# KESTON SPA

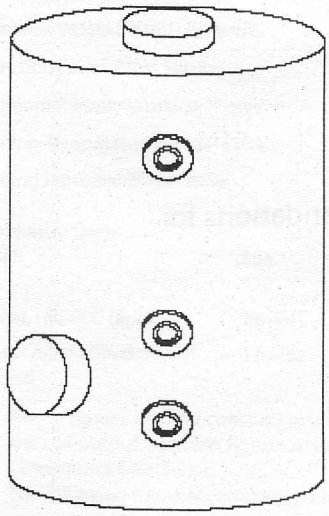
## UNVENTED STORAGE CYLINDERS

SINGLE AND TWIN COIL MODELS

## Installation Instructions

&

## Performance Specification



Single Coil Models
Spa 120 litre
Spa 150 litre
Spa 210 litre
Spa 300 litre
Twin Coil Models
SpaTwin 210
SpaTwin 300
Indirect
Stainless Steel
Cylinders with
Ultra-High
Performance

Fully Approved To Building Regulations G3 and L
WRAS Approved to the Water Regulations

Issue 04-2007

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Equipment

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# READ CAREFULLY BEFORE INSTALLATION

## INCORRECT INSTALLATION MAY INVALIDATE GUARANTEE

CONTENTS PAGE



Note to Installer: Please leave Installation manual with Householder after installation

# INTRODUCTION

The Keston Spa is a range of Duplex stainless steel un-vented water heaters with ultra high performance coils for indirect heating. The use of stainless steel for both coil and tank ensures long life and high strength ensuring high pressure performance. The ultra high efficiency coils give rapid reheat and high volume hot water delivery.

The units are supplied with manifold type pressure regulating/expansion relief valves preset to 3bar and with integral strainer. However, the manifold can be separated to two sections should you wish to install the pressure regulating valve at a remote location. An expansion vessel is also supplied for connection to the cold supply. Use of an external expansion vessel allows the entire volume of the tank to be used for water storage.

The units are also fitted with a 3kW electric immersion heater as standby heating and adjustable thermostat with overheat shut down to control the supply of indirect heat to the unit.

Operating Data:

| | |
|---|---|
| Maximum Water Supply Pressure to pressure regulating valve | 12.0 bar |
| Operating Pressure of unit | 3.0 bar |
| Expansion Vessel Charge Pressure | 3.0 bar |
| Expansion Relief Valve Setting | 6.0 bar |
| Maximum Primary Working Pressure | 3.5 bar |
| Opening Temperature of T&P Valve | 90C |
| Opening Pressure of T&P Valve | 7 bar |

Performance Data:

| Model | Spa 120 | Spa 150 | Spa 210 | Spa 300 | Spa Twin 210 | Spa Twin 300 |
|---|---|---|---|---|---|---|
| Re-heat 15C 60C (approx) | 23mins | 25mins | 35mins | 44mins | 18mins | 22mins |
| Re-heat after 70% draw-off (approx) | 17mins | 17mins | 22 mins | 28 mins | 11 mins | 14 mins |

NB: Above figures assume constant primary coil flow of 82C and sufficient heat input to fully utilise the coil output. SpaTwin figures assume both coils used concurrently with sufficient boiler power

1. Component Check-List

The following items accompany your Spa Unvented Storage Cylinder.

Combined control and overheat thermostat with manual cut-out switch, variable thermostat (30 -70C) and sensor.

Combined strainer/pressure reduction valve, 3.0 bar, with stop tap, check valve, expansion relief valve 6 bar.

