



PUK 1LV

Pressurisation Units

Installation, Commissioning And Servicing Instructions

**Note: THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE
INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT.**

**THE PUK PRESSURISATION UNITS ARE INTENDED FOR USE ONLY IN
COMMERCIAL/LIGHT INDUSTRIAL APPLICATIONS.**

THESE PRESSURISATION UNITS COMPLY WITH THE ESSENTIAL REQUIREMENTS OF THE MACHINERY DIRECTIVE 89/392/EEC AMENDED BY 91/368/EEC, THE LOW VOLTAGE DIRECTIVE 73/23/EEC AMENDED BY 93/68/EEC AND THE ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 89/336/EEC AMENDED BY 91/263/EEC AND 92/31/EEC.

1.0 INTRODUCTION

The pressurisation units in the PUK Series are designed to maintain the minimum pressure requirement of modern low/medium temperature, hot water sealed systems. The pressurisation units also provide replacement water for losses from the systems.

Note! **The pressurisation unit is not to be used for the initial filling of the system.**

The PUK units are housed in a powder coated steel cabinet with removable cover. Housed in the cabinet is a pump, connecting pipe-work and pressure switches. In the top of the cabinet is the header tank, with a float valve. In the front of the cabinet is the systems pressure indication gauge.

2.0 TECHNICAL DATA

The basic overall dimensions of both units are shown below in Figure 1.

All screw threads used in the units conform to **ISO 7/1** or **ISO 228/1** for pipe threads where applicable and **ISO 262** for all general screw threads.

