters, then low and high system pressure switches provide a volt free signal that can be used for an alarm alert at a remote location or via a BMS.

It is recommended that the low and high system pressure switches are used as an interlock circuit, to shutdown the associated plant in the event of a system fault condition.

Electronic Control and Operation

Electronic models use a pressure transducer and electronic processor to maintain and monitor system operating pressure. Floor standing Chesil pressurisation units with the electronic control can be supplied with single or twin pumps and include programmable software to adapt the pump control and monitoring processes to suit end user requirements.

Cold fill pressure is regulated by pump operation according to the programmed pressure setting.

The electronic control features include adjustable set points for pump operation times to govern how long the pump will run. The minimum period setting prevents undue wear and tear on the motor by preventing excessive stop starts. The maximum period setting enables an alarm to alert a system fault, triggering an investigation into the cause of the condition. This will also avoid excessive consumption of water should there be a system leak.

Chesil wall hung models include a solar system option

Fault conditions are shown on the 16 character back-lit LCD display, and an alarm can be signalled remotely via a volt free contact.

Additional pump controls provide an adjustable delay of pump operation after use to prevent rapid cycling as well as a pump kick start function to reduce risk of seizure during prolonged periods without operation.

The electronic models have a comprehensive capability for monitoring the unit to display the following fault conditions:

- Low system pressure
- High system pressure
- Leakage volume exceeded
- Make-up tank low level
- Pump 1 fault – high current
- Pump 2 fault – high current
- Pump 1 time out *
- Pump 2 time out *

* exceeded maximum running time.

Electronic units are provided with volt free contacts for remote alarm or BMS signal for the following conditions:

- Low system pressure
- High system pressure
- General fault condition

A system monitoring and data logging feature enables the following to be reviewed on the electronic units:

- Current system pressure
- Make up water volume used since last reset
- Pump operation cycles since last reset
- Pump 1 hours run since last reset
- Pump 2 hours run since last reset

This function is password protected via the ‘Engineers menu’.

Twin Pump Model

The Chesil electronic control can be set for permanent operation using either the duty or standby pump, or alternatively for sharing of pump operation to maintain even usage.

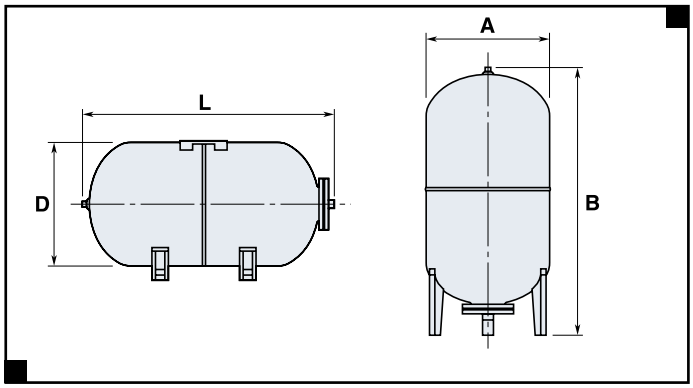
Technical Data

Chesil Pressurisation Units

			Floor Standing		Wall Mounted	Solar
			Single Pump	Twin Pump	Single Pump	Single Pump
	Weight (empty)	kg	23	29	21	20
	Weight (full)	kg	30.6	36.6	28.6	27.6
General data	Maximum cold fill pressure	bar	3.4			
	Maximum water flow rate @ maximum cold fill pressure	l/min	0.1			
	Noise level	dBA	<60 @ 1 metre			
Electrical data	Electrical supply		230V AC 50Hz 1Ph			
	Pressure switch contact rating		15Amp 230V AC, Standard and Solar			
	Volt free contact rating		0.5 Amp 230V AC, Electronic			
	Start current	Amps	9			
	Run current	Amps	2.8			
Factory settings	Cold fill pressure	bar	1.8			
	Low pressure switch setting	bar	1.5			
	High pressure switch setting	bar	3.65			
	Expansion vessel charge pressure	bar	1.7			
System parameters for factory settings	Maximum water flow temperature	°C	82			
	Maximum static height	m	16.5			
	Minimum system operation pressure	bar	3.3			
	Maximum system operating pressure	bar	7			
	Safety relief valve setting (Not HHL supply)	bar	4			
	Nominal pressure differential	bar	0.2			
Connections	Mains cold water inlet		½" BSP			
	Overflow		32mm Poly pipe			
	System connection		15mm Compression			

Dimensional Details

Expansion Vessels



Specification

Model No.	Capacity (litres)	Connection size	Max pressure (bar)	Shipping weight (Kg)	Vertical		Horizontal	
					A (mm)	B (mm)	D (mm)	L (mm)
HAF 60	60	1″	8	17	382	850	380	680
HAF 80	80	1″	10	17	450	870	450	715
HAF 100	100	1″	10	25	450	965	450	775
HAF 200	200	1½″	10	45	550	1247	550	1065
HAF 300	300	1½″	10	59	630	1400	630	1245
HAF 500	500	1½″	10	114	780	1550	-	-
HAF 700	700	1½″	10	162	780	1950	-	-

*Other sizes are available on request

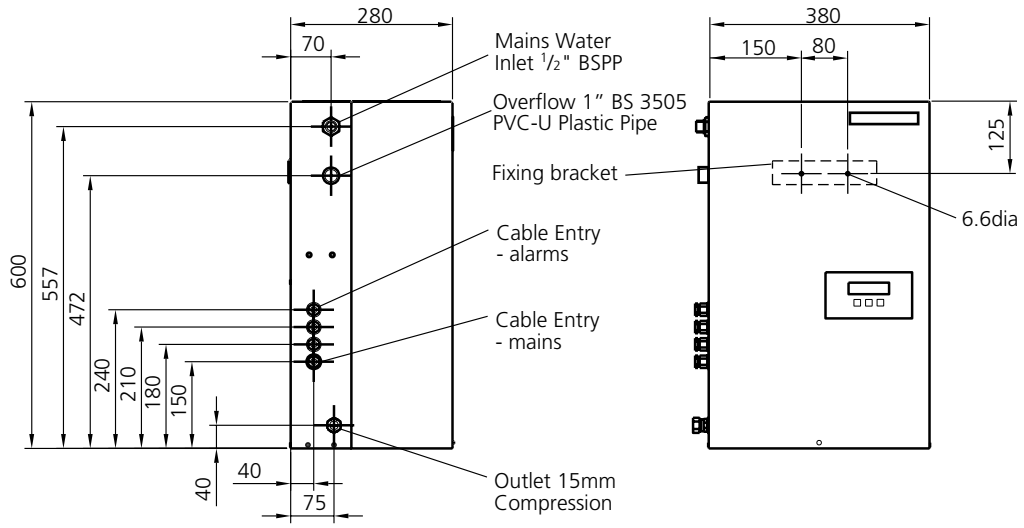
Expansion Vessel Selection
LTHW Systems

Installed boiler power (kW)		System volumne (litres)		Vessel volumne (litres)	No. and size of vessel(s) required
min	max	min	max		
28	70	280	700	60	1 x 60
71	93	701	930	80	1 x 80
94	115	931	1150	100	1 x 100
116	230	1151	2300	200	1 x 200
231	345	2301	3450	300	1 x 300
346	465	3451	4650	400	2 x 200
466	580	4651	5800	500	1 x 500
581	700	5801	7000	600	2 x 300
701	810	7001	8100	700	1 x 700
810	1160	8100	11600	1000	1 x 1000
1161	1620	11601	16200	1400	2 x 700
1620	2330	16200	23300	2000	2 x 1000