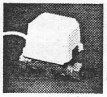
90C/7 bar ?Temperature and Pressure (T&P) relief valve

3kW /230 VAC electric element with safety cut-out switch and variable thermostat - 1.75" BSP head

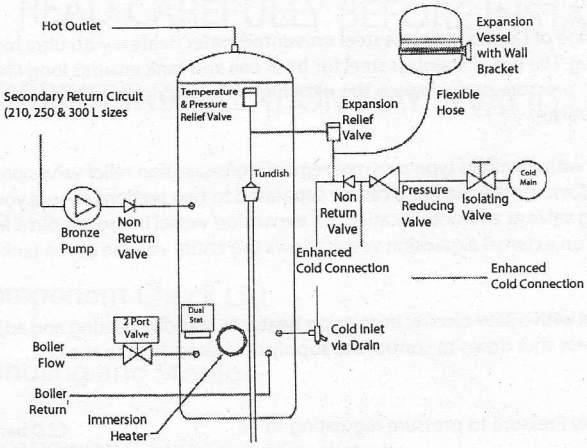
Discharge tundish

Diagnostic gauge

2-Port Motorised Valve



Expansion vessel, hose and wall mounting kit




2. Handling & Storage

- Do not lift via valves or element bosses on unit
- Expansion vessels must not be dented.
- Store unit away from excess heat or frost
- Always transport cylinders in the vertical position

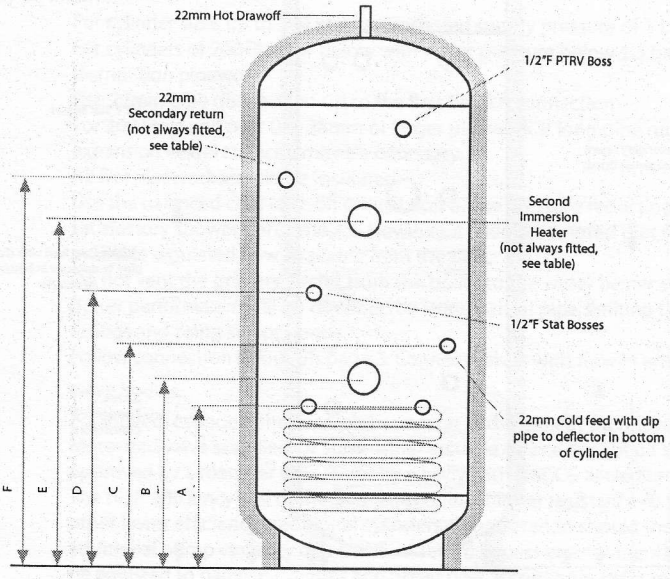
3. Location and Cylinder Mounting

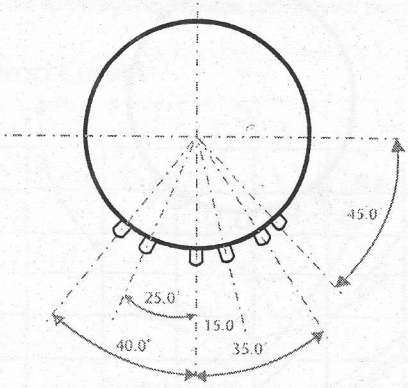
- Site the unit as close as possible to main points of usage. Outlets above the Spa unit will reduce the outlet pressure by 0.1 bar for every 1m of height difference.
- Avoid locating the unit where freezing temperatures may be experienced. All expose pipework should be insulated.
- Ensure unrestricted access to plumbing connections and top of expansion vessel
- Allow sufficient clearance for removal of immersion heater and valves.
- In floor standing the unit place the unit on a load bearing surface sufficient for the weight of the unit when full of water.
- The unit must be installed and transported vertically unless otherwise indicated on packaging
- Valves can be mounted in any orientation provided discharge downpipes can be run to drain in accordance with instructions (see Tundish). The discharge pipework should have a minimum fall of 1:200 from the unit.
- A drainage safe tray should be placed under the cylinder to facilitate servicing