Figure 1 - Basic Overall Dimensions

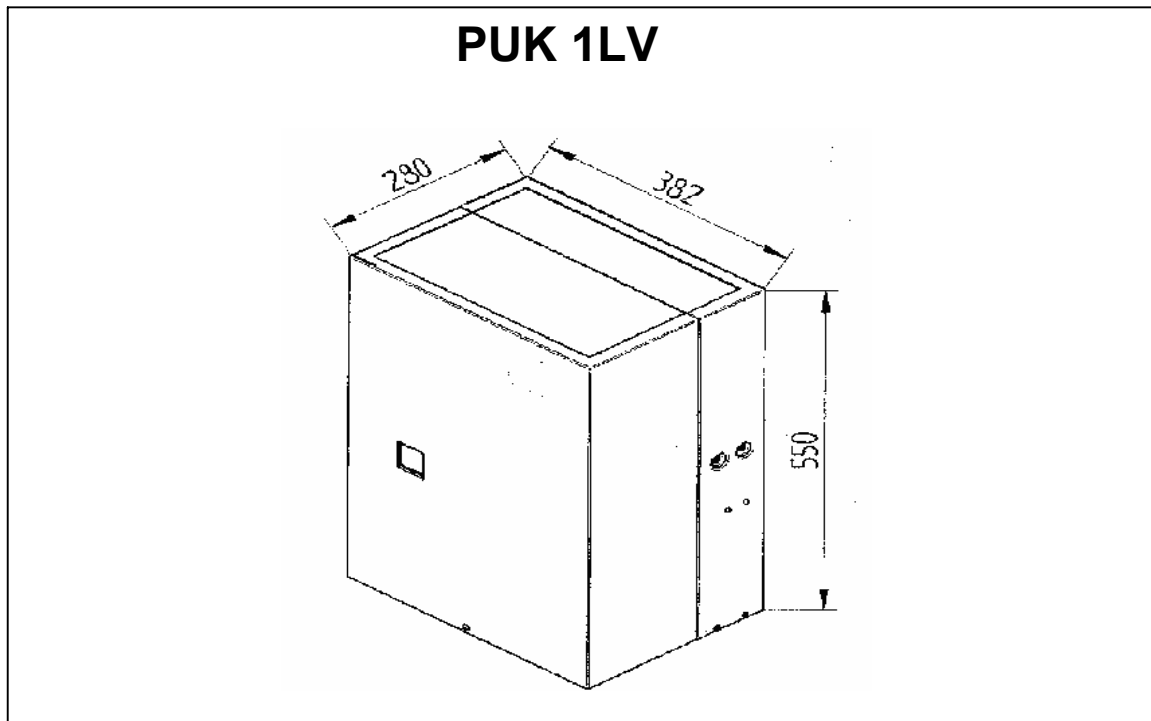




Figure 2 – Pressurisation Units – Technical Data

<u>Model</u>		<u>Standard</u>
Minimum cold fill pressure	bar	0.7
Maximum cold fill pressure	bar	3.4
Maximum operating pressure	bar	7.0
Maximum Flow Rate	l/min	6
Maximum water flow rate @		
Maximum cold fill pressure	l/min	0.1
Weight (empty)	kg	19
Weight (full)	kg	27
Tank Capacity	litres	7.6
<u>Factory Preset Values</u>		
Cold fill pressure	bar	1.0
System low pressure switch	bar	.5
System high pressure switch	bar	2.5
<u>To suit system conditions</u>		
Maximum water flow temp	°C	82
Maximum static height	m	16.5
Min. system operating pressure	bar	3.3
Max. system operating pressure	bar	6.3
Safety relief valve setting	bar	4.0
Nominal pressure differential	bar	0.4
<u>Electrical Data</u>		
Pressure switch contact rating		15A 240V AC
Electrical Supply		230V AC 50Hz 1Ph
Start current	amps	9
Run current	amps	2.8

SEALED SYSTEM FUNCTION

Figure 3 shows the layout of a typical sealed system.

2.1 Terminology

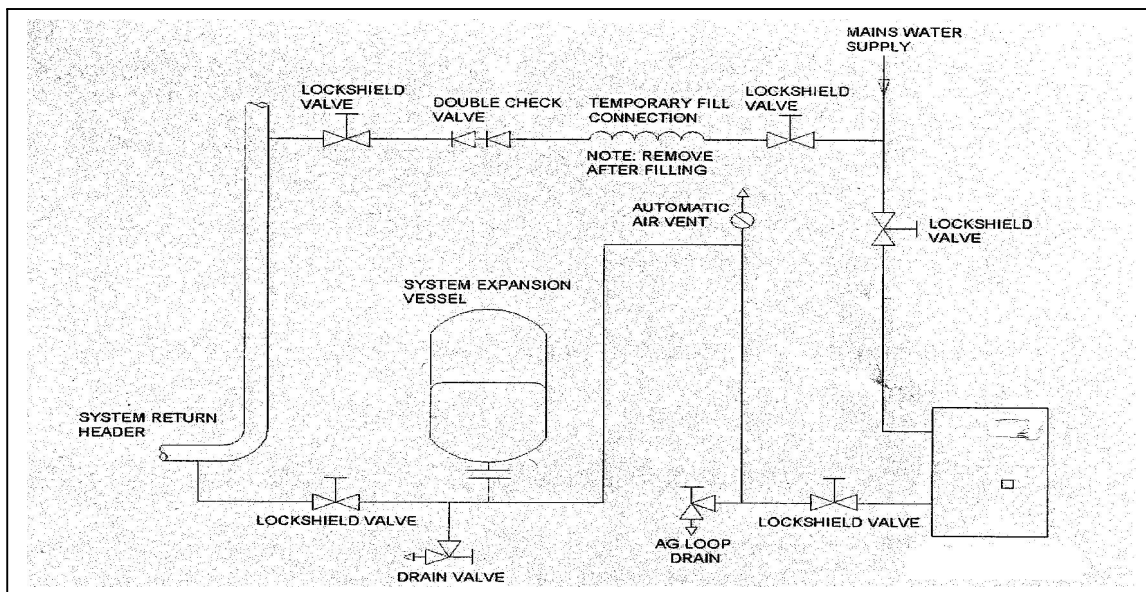
Expansion Vessel Charge Pressure

The air pressure in the expansion vessel with water connection open to atmosphere.