Dimensional Details

Chesil Pressurisation Units

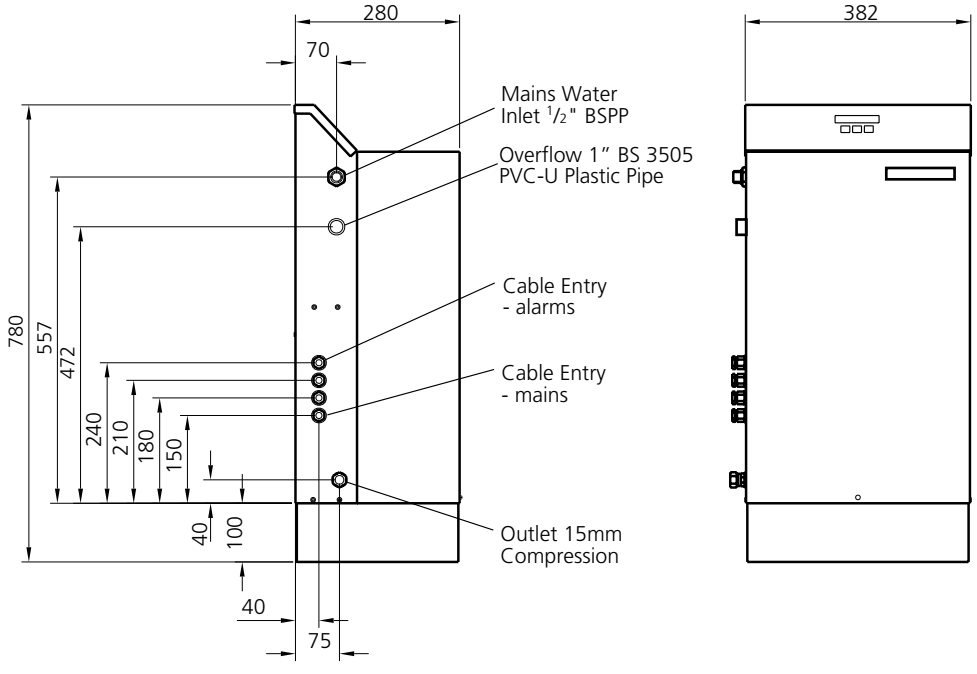
Wall hung



End Elevation LHS

Front Elevation

Floor standing



End Elevation LHS

Front Elevation

Minimum recommended clearances for access and maintenance

	Wall hung models - mm	Floor standing models - mm
Top	100	300
Sides	100	100
Front	600	600
Bottom	450	-

Operation

Chesil Pressurisation Units

Cold Fill Pressure and Pump Control

In all buildings there is a requirement for the highest point in the circulating system to be maintained under positive pressure, to prevent any possibility of air being drawn in, resulting in poor operating conditions.

Cold fill pressure is directly linked to the height of the building, with a small additional pressure margin to ensure positive pressure at the highest point of the circulating system. Chesil pressurisation units are preset to maintain a cold fill pressure of 1.8 bar which will suit a wide variety of applications. Where necessary it is possible to change the settings permitting cold fill pressures in the range 0.7 bar to 3.4 bar. These settings will need to be made on site during commissioning. At the same time, the low system pressure setting and high system pressure setting will also require a change, to suit the new operating parameters.

The pressurisation unit is pre-set at the factory to start the pump for maintaining a cold fill pressure of 1.8 bar. On heating systems the expansion vessel charge pressure (cushion pressure) should be set 0.1 bar below the cold fill pressure. For chiller systems the expansion vessel charge pressure should be set 0.35 bar below cold fill pressure, whilst solar systems should be set 0.3 bar below.

Hot Water Applications

As the water heats up in the system, due to boiler operation or solar collector operation (heat source), the expanded volume is absorbed by the expansion vessel.

A small pressure rise takes place (Boyles Law) which the vessel is designed to accept.

When the system eventually cools down, and if there has been some loss of system fluid, the pump pressure switch will operate the pump to recharge the system, maintaining the required minimum cold fill pressure.

If a twin pump unit is installed and the pressure is not satisfied, or the maximum pump running time is exceeded by the duty pump, then the control processor will automatically changeover to the standby pump. A visual alarm message will be shown on the LCD display, once this changeover has been initiated.

Should the pressure continue to fall, then the system low pressure switch will shut down the heat source, ensuring a fail safe condition.

Depending on which control option is fitted, the fault condition volt free contacts will be energised, and with the electronic unit an additional fault message will be shown at the LCD display. Immediate action can then be taken to remedy the fault condition.

The pressurisation unit will continue in its attempt to re-establish pressure within the system if the pump(s) are operative. However, if the fault is due to a major leak, then the water level in the make-up tank could drop to the low level condition, shutting down the pump.

Similarly, the high pressure switch continually monitors the system, and if a high pressure fault occurs, then the heat source and the pressurisation unit are shut down.

Chiller Applications

The operation of a pressurisation unit when used on a chiller system is identical to that of a hot water system, however, the expansion vessel operates in a different way. When the system has been filled, some water is stored in the expansion vessel due to the cushion pressure being some 0.35 bar below the cold fill pressure.

When the chiller is switched on, the water will contract due to cooling of the system fluid. The pressurisation unit will operate to maintain the required cold fill pressure. When the chiller is switched off, the system fluid temperature will increase up to the nominal ambient temperature. As this happens, fluid will expand and increase pressure within the system. Fluid will then be forced into the expansion vessel until the pressure is stabilised. This fluid is then stored in the expansion vessel until the chiller is operated again.

Solar Applications

Pressurisation unit operation with a solar collector circuit is very similar to a hot water application. As solar energy builds, the circuit warms with an increase in pressure and expansion of the solar fluid.

When the solar circuit is cold, the expansion vessel stores a small quantity of solar fluid that will replenish any small losses from the circuit should there be any leakage. This small reserve of solar fluid also ensures the entire circuit remains full when the system cools.

In addition to the expanded fluid volume created at hot working temperatures, the expansion vessel also has to absorb the additional expanded volume when the solar circuit stagnates. Stagnation is the operating condition of the solar collectors when there is no longer any heat transfer to the heat exchanger whilst there remains high solar energy levels. In this condition the static solar fluid in the collector reaches high temperatures, in excess of 200°C, and vaporises, pushing the solar fluid contained within local pipe work towards the expansion vessel.