4. Warnings

- Boilers without thermostatic control, such as and steam heating plant should not be used with this unit unless appropriate additional safety controls are installed. Solid fuel boiler must not be used with any unvented unit.
- Under no circumstances must the unit be filled or operated without the factory fitted T&P relief valve.
- Do not fit a stop or check valve between the inlet safety group and the cylinder
- Do not apply heat to any component or any welding to cylinder or pipe connections.
- All electrical wiring should be carried out by a registered electrical contractor and must conform to IEE Wiring Regulations.
- If a replacement immersion heater is required at any time, do not fit an immersion heater(s) without thermal cut-out(s).
- Ensure unit is flushed for 3 minutes via hot tap before switching on.
- Do not use excessive plumbers paste or flux, which may damage the controls.
- Do not switch on power until the unit is full of water. Do not open electric elements unless power is switched off.
- Position discharge tundish away from any electrical components.
- Do not allow discharge pipes to kink or block in any way.

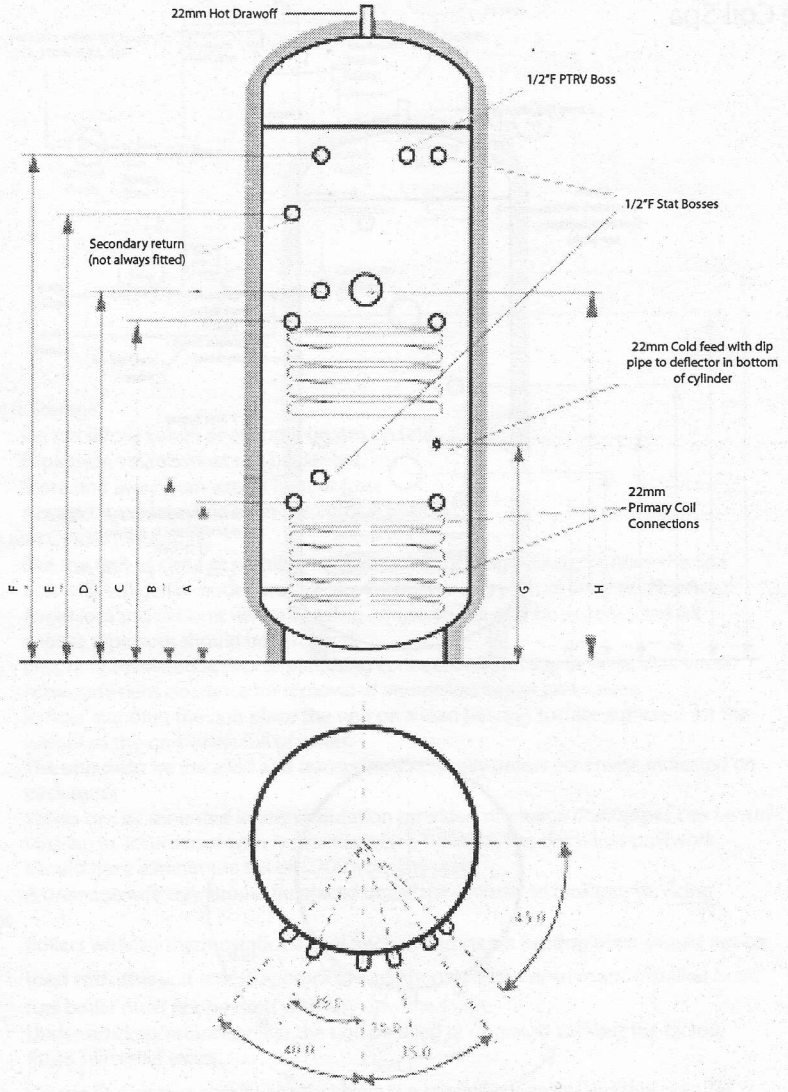
# Markings and Specification
# Single Coil Spa




| MODEL | CAPACITY (Litres) | WEIGHT Empty (kg) | Full (kg) | Height | Dia | DIMENSIONS (in mm) A | B | C | D | E | IMM F | (kW) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spa 120 | 120 | 35 | 155 | 906 | 550 | 290 | 330 | 390 | 345 | N/F | N/F | 3 |
| Spa 150 | 150 | 40 | 190 | 1093 | 550 | 330 | 370 | 465 | 385 | N/F | N/F | 3 |
| Spa 210 | 210 | 50 | 260 | 1469 | 550 | 365 | 405 | 465 | 465 | N/F | 1150 | 3 |
| Spa 300 | 300 | 60 | 360 | 2032 | 550 | 365 | 405 | 465 | 660 | 1100 | 1600 | 6 |