System Cold Fill Pressure

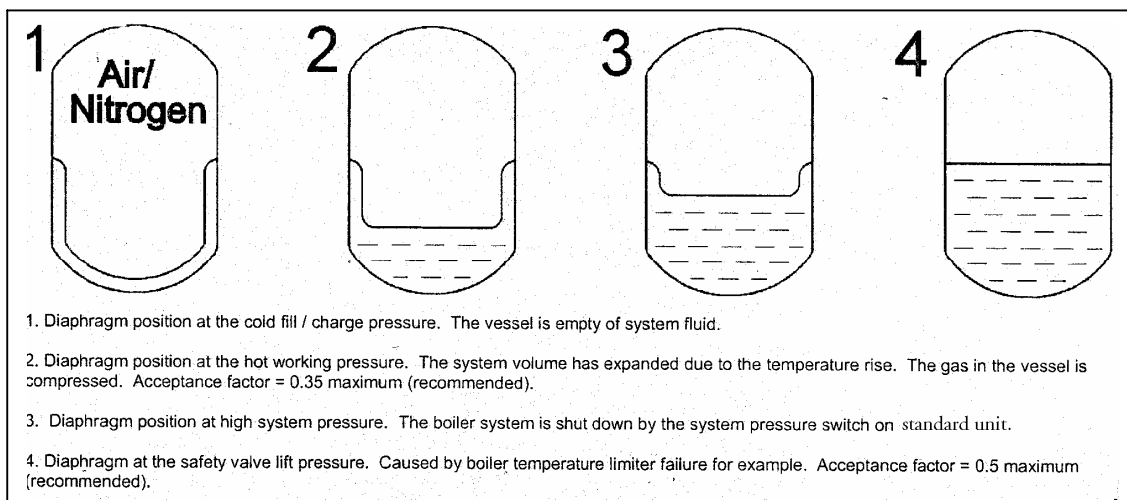
The water pressure in the system that the pressurisation unit is set to maintain.

Figure 3 - Typical System Schematic Layout



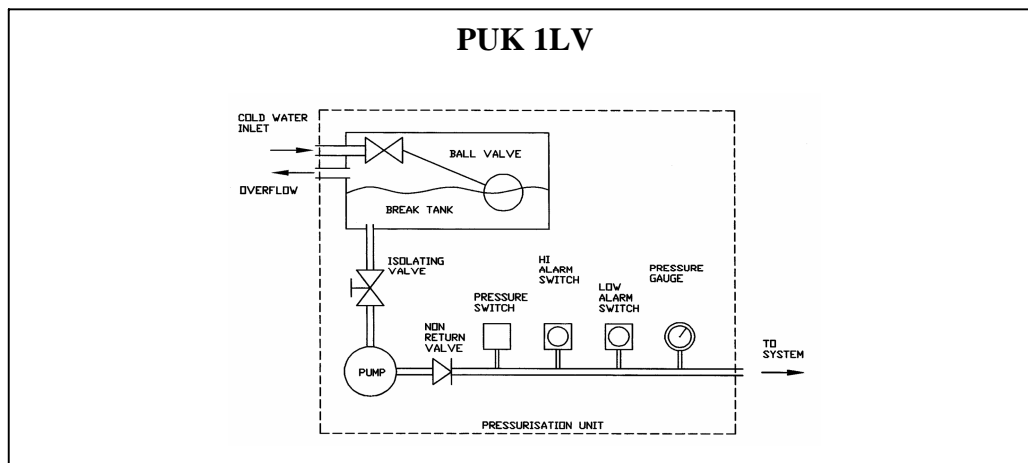
The system expansion vessel change pressure is set 0.1 bar below the cold fill pressure. Before operation of the boiler, with the system at cold fill pressure the expansion vessel is empty. As the system heats up the expanded volume is absorbed by the expansion vessel. A small pressure rise occurs which is accommodated by the vessel. When the system cools the pressure drops. If there has been some fluid loss the pressurisation provides replacement.

Figure 4 - Expansion Vessel Operation



3.0 OPERATION OF THE PRESSURISATION UNIT

Figure 5 – Schematic Layout of the Standard Units



3.1 Unit Operation

A drop in system pressure due to, for example, loss of water, will cause the pump to maintain the pressure. As the level of water in the tank reduces a ball valve allows new water into the tank. When the pump pressure switch is satisfied the pump stops.

3.2 Safety function

The PUK 1LV unit is fitted with two extra pressure switches. A pressure above the high pressure limit set on the unit will switch over the SPDT high pressure switch and a pressure below the low pressure limit set on the unit will switch over SPDT low pressure switch.

4.0 GENERAL REQUIREMENTS

4.1 Related Documents

Pressure Systems and Transportable Gas Containers Regulations 1989

It is the law that pressure system appliances are installed by competent persons in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your own interest and that of safety, to ensure that this law is complied with.

The installation of the pressurisation unit and expansion vessel **MUST** be in accordance with the relevant requirements of the Pressure System Regulations, Building Regulations, IEE Regulations and the bylaws of the local water undertaking.