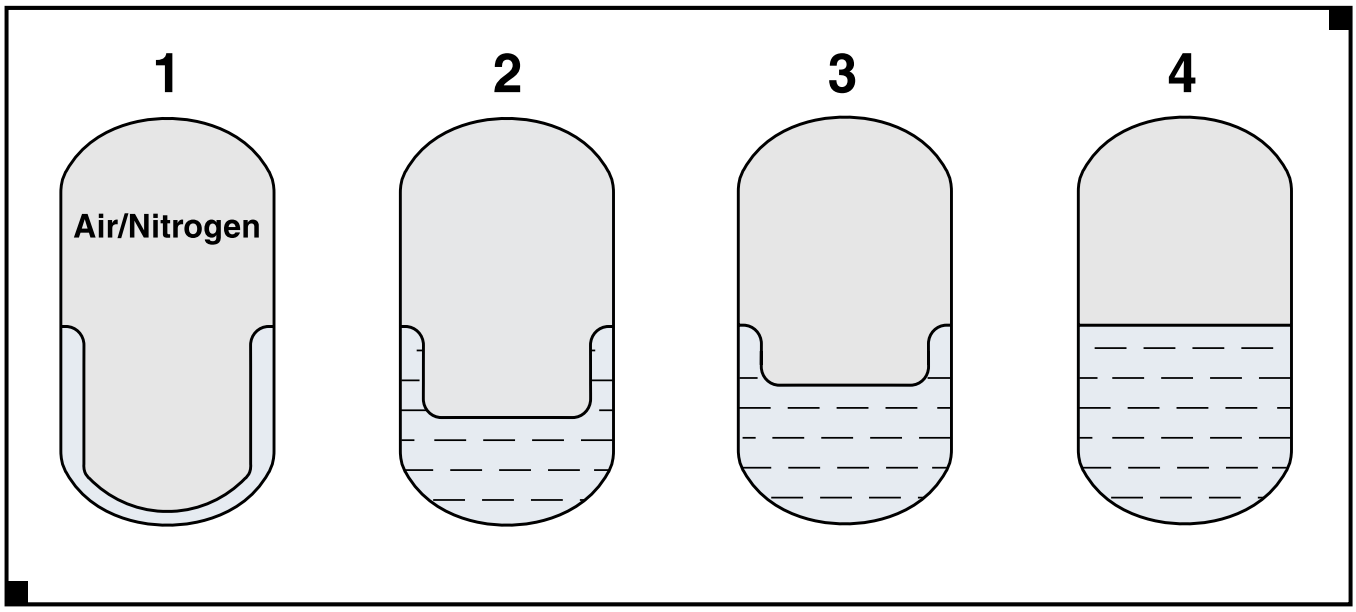
As the solar circuit cools, the vaporised solar fluid condenses and some of the solar fluid absorbed by the expansion vessel is pushed into the solar circuit. If solar energy is no longer available then the solar circuit will continue cooling to cold, at which point the expansion vessel will be virtually empty.

The expansion vessel must be sized to absorb the full expansion volume from cold to stagnation whilst maintaining system operating pressure within safe design conditions.

NOTE: With solar systems the expansion vessel cushion pressure must be reset at commissioning to suit the system. Cold fill pressure and high / low settings must also be reset.

Operation

Expansion Vessels



Expansion Vessel Operation - hot water applications

1. Diaphragm position at the cold fill/charge pressure. The vessel is empty of system fluid.

2. Diaphragm position at the hot working pressure. The system volume has expanded due to the temperature rise. The gas in the vessel is compressed. Acceptance factor = 0.35 maximum (recommended).

3. Diaphragm position at high system pressure. The boiler system is shut down by the system pressure safety circuits.

4. Diaphragm at the safety valve lift pressure caused by boiler temperature limiter failure for example. Acceptance factor = 0.5 maximum (recommended)

Expansion Vessel Operation - chilled water applications

1. Diaphragm position at the charge pressure. The charge pressure is 0.35 bar less than the cold fill pressure. The vessel is empty of system fluid.

2. Diaphragm position at the cold fill pressure. As the chiller operates the system fluid contracts due to the drop in temperature. The pressurisation unit operates to maintain the system at the cold fill pressure. The gas in the vessel is compressed to equalise the system pressure.

3. Diaphragm position at the maximum ambient temperature. When the chiller is switched off the system water expands due to the rise in system temperature to ambient. The gas in the vessel is compressed. Acceptance factor = 0.35 maximum (recommended).

4. Diaphragm at the safety valve lift pressure. Acceptance factor = 0.5 maximum (recommended).

The chiller will have been shut down by the system pressure safety circuit.

Expansion Vessel Operation – solar applications

1. Diaphragm position at cold fill pressure. The vessel contains only the fluid seal volume.

2. Diaphragm position at hot working pressure. The system volume has expanded due to temperature increase. The gas in the vessel is compressed.

3. Diaphragm position at stagnation condition. The vessel has absorbed the solar fluid displaced by vaporisation within the solar collectors.

4. Diaphragm position at high system pressure. The solar transfer station is shut down by the system pressure safety circuit.

Application & System Data

Chesil Pressurisation Units

Installation must be in accordance with the relevant requirements of the Building Regulations, IEE Regulations and the Water Supply (Water Fittings) Regulations. It should also be in accordance with any relevant requirements of the Local Authority and the relevant recommendations of the following documents:

These British Standard Codes of Practice and additional publications have relevant recommendations regarding the installation of Chesil pressurisation units.

British Standards

BS 7074 Part 2: Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Code of practice for low and medium temperature hot water heating systems

BS 7074 Part 3: Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Code of practice for chilled and condenser systems

BS 7671 Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition.

BS 6644 Specification for installation of gas fired boilers of rated input between 70kW net and 1.8MW net (2nd and 3rd family gases).

BS 6880 Part 1, 2 & 3 Code of practice for low temperature hot water heating systems of output greater than 45kW.

BS EN ISO 4126-1 Safety devices for protection against excessive pressure. Safety valves.

BS EN 12828 Heating systems in buildings. Design for water-based heating systems.

Health & Safety Executive

Guidance Note PM5 Automatically controlled steam and hot water boilers.

Statutory Instrument

The Water Supply (Water Fittings) Regulations 1999.

Water industry England and Wales

General Requirements

All connections to the local water main must comply with Water Supply (Water Fittings) Regulations 1999. Additionally the water supply connection must also comply with all local WRAS regulations.

If conditions within the boiler house are likely to fall below freezing, then consideration should be made for providing thermostatically controlled heating of the expansion vessel connection pipe and anti-gravity loop. Water movement in this section of pipe is slow and at the most vulnerable times (overnight) may have no movement. Electrical trace heating of this pipe section is recommended, operating at approximately 5°C.

Location

The location must provide adequate space for servicing and air circulation around each unit. This includes any electrical trunking laid along the floor and to the appliance.

The pressurisation unit can be mounted directly onto a wall or supported on a floor, depending on model variant.

In either case the mounting surface should be a non combustible flat and level surface capable of supporting the weight of the unit when full of water and any additional ancillary equipment.