# Double Coil SpaTwin



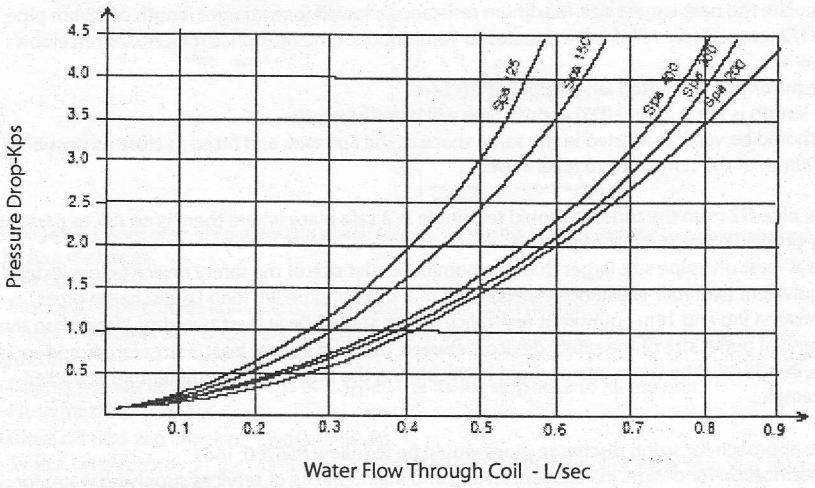

| MODEL | CAPACITY (Litres) | WEIGHT Empty (kg) | Full (kg) | Height | Dia | DIMENSIONS (in mm) A | B | C | D | E | F | G | IMM H | (kW) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spa Twin210 | 210 | 55 | 265 | 1469 | 550 | 365 | 420 | 779 | 834 | 1150 | 1268 | 465 | 830 | 3 |
| Spa Twin 300 | 300 | 60 | 365 | 2032 | 550 | 365 | 420 | 979 | 1034 | 1600 | 1832 | 465 | 1030 | 3 |

6. Connection Layout & Recommendations

The performance of any unvented mains fed cylinder is always limited by the supply of mains water to the unit. A high static mains pressure is not a guarantee of adequate supply. The static mains supply pressure should be measured as well as the size of the supply pipe. Unvented mains fed cylinders should not be used where the water supplies have inadequate pressure, flow rate or where the supply may be intermittent.

1. For cylinder sizes up to 300 litres a suggested supply pressure of 1 bar or more is desirable.
2. For cylinders of 200 litres or below with water pressure below 1.5 bar use 22mm supply and distribution pipework.
3. Use 22mm pipe distribution up to the first branch connection
4. For 300 litres and over use 28mm or larger pipework. If long pipe runs are required extra expansion vessel capacity may be necessary.
5. All hot pipework should be insulated.
6. Use the balanced cold take-off connection of the pressure reduction valve to ensure satisfactory shower performance. However, it should be noted that this will reduce the total available regulated flow available from the tank.
7. Do not vent the primary circuit from the boiler to the water heater system.
8. Better performance will be obtained by using 22mm pipe, limiting the number of elbows and fittings and using swept bends.
9. Follow connection layout on page 3. Connect valves with flow in arrow direction marked on valve bodies.
10. For indirect cylinders the control thermostat and overheat thermostat must be wired to the Motorized valve supplied, or some other suitable device to shut off the flow to the coil that is approved by a member of EOTA or by a body with NACCB accreditation.
11. The high efficiency coil of the Spa tanks offer a higher resistance to boiler water flow than other lower efficiency traditional cylinders. Consideration should therefore be given to additional pump capacity or a coil flow/return bypass arrangement. Such a by-pass may then be adjusted to balance cylinder and boiler flow accordingly. Refer to the cylinder coil pressure drop curves below for pump selection.
12. For twin coil models the boiler should be connected to the upper coil. The lower coil should be used for the additional heat source, such as solar thermal or heat pump.