It should also be in accordance with any requirements of the local authority and the relevant recommendations of the following documents: -

Applicable standards and documents are:

BS7074	Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems
BS6644	Installation of Gas Fired Hot Water Boilers 60 kW to 2MW
BS6880 Parts 1,2 & 3	Code of Practice for low temperature hot water heating systems of output greater than 45 kW

BS6759 Part 1 (ISO 4126): Specification for safety valves for steam and hot water
 BS 3456 (CEE10 Part 1, CEE11 Part 1): Safety of Household and similar electrical appliances
 HSE Guidance note PM5: Automatically controlled steam and hot water boilers.

4.2 Mains Water Connections

All connections to local water mains must comply with WRAS Regulations including any local requirements. **The System temporary fill connection must be as per water supply bylaws and must be removed after initial filling.**

4.3 Expansion Vessels

System expansion vessels must be constructed to BS4814 or BS6144. Pumps UK have a range of products available on request including guidance of vessel sizing

5.4 Safety Relief Valve

Must comply with BS6759 part 1, and be sized and installed in accordance with BS6644 and BS7074.

6.0 INSTALLATION

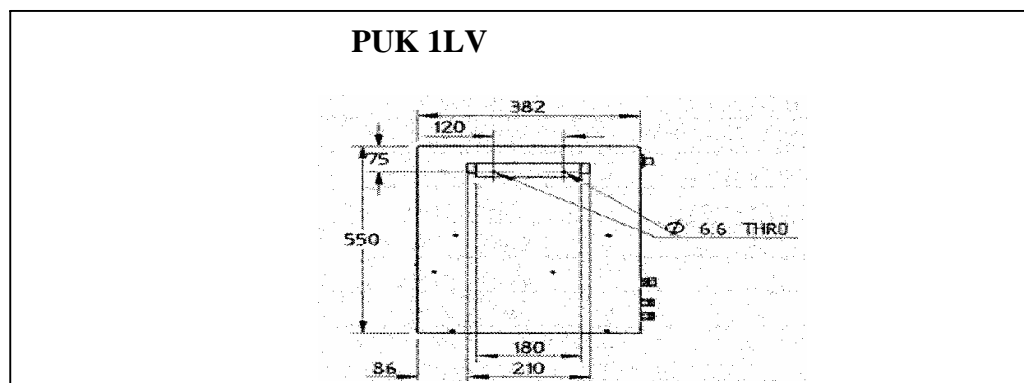
The units are supplied inside a strong cardboard box with foam padding and should be left in this packaging until they arrive on site and are installed.

6.1 Location

Figure 6 - Recommended Clearance Dimensions

The units are designed for wall mounting. A mounting bracket is supplied inside the unit taped to the front of the tank. It is intended that this bracket should be fixed to the wall and the unit hung from it. Each unit also has two holes in the back of the chassis for extra security. The corresponding holes in the wall should be drilled to suit once the unit is mounted on its bracket; the bracket dimensions are shown below in fig 7 below.

Figures 7 - Mounting Bracket Dimensions



The pressurisation units can be installed on the floor if they are secured to a wall or support using screws through the holes in the chassis.

6.2 Pipework Connections

- 1) Mains water connection (1/2" BSP Male)

The units have a type 'AF' air gap to prevent backflow in accordance with Water Supply (Water Fittings) Regulations 1999. The water supply connection must conform to all local WRAS regulations.