System Safety

Extra safety features built into the Hamworthy pressurisation units ensures that the plant operates within health and safety requirements at all times, and with the assurance that should an unmanned plant room develop a problem, the pressurisation unit will ensure fail safe operation along with remote indication, enabling rapid response and rectification.

The Chesil pressurisation units and expansion vessels (where supplied) are factory pre-set to suit the following conditions:

1) A system flow temperature of 82°C maximum.

2) A system static height of 16.5 metres maximum.

3) A system working pressure of 3.3 bar minimum, i.e. safety valve set at 4.0 bar minimum.

NOTE: Generally LTHW and MTHW system maximum working pressures are defined by the heat generator (i.e. boiler).

The expansion vessel will be factory preset and so the assembly will only require a check to ensure settings have not changed during transport or installation before switching on the unit.*

* Where system requirements dictate a higher or lower setting this will require adjustments on commissioning.

Expansion vessel selection

A table of calculated expansion vessel sizes based on a set of fixed parameters, suitable for LTHW systems, is detailed on page 6. If your system complies with these requirements, the data as tabled may be used. For other applications outside these parameters refer to page 16 & 17 for a more detailed sizing method.

Unit Settings

The Chesil pressurisation units are designed to operate up to a maximum cold fill pressure of 3.4 bar, with a maximum working pressure of 7 bar.

The pressurisation units are factory pre-set to suit a wide range of applications having the following settings:

Heating and chiller units

i. Cold fill pressure = 1.8 bar

ii. System low pressure switch = 1.5 bar

iii. System high pressure switch = 3.6 bar

Expansion vessels where supplied are pre-charged to 1.7 bar. This provides a small buffer of water within the vessel, even at cold fill pressure conditions, ensuring the attached system remains full of water at the highest point.

System Filling

It is a requirement of the Water Supply (Water Fittings) Regulations 1999 that system filling is via an RPZ (Reduced Pressure Zone) valve with integral Type BA air gap.

Information regarding the application, use and maintenance requirements for RPZ valves with Type BA air gap is available from WRAS.

It is also advisable to contact the local water utility company to verify notification requirements for the use of these valves.

With the electronic model of Chesil pressurisation unit it is not always necessary to use an RPZ valve assembly for system filling. These units have a fill function that is suitable for use with small systems up to a maximum capacity of 2000 litres. Where the fill function is used, it is not necessary to have a quick fill loop with RPZ valve.

Delivery

Chesil pressurisation units are supplied fully assembled from the factory, packaged in a cardboard carton for protection. The packaging identifies the unit model.

All Hamworthy deliveries are made to site using a vehicle with a tail-lift, and are closely co-ordinated with the customer to suit the site construction programme. Standard delivery is to ground level from the tail-lft vehicle.

To enquire about special delivery services please contact our customer services team. Tel: 0845 450 2865.

Commissioning

Hamworthy Heating strongly recommends that all units are commissioned by their service department. *For more information on commissioning contact Hamworthy Heating Service team: Tel: 0845 450 2866*

It is imperative that solar pressure pressurisation units and expansion vessels are commissioned to suit the system. Heating and chilled water systems will need commissioning if the system operating conditions do not fall within the factory pre-set operating parameters.

Warranty

Products from Hamworthy carry a standard two-year warranty on parts, and where the product is commissioned by Hamworthy service engineers, then the warranty covers parts and labour. In offering flexible solutions for after-sales support, Hamworthy can tailor packages to suit individual customer requirements, many of which include extended warranty benefits.

Dosing Pots

Dosing pots are used to introduce liquid chemicals such as corrosion inhibitors into sealed systems. A simple construction offering a safe and effective solution for manual chemical dosing.

The dosing pot is best installed across the main flow and return pipe work with the flow from the bottom of the pot and the return in at the top. This will create the ideal conditions for a rapid intake of chemicals.

Hamworthy offer a range of sizes and the dosing pots are manufactured with a mild steel shell with flow and return valves, drain valve, filling valve, steel tundish, air release valve, non return valve and wall mounting brackets.

Air and Dirt Separators

Air and dirt separators are used to remove micro air bubbles and system debris from wet circulating systems.

Where a combined air and dirt separator or an air separator only is used in a heating system, it should be installed in the hottest part of the system, before the pumps, in the main flow pipe work close to the boilers.

Where a combined air and dirt separator or an air separator only is used in a cooling system, it should be installed in the return, close to the chiller.

Where a dirt separation unit only is used, this should be installed in the return pipe work, before the flow of water enters the plant such as boilers, pumps etc.

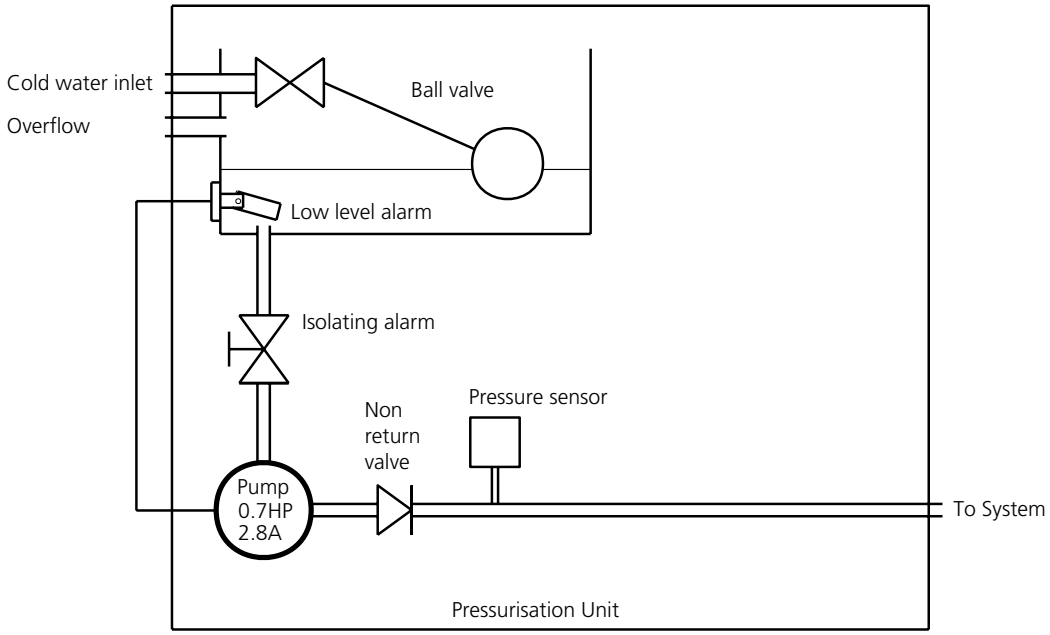
Hamworthy offers a range of models with additional demountable versions that can be taken apart for cleaning.

Units are manufactured from mild steel and are completely equipped with flushing valve and automatic air vent.