## Coil Pressure Drop Curves



How to drain the System

1. Switch off the electrical power to the immersion heater(s) and shut down the boiler. Close the stop cock valve.
2. Open a hot water tap on order to reduce pressure in the cylinder. Leave the hot water tap open.
3. Connect a hose to the draining tap ensuring it reaches a level below the unit (this will ensure a siphon is established to drain the maximum amount of water) CAUTION WATER DRAINED OFF MAY BE VERY HOT!

Discharge Pipework and Tundish

- Tundish must be visible
- Discharge pipe must be to fixed grating and not located to cause possible discharge injury to persons.

## Typical Discharge Pipe Arrangement

Table 1: Sizing of copper discharge pipe D2 for common temperature relief valve outlet sizes.

| Valve Outlet Size | Min size of discharge pipe D1 | Min size of discharge pipe D2 from tundish | Maximum resistance allowed as a length of straight pipe (i.e. no elbows or bends) bend | Resistance created by each elbow or |
|---|---|---|---|---|
| G1/2 | 15mm | 22mm | up to 9m | 0.8m |
| | | 28mm | up to 18m | 1.0m |
| | | 35mm | up to 27m | 1.4m |
| G3/4 | 22mm | 28mm | up to 9m | 1.0m |
| | | 35mm | up to 18m | 1.4m |
| | | 42mm | up to 27m | 1.7m |
| G1 | 28mm | 35mm | up to 9m | 1.4m |
| | | 42mm | up to 18m | 1.7m |
| | | 54mm | up to 27m | 2.3m |

Worked example:
The example below is for a G1/2 temperature relief valve with a discharge pipe (D2) having 4 no. elbows and length of 7m from the tundish to the point of discharge.

From Table 1: Maximum resistance allowed for a straight length of 22mm copper discharge pipe (D2) from a G1/2 temperature relief valve is 9.0m. Subtract the resistance for 4 no. 22mm elbows at 0.8m each = 3.2m
Therefore the maximum permitted length elbows equates to 5.8m is less than the actual length of 7m therefore calculate the next largest size. Maximum resistance allowed for a straight length of 28mm pipe (D2) from a G1/2 temperature relief valve equates to 18m. Subtract the resistance for 4 no. 28mm elbows at 1.0m each = 4m.
Therefore the maximum permitted length equates to 14m.
As the actual length is 7m, a 28mm (D2) copper pipe will be satisfactory.
The tundish should be vertical, located in the same space as the Spa tank and fitted as close as possible and within 500mm of the temperature relief valve.

The discharge pipe D2 from the tundish should terminate in a safe place where there is no risk to persons in the vicinity of the discharge, be of metal and:

a) be at least one pipe size larger than the nominal outlet size of the safety device unless its total equivalent hydraulic resistance exceeds that of a straight pipe 9m long i.e. discharge pipes between 9m and 18m equivalent resistance length should be at least two sizes larger than the nominal outlet size of the safety device, between 18m and 27m at least 3 sizes larger, and so on. Bends must be taken into account in calculating the flow resistance. Refer to the worked example.

An alternative approach for sizing discharge pipes would be to follow BS6700: 1987 Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages, Appendix E, section E2 and table 21.

b) have a vertical section of pipe at least 300mm long, below the tundish before any elbows or bends in the pipework

c) be installed with a continuous fall.