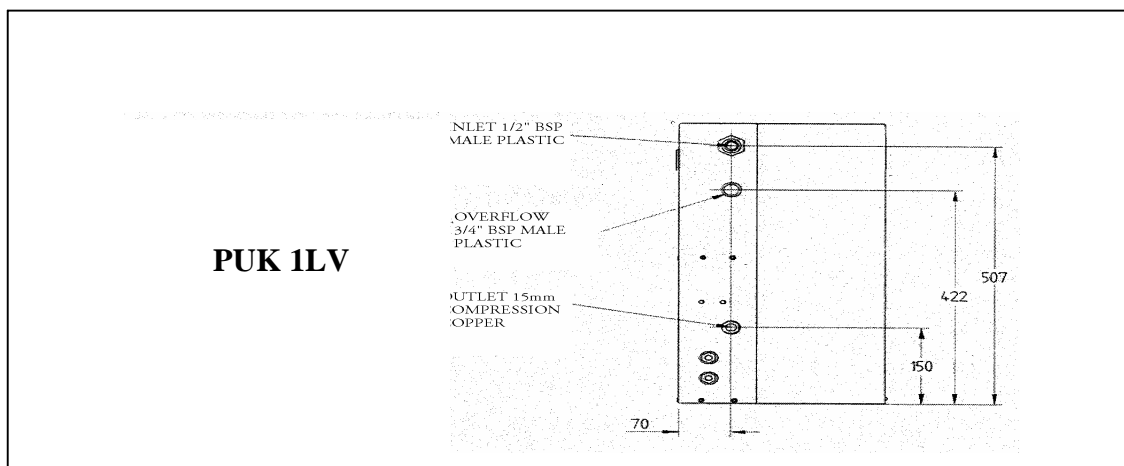
- 2) Overflow Connection (22 mm and 3/4" Female)

Overflow should be piped to where it will be safe but visible so it will be noticed and corrected.

- 3) System Connection

The system connection is via a 15 mm compression fitting. The unit must be connected to the system by an antigravity loop. The antigravity loop must be made in pipe-work no smaller than the expansion vessel connection, and have a minimum height of 2 metres. It should include a lock-shield (or lockable) valve at the system connection point for servicing and an automatic air vent fitted at the highest point of the loop. The antigravity loop must not be lagged but can be fitted at the highest point of the loop. The antigravity loop must not be lagged but can be fitted with an optional kit to prevent freezing. The pipe-work and fittings must be pressure tested to 1.5 times the safety valve lift pressure.

Figure 8 - Pipework Connections



6.3 Electrical connection

All wiring to the pressurisation unit must be in accordance with the IEE regulations, and any local regulations, which apply. Note: If in any doubt a qualified electrician should be consulted.

6.3 Mains Connection

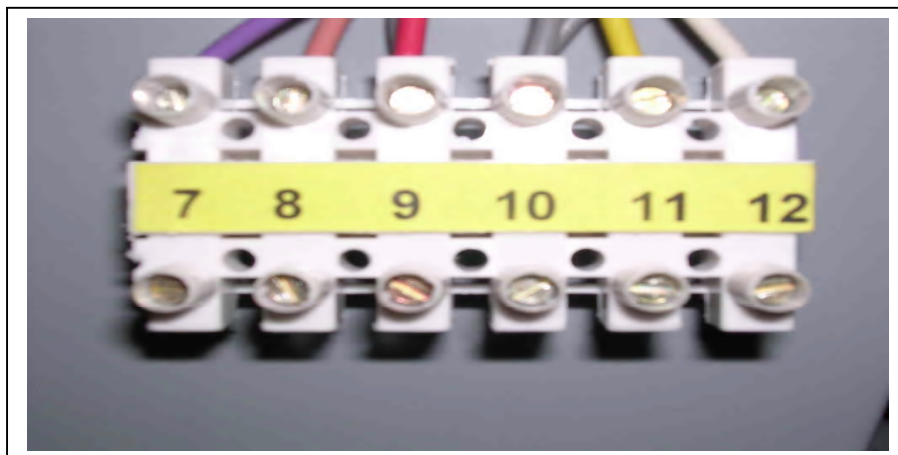
Both the Standard and Compact are supplied fitted with a 1m flying lead for connection to the mains supply. Mains connection must be via a fused isolator rated at 13 Amps (supplied in tank) and positioned locally to the unit.

- 1) Safety Switches/Circuits On – Standard only

The SPDT hi and lo pressure switches can be incorporated into circuits to interrupt a boiler control signal, in order to shut down the boiler in the event of a system fault condition. The boiler control system must be designed so that manual resetting is required after a system fault condition.

The circuits are rated at 230 V ~ 50 Hz, 15 A. Note: if the factory set pressure switch levels are to be altered terminal should not be connected at this stage.

Figure 9 - Standard Alarm Terminal



7.0 COMMISSIONING

PUK Units are supplied factory set and tested to suit the system parameters as specified. If the application falls within these parameters the unit requires minimal commissioning checks.

7.1 Mechanical Installation

Check that the PUK Unit and expansion vessel have been installed correctly, as detailed in section 6.2: Pipe-work connections. Check also that all lock-shield or lockable valves are correctly set.