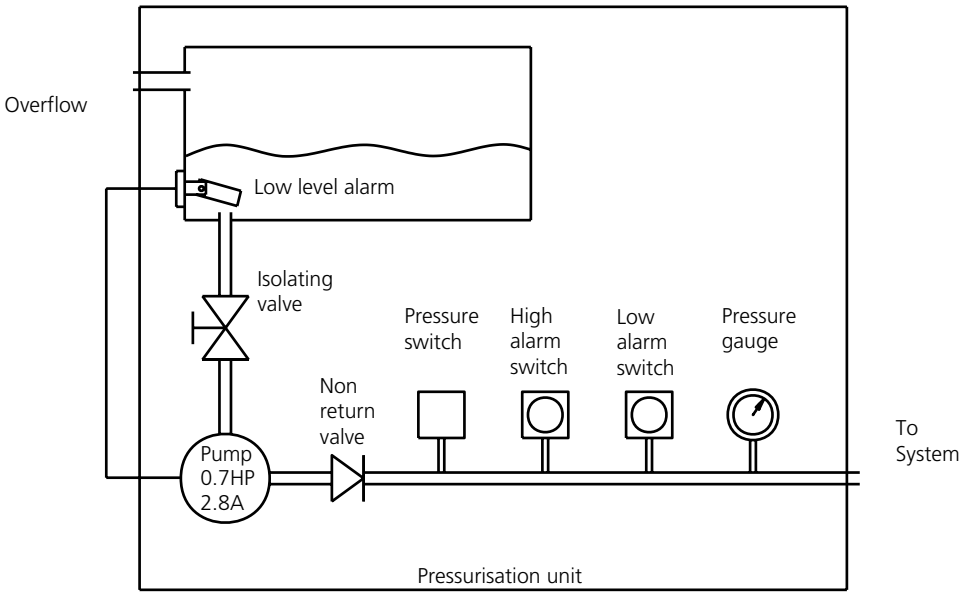
Product Schematic

Chesil Pressurisation Units

Chesil Electronic Control Pressurisation Units



Chesil Standard Control and Solar Pressurisation Units



Notes:

(1) Low level float switch not fitted to standard control, WSS and FSS units

(2) Cold water inlet and float valve not fitted to solar unit

Product Layout

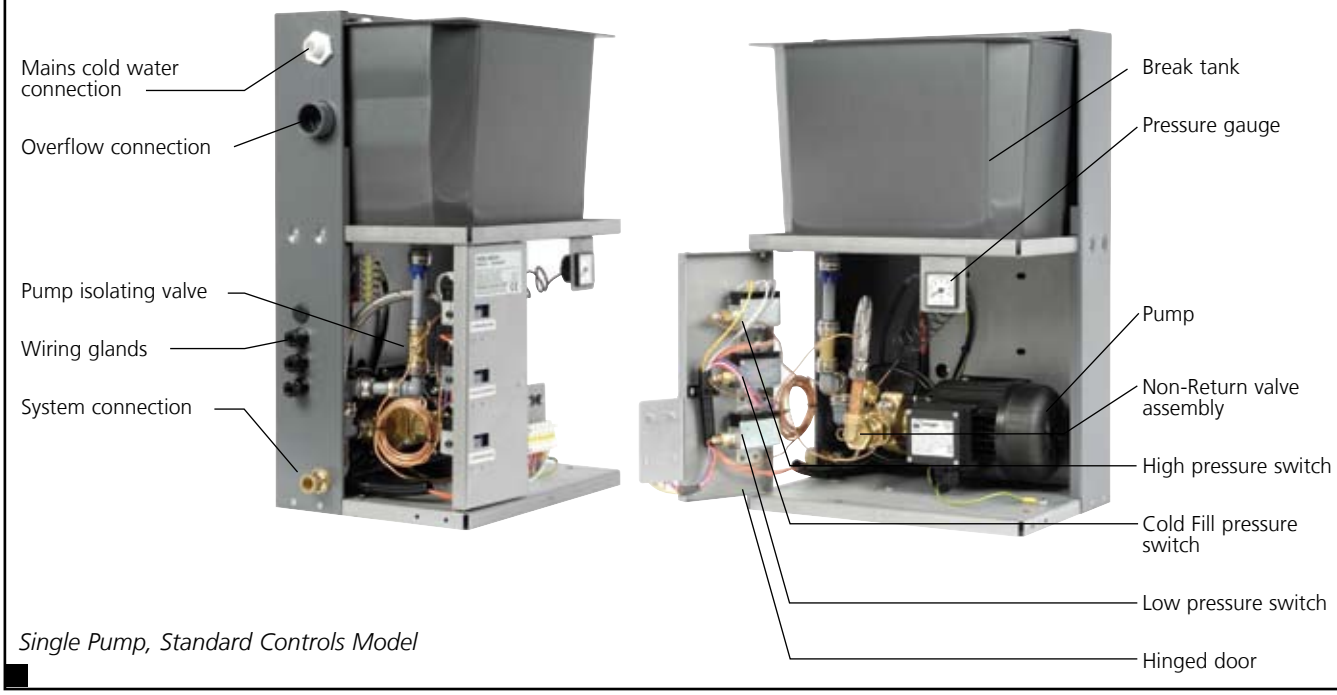
Chesil Pressurisation Units

Floor Standing

Twin Pump, Electronic Controls Model

Wall Hung

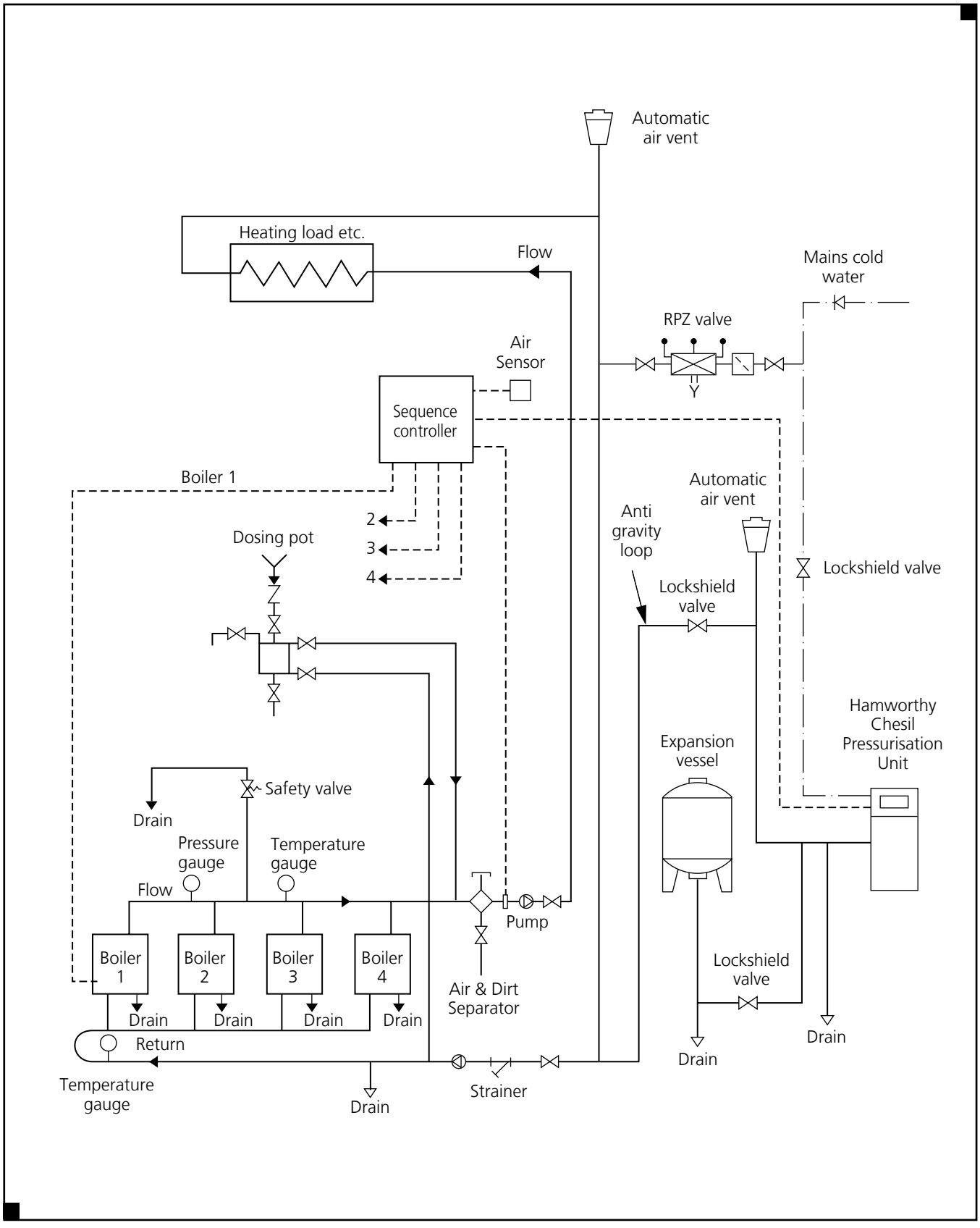
Note: Solar model does not have a mains cold water connection



Single Pump, Standard Controls Model

System Schematic

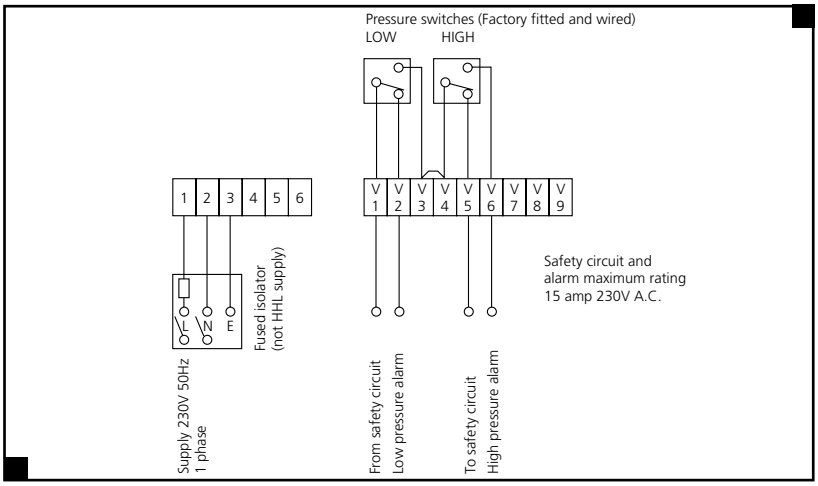
Chesil Pressurisation Units



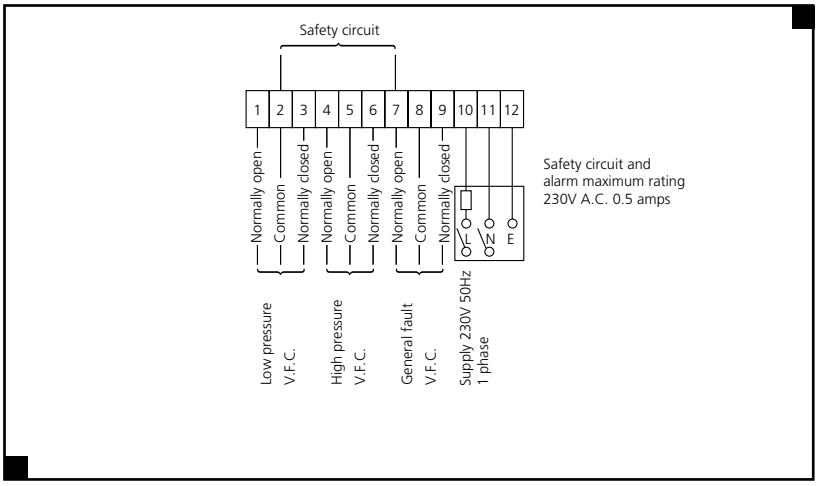
Wiring Diagrams

Chesil Pressurisation Units

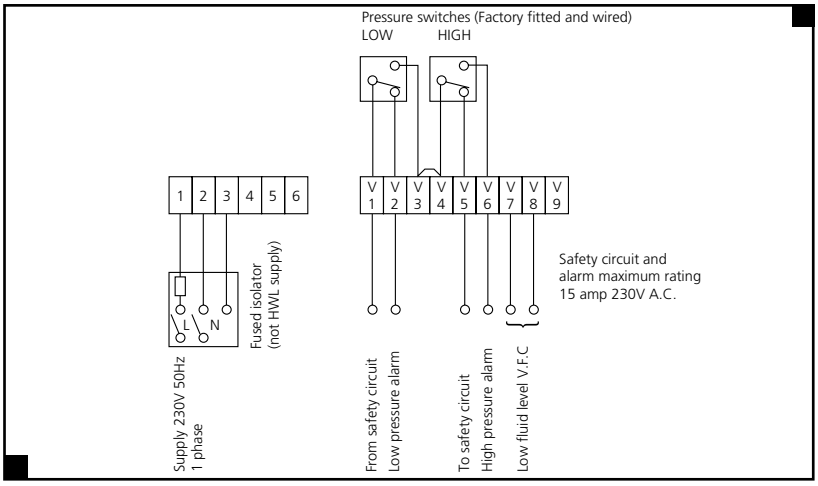
Site wiring details of Standard Pressurisation Unit



Site wiring details of Electronic Pressurisation Unit



Site wiring details of Solar Pressurisation Unit



Sealed System Calculations

Expansion Vessel Sizing

Hot Water Applications

1) Total system water content = _____ litres. (Sv.)
   Note: an assumed ratio of 10 litres/kW of installed boiler capacity can be used if not known.
2) Static head from base of expansion vessel to highest point of system = _____ metres. (Ph.)
3) System flow temperature (maximum under normal operation) = _____°C. (Tf.)
4) System return temperature = _____°C
5) Maximum system working pressure = _____ bar. (Pw.)
   Note: normally determined by the weakest part of the system - boiler, radiators etc. If system is below pressurisation unit (i.e. roof top boiler house), the maximum static head of components fitted must be considered.
6) Electrical supply available = _____ volts
   _____ ph
   _____ Hz

Preliminary sizing sheet

Sv = ☐ litres Ph = ☐ metres Tf = ☐ °C

$$\text{Cold fill/charge pressure} = \left(\frac{Ph}{10.2}\right) + 0.2 + Vp \quad \text{(see table below)}$$

$$\therefore Pf = \frac{\square}{10.2} + 0.2 + \square \text{ bar}$$

$$\therefore Pf = \square \text{ bar (Max 3.4 bar)}$$

(Note: if Pf < 1.0 then Pf = 1.0)

To size expansion Vessel

$$\text{Vessel volume} = \frac{Sv \times \text{expansion factor}}{0.35} \quad \text{(see table below)}$$

$$\therefore \text{Vessel volume} = \frac{\square \times \square}{0.35}$$

= ☐ litres (calculated)

∴ Using the next larger standard expansion vessel(s):

= ☐ off x ☐ litres

= ☐ off x ☐ litres

Charge pressure = Pf (fill press.) -0.1 = ☐ bar

Chiller Applications

1) Total system water content = _____ litres. (Sv.)
2) Static head from base of expansion vessel to highest point of system = _____ metres. (Ph.)
3) Maximum ambient temperature = _____°C. (Tf.)
4) Maximum system working pressure = _____ bar.
   Note: normally determined by the weakest part of the system - chiller unit, air handling unit etc. If system is below pressurisation unit (i.e. roof top air conditioning unit), the maximum static head of components fitted must be considered.
5) Electrical supply available = _____ volts
   _____ ph
   _____ Hz

Preliminary sizing sheet

Sv = ☐ litres Ph = ☐ metres Tf = ☐ °C

$$\text{Cold fill pressure} = \left(\frac{Ph}{10.2}\right) + 0.2$$

$$\therefore Pf = \frac{\square}{10.2} + 0.2 \text{ bar}$$

$$\therefore Pf = \square \text{ bar (Max 3.4 bar)}$$

(Note: if Pf < 1.0 then Pf = 1.0)

To size expansion Vessel

$$\text{Vessel volume} = \frac{Sv \times \text{expansion factor}}{0.35} \quad \text{(see table below)}$$

$$\therefore \text{Vessel volume} = \frac{\square \times \square}{0.35}$$

= ☐ litres (calculated)

∴ Using the next larger standard expansion vessel(s):

= ☐ off x ☐ litres

= ☐ off x ☐ litres

Charge pressure = Pf (fill press.) -0.35 = ☐ bar

Hot Water Applications

Max. system temperature (Tf) °C	70	75	80	82	85	90	95	100	105	110	115	120
Vapour pressure Pv (bar)	0	0	0	0	0.10	0.35	0.60	0.90	1.20	1.55	1.90	2.35
Water expansion factor (ew)	0.023	0.026	0.029	0.031	0.033	0.036	0.040	0.044	0.048	0.052	0.056	0.060
Anti-freeze expansion factor (ea)	0.061	0.064	0.068	0.069	0.071	0.075	0.079	0.083	0.087	0.090	0.094	0.098

Chiller Applications

Max. ambient temperature (Ta) °C	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5
Water expansion factor * (ew)	0.0002	0.0003	0.0007	0.0010	0.0014	0.0018	0.0024	0.0030	0.0037	0.0044	0.0052
Anti-freeze expansion factor (ea)	0.0169	0.0188	0.0206	0.0224	0.0242	0.0261	0.0279	0.0298	0.0316	0.0330	0.0345

Expansion Vessel Sizing

*NOTE: these figures apply to water systems only

Solar Applications

1) Total system fluid content = _____ litres. (Sv.)
2) Static head to highest point of system
   = _____ metres. (Ph.)
3) Maximum system working pressure
   = _____ bar. (Pw)
   Note: Normally determined by the safety valve setting with the solar transfer station or solar circuit.
4) Maximum ambient temperature during system filling
   = _____°C. (T1)
5) Minimum ambient operating temperature
   = _____°C. (T2)
6) Working steam volume, volume of collectors and adjacent pipe work, including all pipe work above collectors
   = _____ litres. (V vapour) safer to over estimate
7) Safety valve response pressure = _____ bar. (P sv).
   (6 Bar in HHL solar transfer station)
8) Desired cold pressure at collectors
   = _____ bar. (P op).
9) Water seal pressure at expansion vessel
   = _____ bar. (P wseal) not less than 0.3 bar
10) Pump head available during normal operation
    = _____ bar. (P pump).

Expansion volume

V expanded = Sv x 0.08 = ☐ x 0.08 = ☐ litres

Volume of fluid for steam protection and leak reservoir

V wseal = Sv x 0.000654 x (T1+T2)

☐ x 0.000654 x (☐ + ☐) = ☐ litres

If less than 3 litres then V wseal = 3 litres

Required working volume of expansion vessel

V working = V expanded + V wseal + V vapour

☐ + ☐ + ☐ = ☐ litres

Water gauge pressure of solar system

P geo = Ph x 0.1 = ☐ x 0.1 = ☐ bar

Cushion pressure of expansion vessel

P air = P geo + P op = ☐ + ☐ = ☐ bar

Pressure margin for safe operation

P margin = 0.1 x Psv = 0.1 x ☐ = ☐ bar

If less than 0.5 bar then P margin = 0.5 bar

Actual working pressure

P final = Psv – P margin = ☐ - ☐ = ☐ bar

Pressure Factor

$$Pfactor = \frac{P\ final + 1\ bar}{P\ final - (P\ gas - P\ pump)}$$

$$\frac{\square + 1\ bar}{\square - (\square - \square)} = \square$$

Required expansion vessel volume

V nominal = Pf x V working

☐ x ☐ = ☐ litres

Always select next expansion vessel volume greater than calculated.

Cold fill pressure

Pf = P air + P wseal = ☐ + ☐ = ☐ bar

Calculation in accordance with CIBSE recommendations: Solar Heating Design and Installation Guide.

Expansion Vessels

Hamworthy can supply a wide range of expansion vessels to complete the installation.

In order to accurately process an enquiry the following details will be required:

1. The system water content - litres (Sv). The installed boiler or chiller power, (kW) rating is acceptable if water content is not known.
2. The static head from the base of the expansion vessel to the highest point in the system - Metres (Ph).
3. The system flow temperature - °C (Tf).
4. The maximum system working pressure - bar (Pw). This is normally determined by the weakest part of the system.

With all of the above data our Technical Applications Team will be pleased to offer assistance and arrange for a quotation to be prepared.

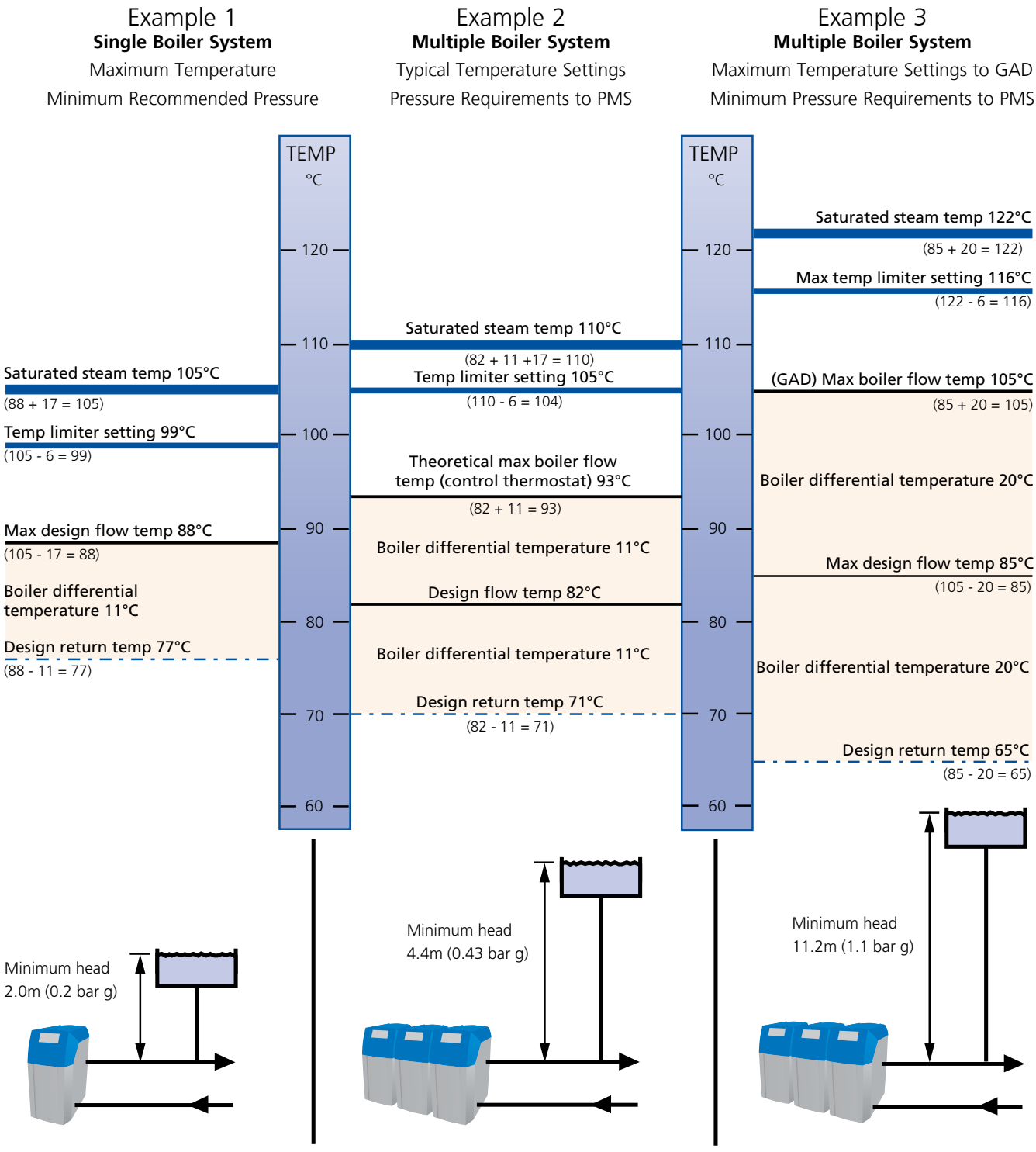
If the required system working pressure is below 3.3 bar, or the boiler installation is on or near the roof, then the factory preset pressure settings may be adequate.

Pressures & Temperatures

Open Vented Systems

The diagram shows example variations of temperature settings and system pressures required for single and multiple boilers with reference to HSE Guidance Note PM5, and the European Gas Appliance Directive (GAD).

Temperature settings and system pressures are particularly important in installations of boilers in single storey buildings or on rooftops where it may be difficult to provide the required pressure (head). In such cases, a sealed pressurised system using a Hamworthy Chesil pressurisation unit will result in a simple and effective solution.



Solar Hot Water Systems

The Chesil solar pressurisation unit is designed for use with solar thermal sealed systems.

Hamworthy Heating have a full range of products to provide solar thermal solutions for hot water in commercial buildings.

Hamworthy's ModuSol solar hot water systems provide flexible solutions for direct and in-direct fired storage hot water, complete with integrated controls.

The ModuSol system components include:

- High performance flat plate collectors
- In-roof, on-roof or 'A' frame installation
- Solar energy controllers
- Insulated solar transfer station
- Twin coil solar calorifiers
- Hot water storage tanks
- Twin coil direct fired water heaters
- High efficiency condensing boilers
- Solar system pressurisation unit

Biral Solar Controller

The solar controller can be supplied for wall mounting or as part of a pump mounted solar transfer station. Featuring 9 pre-programmed hydraulic circuits, the controller can handle multiple storage vessel settings, integrated boiler control and a choice of solar charging strategies.

A Legionella protection function ensures that the hot water system is purged regularly to minimise the risk of infection.

Controller features:

- Matched pump and controller
- Pump or remote mounting
- LCD backlit display
- Pre-programmed solutions
- Choice of operating modes
- Filling and drainage facilities
- Variable speed pump control
- Comprehensive operating data

Solar Water Heaters

The latest extension to the Hamworthy Dorchester range of direct gas fired water heaters includes a condensing unit with an additional coil for solar energy input.

With fully integrated control, this innovative solution is ideal for installations where boilers are not required.

Solar Collectors

Hamworthy have partnered with an experienced European manufacturer of high quality well engineered solar collectors to provide reliable and proven solar technology for the ModuSol package. The solar collector features:

- Polycarbonate moulded casing
- Tolerance to extreme temperatures
- High selectively coated full area absorber
- Quick and easy installation features
- Compact space saving design
- In-roof or on-roof mounting
- Pitched or flat roof mounting
- Tested and certified to EN 12975

ModuSol solar package for commercial hot water systems

Calorifiers & Storage Tanks

In-direct hot water storage is provided by a range of Hamworthy Powerstock high performance quality calorifiers and storage tanks up to 1000 litre capacity. Manufactured from steel with a superior glass lined internal finish, all products have full WRAS Approval.

- Twin & single coil construction
- 10 bar pressure rated
- Pre-wired control panel
- Unvented kit for mains water supply
- Electric immersion elements
- Electric anode protection for soft water
- Quality finish

To find out how Hamworthy can tailor commercial solar solutions for your project,
call 0845 450 2865 or
email sales@hamworthy-heating.com

Customer Service Centre
Hamworthy Heating Limited
Fleets Corner, Poole,
Dorset BH17 0HH

Telephone: **0845 450 2865**
Email: **sales@hamworthy-heating.com**
Web: **www.hamworthy-heating.com**

500002486 A