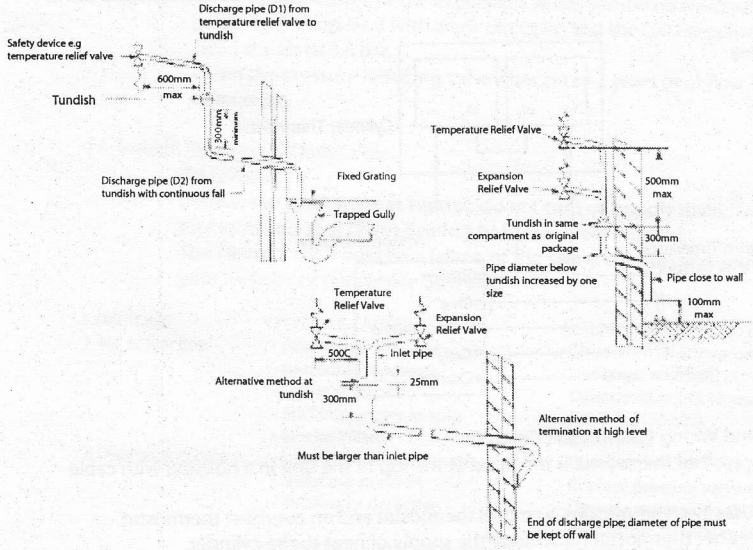
d) have discharges visible at both the tundish and the final point of discharge but where this is not possible or is practically difficult there should be clear visibility at one or other of these locations. Examples of acceptable discharge arrangements are;

i) ideally below a fixed grating and above the water seal in a trapped gully.

ii) Downward discharges at low level; i.e. up to 100mm above external surfaces such as car parks, hard standings, grassed area etc. are acceptable providing that where children may play or otherwise come into contact with discharges a wire cage or similar guard is positioned to prevent contact, whilst maintaining visibility.

iii) Discharges at high level; e.g. into a metal hopper and metal down pipe with the end of the discharge clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water 3m from any plastics guttering system that would collect such discharges (tundish visible)

iv) Where a single pipe serves a number of discharges, such as in blocks of flats, the number served should be limited to not more than 6 systems so that and installation discharging can be traced reasonable easily. The single common discharge pipe should be at least on pipe size larger than the largest individual discharge pipe D2 to be connected. If unvented hot water storage systems are installed where discharges from safety devices may not be apparent i.e. in dwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.

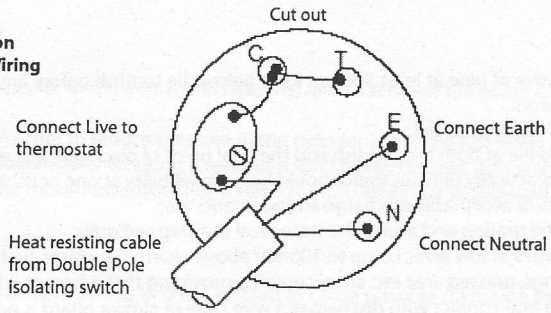



Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and nonmetallic rainwater goods may be damaged by such discharges.

7. Flushing and Commissioning

- Ensure all pipe connections are tight, including immersion heater(s).
- Check the immersion heater setting is not above 60C and that the live and neutral connections are correct.
- Open a hot tap farthest from the unit. Open the mains stop cock to fill the unit.
- Flush for three minutes.
- Close off taps and check pipework for leaks.
- Switch on electricity to the immersion heater(s) or switch on the boiler. Refer to boiler manufacturer s instructions or commissioning.
- Bring the unit to approx 65C. Check that water does not discharge via the Tundish pipework during heating.

**Immersion Heater Wiring**

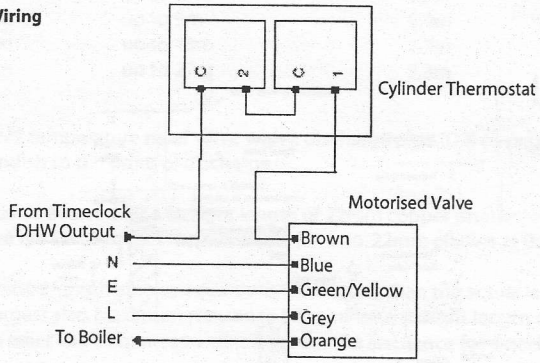



- Hand guarantee card to user.

8. Electrical Specification & Wiring (Immersion Heater)
   - Element terminals are marked N(Neutral) and L(Live)
   - Ensure earth connection of 3 wire supply is connected to earth.
   - Recommended supply for 3kW element is 2.5mm cable to BS6141
   - A 16 Amp timer is recommended for 3kW elements
   - The unit is not fitted with a fuse.
   - All heating elements operate on a 230 VAC 50Hz mains supply. Do not fit immersion heater(s) without thermal cut-out(s).

FUSE RATING:
The fuse rating for two 3kW immersion heaters wired separately from the main fuseboard should be 15 Amps.

**Electrical Wiring Drawing**




Electrical Specification and Wiring (Thermostat Control)
- The cylinder control thermostat is mounted at the top of the unit in a housing with cable entry point.
- The unit houses two thermostats, a control thermostat and an overheat thermostat. Operation of either thermostat must cease the supply of heat to the cylinder.
- Remove the thermostat housing cover. Wire the two thermostats inside in series to the hot water control valve as shown below. Electrical Specification and Wiring (Thermostat Control) for additional heat source refer to the suppliers manual. However, the manual reset limit ther mostat should be used to isolate any further supply of heat to the Spa.

9. Secondary Circulation
   - A pump is required together with a non-return valve.
   - The pump should be fitted with isolating valves on either side and sited to minimise air accumulation away from the high point of the circuit. An air bleed valve may be located at the high point.

- The return pipe should be fitted to the secondary return/drain off tapping near the base of the cylinder.
- A drain off cock (not supplied) should be fitted in-line in the secondary return near the connection to the cylinder to facilitate drainage of the cylinder for maintenance purposes.
- A non-return valve (not supplied) must be fitted to prevent backflow.
- Calculate the flow rate and pump size by determining the total heat loss in flow and return in watts.
- Consideration should be given to the fitting of an additional vessel where excessively large secondary loop circuits are used.

Required flow rate = $\frac{\text{Total Watts}}{4186 \times 1000 \times T}$ litres/second

where T = temperature difference between flow and return (normally the desirable drop is 5C and the hot water temperature should be 60C).

10. Scale Advice and Maintenance

- In areas of hard water high storage temperatures (above 50C) will result in scale deposition
- It is advisable to set the thermostat to the required level and fit a water softener or scale inhibitor (capable of the required circuit flowrate) in the cold supply line.

Maintenance

- The valve easing gear on the pressure and temperature relief valve must be operated at least once every 6 months.
- The charge pressure of the expansion vessel should be checked annually with a pressure gauge at the top (and with a hot tap open and the cold supply turned off). Recharge with clean dry air to 3.5 bar.
- Clean the pressure reducing valve filter every 2 years or of flow from water heater begins to deteriorate.

11. Trouble Shooting & Fault Guide

WARNINGS

If hot water discharges at tundish do not turn off supply main, Switch off power to electric elements and shut down heating boiler (indirect models).
The cause of this could be a failure of the safety controls and you should immediately contact your installer or our service operator.

| SYMPTOMS | POSSIBLE CAUSES | ACTION |
|---|---|---|
| 1. No or low flow | - Poor mains pressure | - Check that all arrows on valves are in water flow direction. |
| | - Restricted pipework | - Use larger diameter pipework |
| | - Mains stopcock | - Operate stopcock or replace |
| | - Sticking jumper in stop | - Replace stop cock |
| | - Blocked filter | - Clean filter |
| 2. Discharging cold | - Loss of expansion vessel | - Check and recharge vessel relief valve (with hot tap open) |
| | - Defective pressure | - Replace pressure valve reducing valve |
| | - Blocked or defective | - Operate expansion valve expansion relief valve mechanism to clear or replace |
| | - Crossflow from cold supply | - Check mixer taps and fit check through mixer top or other valve on hot outlet from heater fittings. |
| 3. Water is cold | - Boiler not switched on (indirect) | - CARRY OUT PROCEDURE BELOW |
| | - Air locked primary flow | |
| | - Thermostat settings incorrect | |
| | - Cut out switch need reset | |

Warnings (Electric Models)
Always isolate the electrical supply before opening heating elements.
Confirm that power supply is reaching the elements.
If thermal cut-out switches have operated press in the red button. If this fails to heat the cylinder the element has failed and should be replaced. Fit new element and reset thermal cut-out.
With power to the element and the cut-out reset, check the voltage on thermal cut-out output.
If this is incorrect replace cut-out switch.

12. Spares

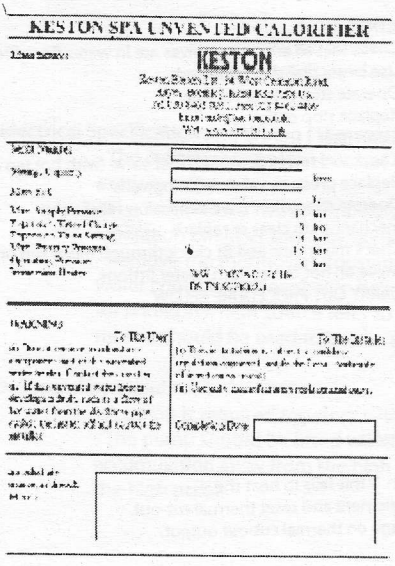
| ITEM DESCRIPTION | MODEL | SPECIFICATION |
|---|---|---|
| 1/2 inch Temperature and Pressure Relief Valve | KSI.120.04.00.1 | 1/2 inch male inlet, 15mm comp. outlet, 90C, 7 bar |
| 3/4 inch pressure reduction valve, expansion relief manifold | KSI.125.06.00.0 2 | 2mm comp inlet, 22mm comp outlet, 3 bar supply, 6 bar relief. |
| 12 litre Expansion Vessel (120, 150 litre sizes) | KSI.200.01.00.1 | 3/4 inch male inlet. 3 bar |
| 18 litre Expansion Vessel (210 litre size) | KSI.300.03.00.0 | 3/4 inch male inlet. 3 bar |
| 24 litre Expansion Vessel (300 litre size) | KSI.400.01.00.1 | 3/4 inch male inlet. 3 bar |
| Immersion Heater | KSI.125.02.00.1 | 3kW. 2.25 inch male. 80C cut-out 1.75inch boss |
| Control Thermostat | KSI.125.03.02.0 | Adjustable 30 to 70C |
| Overheat Thermostat | KSI.125.03.01.0 | 80C Cut-Out Manual Reset |
| Motorized Valve 22mm | KSI.125.07.00.2 | 22mm 2-port valve |
| Tundish | KSI.125.10.00.0 | 15mm/22mm Compression |
| Diagnostic Gauge | | |
| Expansion Vessel Hose | | |

13. Safety & Relevant British Standards

Installation of this tank as an unvented hot water system falls within the scope of the Building Regulations 1995 (Part G). These require that installation of an unvented system shall be notified to the local authority Building Control Department; also that the work must be carried out by a competent person as defined in the Approved Document G3.
The Electricity at Work Regulations 1989.
The manufacturers notes must NOT be taken, in any way, as overriding statutory obligations.

13. Tank Data Plate

Single Coil Spa




Twin Coil Spa