7.2 System Flushing

Ensure that the system has been flushed and all foreign matter has been removed, including pipe-scale.

Note: Should this material come into contact with the expansion vessel diaphragm it could result in premature failure of the expansion vessel assembly.

7.3 Electrical Installation

Before working on PUK units ensure all electrical circuits connected to it are isolated.

7.4 System Expansion Vessel

To set or check the expansion vessel charge pressure the lock-shield between the PUK unit and the vessel must be closed. The drain cock fitted on the base of the expansion vessel must be open to allow any water in the vessel to escape.

A suitable gauge should be used to check the charge pressure. Generally a Schroeder valve is fitted near the top of the expansion vessel. If the charge pressure is too high it can be reduced by depressing the centre of the Schrader valve or by using a pressure gauge with an integral air release

valve. If the charge pressure is too low a small increase can be provided using a car foot pump otherwise an oil free compressor or nitrogen bottle is recommended.

Note: the expansion vessel charge pressure should be set at 0.1 bar less than the cold fill pressure.

When the correct pressure is set the Schrader valve protective cap must be replaced.

Check the integrity of the pipe-work. Ensure the lock-shield valve between the PUK unit and the expansion vessel is open and the drain valve is closed. Ensure the air purge plug is fitted (near the top of the expansion vessel).

7.5 Initial Setting Of PUK 1LV Units

- 1) Check water inlet supply, it MUST have a flow greater than 8 l/min.
- 2) Flow Restrictors

PUK 1LV

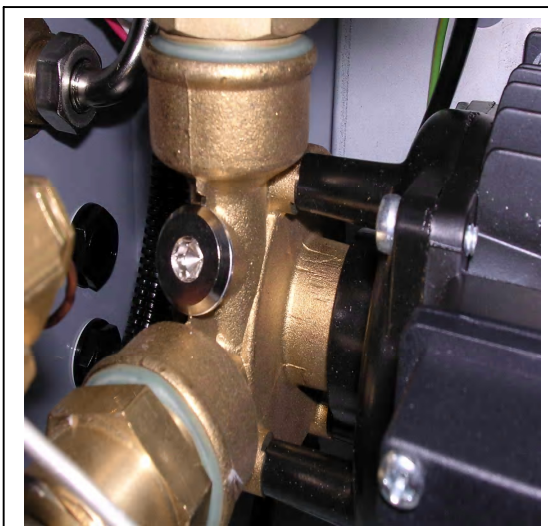
Each standard unit comes with a selection of inserts that can be fitted into the inlet valve to achieve the required output:

Mains inlet pressure > 4-bar H P restrictor
Mains inlet pressure < 4 bar L P restrictor

7.6 Filling the Unit

- 1) Check all connections and pressures. Open inlet isolation valve and fill the tank
- 2) Undo the priming screw on pump head. Prime until water appears. Close the screw and turn on the pump (keeping system isolation valve closed). Pump should run for a few seconds until set pressure is reached.

Figure 11 - Priming Screw – Standard



- 3) Check for any leaks within the units, if OK open system isolation valve and fill system via filling loop.
- 4) The unit will now monitor the system and keep it at the required pressure.

7.7 Pressure Switch Adjustment

The pressure switches are fitted with a scale to indicate the pressure at which they are set. This scale is to be used for indication only. As all the pressure switches and the pressure gauge take readings from the same place, the unit's pressure gauge can be used to give an accurate reading when setting switching levels. The switches should be set last, after all the other commissioning tasks are complete.

Figure 12 - Pressure Switch Adjustment



All the pressure switches have a nominal differential (Hysteresis) of 0.4 bar. This means that there will be 0.4 bar between the pressure at which the switch changes state during a pressure rise and the pressure at which it will change when the pressure is falling again or vice versa. For example, if the cold fill pressure switch is set to 3.4 bar then the switch will operate when the pressure rises to 3.4 bar causing the pump to stop. The switch will not change over and start the pump until the pressure has fallen back to 3.0 bar.

7.8 Pressure Switch Adjustment Apparatus

When adjusting pressure switches the unit must be set up with the apparatus similar to that shown in connected to the outlet.

Figure 13 - Pressure Switch Adjustment Apparatus

7.8.1 Cold Fill Pressure Switch

Designed to stop the pump when pressure reaches a preset level. Setting procedure as follows:

- 1) Ensure the system pressure is lower than the pressure the switch is to be set to.
- 2) Switch the unit on.
- 3) Introduce a small leak at the outlet.
- 4) Because of the leak the unit begins a cycle of starting and stopping. Adjust the cold fill pressure switch until the unit starts at 0.4 bar below the required cold fill pressure.

7.8.2 Low Pressure Switch – Standard Only

Designed to stop the boiler operating if the pressure falls below a preset level. Setting procedure as follows:

- 1) Set the cold full pressure switch and allow system to run to pressure
- 2) Isolate the PUK unit from the mains electrical supply and from the boiler circuits
- 3) Introduce a small leak until the unit's pressure gauge reading equals the required Low pressure setting.
- 4) Stop the leak.
- 5) The Low pressure switch is lowest on the panel which pivots around corner for easy access
- 6) Set the Low pressure switch to its highest level
- 7) The terminals at either end of the switch form a closed circuit. Adjust the switch until the circuit is open. A meter across the two terminals will signal the change.

7.8.3 High Pressure Switch – Standard Only

Designed to stop the boiler operating if the pressure exceeds a preset level. Setting procedure follows:

- 1) Isolate the PUK unit from the mains electrical supply and boiler circuits
- 2) Use the pressure source increase the pressure until the pressure gauge reads the required High pressure level.
- 3) Set the High pressure switch to its lowest level
- 4) The terminals at either end of the switch form an open circuit. Adjust until the circuit is closed. A meter across the terminals will signal a change.

8.0 FAULT FINDING

General fault finding - If the unit still does not operate satisfactorily, consult Pumps UK Ltd for assistance.

Figure 14 - Fault finding guide

Fault	Possible Causes	Action
Pump will not run	Unit up to pressure No power to the unit Isolator fuse blown Cold Fill Pressure switch set incorrectly Pump seized or faulty	None Check at source Replace fuse in isolator. Note investigate cause of blown fuse before restarting the unit Check wiring and/or adjust Pressure switch setting Service or replace pump
Pumps runs but will not build up pressure	Pump isolating valve closed – Standard only Pump not primed No water in tank Pump non return valve jammed	Open Valve Prime pump (see section 7.6) Check water level and investigate if necessary Check valve
Pumps cuts in and out rapidly (hunting)	Pressure switches set incorrectly Non return valve not sealing correctly System Leak	Adjust pressure switches (see section 7) Clean valve seat or replace valve if necessary Trace leak and ensure system is sound
Pump runs continuously	Cold fill pressure switch set incorrectly Cold fill pressure switch fault System Leak	Adjust pressure switches (see section 7) Replace faulty switch Trace leaks and ensure system is sound.

Pumps cuts out at wrong pressure	Cold fill pressure switch set incorrectly	Adjust pressure switches (see Section 7)
	Cold fill pressure switch faulty	Replace faulty switch
Maximum system working pressure too high	Cold fill pressure switch set incorrectly	Adjust pressure switches (see Section 7)
	Cold fill pressure switch faulty	Replace faulty switch
Boiler switches off unexpectedly	Hi or Lo pressure switches set incorrectly	Adjust pressure switches (see section 7)
	Hi or Lo pressure switches and circuits wired incorrectly	Check wiring.
System pressure runs consistently at cold fill pressure	Small system leak	Trace leak and ensure system is sound

9.0 SERVICING SCHEDULE

The following is a recommended servicing schedule for the PUK unit and expansion vessel. If remedial action is required;

9.1 6 Monthly

- 1) Check the expansion vessel charge pressure, A significant drop in charge pressure could be due to a faulty vessel diaphragm : Replacement of diaphragm should be considered.
- 2) Briefly run the pump to check for rotor seizure. This could occur if the pump is not run for extended periods. This can be accomplished by slightly opening the expansion vessel drain valve to initiate a leak.

9.2 12 Monthly

- 1) Check the ball float valve diaphragm for integrity and replace if necessary. Also check the plastic float for soundness.
- 2) Check the expansion vessel for signs of external corrosion. If any deterioration is observed then it is recommended that the frequency of inspection be increased.
- 3) Check the operation of the safety circuits it utilised on the Standard Unit.



NOTES: