CI/SfB (53.3) X

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Agrément Certificate No 94/3022
*Second issue**

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

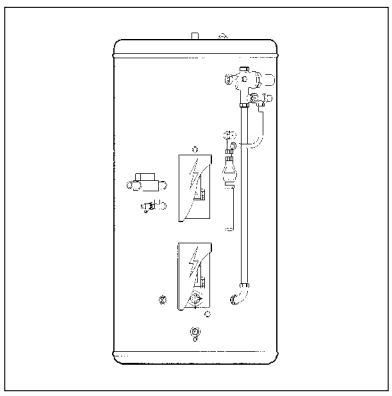
Designated by Government to issue European Technical Approvals

OSO UNVENTED HOT WATER STORAGE SYSTEMS

Système d'eau chaude sanitaire
Heißwasserbereiter

Product

- *THIS CERTIFICATE RELATES TO OSO UNVENTED HOT WATER STORAGE SYSTEMS.*
- *The systems are for use in domestic, commercial and public buildings with domestic hot and cold water services to BS 6700 : 1987.*
- *The systems are for connection to mains water supply at pressures up to 12 bar.*
- *It is essential, for reasons of safety and performance, that the systems are installed and maintained in accordance with this Certificate.*



Regulations, Legislation and Byelaws — Detail Sheet 1

1 The Building Regulations 1991 (as amended) (England and Wales)

The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of unvented hot water storage systems with the Building Regulations. In the opinion of the BBA, OSO Unvented Hot Water Storage Systems, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement:	G3	Hot water storage
Comment:		See sections 6 and 15.2 of each system Detail Sheet.
Requirement:	L1	Conservation of fuel and power
Comment:		See the marked parts of section 5 of each system Detail Sheet. Systems with a capacity of more than 150 litres that are not heated by off-peak electricity should be fitted with a time switch.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The systems are acceptable.

2 The Building Standards (Scotland) Regulations 1990 (as amended)

In the opinion of the BBA, OSO Unvented Hot Water Storage Systems, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and Technical Standards listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		The systems comply with the requirements of this Standard.
Regulation:	22	Conservation of fuel and power
Standard:	J5.2	Controls for hot water storage vessels
Comment:		The systems are fitted with a thermostat which meets the requirements of Standard J5.2a. Systems having a capacity of more than 150 litres, and where the water is not heated by off-peak electricity, require a time switch that can start up and shut off the supply of heat. See the marked parts of section 5 of each system Detail Sheet.
Standard:	J5.3	Insulation of hot water storage vessels
Comment:		The storage vessels have a heat loss of not more than 90 Wm^{-2} and thus satisfy this Standard.
Regulations:	27 and 28	Miscellaneous hazards
Standard:	P2.6	Discharge of steam or hot water
Comment:		When installed in accordance with the recommendations of this Certificate, the systems will satisfy the requirements of this Standard. See section 6 of each system Detail Sheet.
Standard:	P3.1	Unvented hot water storage system
Comment:		The systems are constructed so as to prevent the temperature of the stored water at any time exceeding 100°C and to provide adequate protection from malfunction of the system. See section 15.3.

3 The Building Regulations (Northern Ireland 1994 (as amended)

In the opinion of the BBA, the position of OSO Unvented Hot Water Storage Systems, if used in accordance with the provisions of this Certificate, will satisfy the various Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The systems are acceptable
Regulation:	F4	Control of space heating and hot water supply systems
Comment:		The systems are fitted with a thermostat meeting the requirements of this Regulation. To comply with the deemed-to-satisfy provisions set out in Technical Booklet F : 1991 *Conservation of fuel and power* Section 2, systems having a capacity of more than 150 litres, and where the water is heated by means other than off-peak electricity, must be used in conjunction with a time switch to shut off the supply of heat when the building is not occupied. See the marked parts of section 5 of each system Detail Sheet.
Regulation:	F6	Insulation of pipes, ducts and hot water storage vessels
Comment:		The systems will satisfy the requirements of this Regulation.
Regulation:	P5	Unvented hot water storage systems
Comment:		The systems incorporate suitable safety devices to meet the requirements of Regulation P5. See sections 6 and 15.4 of each system Detail Sheet.
Regulation:	P6	Deemed-to-satisfy provisions for an unvented hot water storage system
Comment:		When installed in accordance with this Certificate, the systems will meet the deemed-to-satisfy provisions of Regulation P6.

4 The Health and Safety at Work etc Act 1974 and the Health and Safety at Work (Northern Ireland) Order 1978

In buildings subject to this Act and Order, regular maintenance is a requirement. See section 12 of each system Detail Sheet.

5 Water Byelaws England, Wales and Scotland and the Water Regulations Northern Ireland

England and Wales

The hot water storage systems satisfy the current requirements of the Water Byelaws.

Scotland

The hot water storage systems satisfy the Water Byelaws issued by the Regional Authorities.

Northern Ireland

The hot water storage systems satisfy the Water Regulations (Northern Ireland) 1991.

6 The Electrical Equipment (Safety) Regulations 1994 and the Electromagnetic Compatibility Regulations 1994

These Regulations implement the Low Voltage Directive 73/23/EEC (as amended by the CE Marking Directive 93/68/EEC) and the Electromagnetic Compatibility Directive 89/336/EEC and require manufacturers to carry out assessment of their products against the criteria given in the Directives. Declarations of Conformity have been provided by OSO Hotwater (UK) Limited. The BBA has not assessed the product for compliance with these Directives.

Conditions of Certification

7 Conditions

7.1 This Certificate:

(a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;

(b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;

(c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;

(d) is copyright of the BBA.

7.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

7.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

(a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

7.4 In granting this Certificate, the BBA makes no representation as to:

(a) the presence or absence of any patent or similar rights subsisting in the product or any other product;

(b) the right of the Certificate holder to market, supply, install or maintain the product; and

(c) the nature of individual installations of the product, including methods and workmanship.

7.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

In the opinion of the British Board of Agrément, OSO Unvented Hot Water Storage Systems are fit for their intended use if installed, used and maintained as set out in this Certificate. Certificate No 94/3022 is accordingly awarded to OSO Hotwater (UK) Limited.

On behalf of the British Board of Agrément

Date of Second issue: 30th March 1999 Director

**Original Front Sheets and Detail Sheet 1 issued 6th June 1994. This amended version issued to include reference to the revised national Building Regulations, revised* Conditions of Certification *and Certificate format.*

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(53.3) X

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

OSO Hotwater (UK) Limited

OSO UNVENTED HOT WATER STORAGE SYSTEMS

Certificate No 94/3022

DETAIL SHEET 2

*Third issue**

Components

- *THIS DETAIL SHEET LISTS THE COMPONENTS THAT ARE APPROVED FOR USE ON OSO UNVENTED HOT WATER STORAGE SYSTEMS.*
- *Each system Detail Sheet lists the components that are required to be factory fitted and others which are supplied separately for fitting by the installer.*
- *The BBA has assessed each of the components as suitable for purpose.*

This Detail Sheet must be read in conjunction with the Front Sheet and the relevant Detail Sheets.

Component	Manufacturer/supplier and component number	Setting	Size
Combined pressure reducing valve	Reliance PRED 510012	2.1 bar	22 mm
Line strainer	—	—	—
Pressure control valve	Reliance DA75	2.1 bar	¾"
	Reliance PRED 510503	2.1 bar	¾"
	Honeywell DO72F	2.1 bar	¾"
	Desbordes 9BisFX	2.1 bar	¾"
Combined check and expansion relief valve and balanced draw-off	Reliance PRED 214008	8 bar	22 mm
	Reliance CORE 214	8 bar	¾"
Combined temperature and pressure relief valve	Reliance PTEM 550010	90°C/10 bar	½"
	Reliance ZTPR 550803	90°C/10 bar	½"
Tundish	Reliance TUN 218008	—	½" x 1"
	Reliance TUN 219002	—	15 mm x 22 mm
Braided hose 220 mm	Reliance hose 202108	—	15 mm
Combined indirect thermostat and non-self-resetting thermal cut-out	Thermodisc 59T/66T	45°C to 75°C	—
		85°C ± 3°C	—
Combined direct thermostat and non-self-resetting thermal cut-out	Thermodisc 59T/667	45°C to 75°C	—
		85°C ± 3°C	—
Motorized valve†	Honeywell V4043 H 1056	—	¾"
	ACL Drayton 679H30B-30L1	—	¾"

†It is essential on indirectly heated systems that the motorized valve supplied with the system is installed and is not substituted by any other motorized valve which may exist and be in service at the site of installation, eg a motorized valve installed in a central heating circuit.

Note: The replacement or servicing of any components must be carried out, using the OSO installation instruction leaflet, by a *competent person* (see section 15 of each system Detail Sheet), or by OSO Hotwater (UK) Limited under their responsibility as the product manufacturer, including that required by their warranty, using components supplied by OSO Hotwater (UK) Limited.

On behalf of the British Board of Agrément

Date of Third issue: 30th March 1999

Director

**Original Detail Sheet 2 issued 6th June 1994. This amended version includes additional alternative components for use with the system.*

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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

OSO Hotwater (UK) Limited

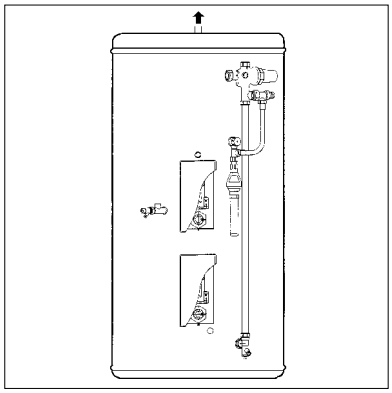
OSO DIRECT UNVENTED HOT WATER STORAGE SYSTEM

Certificate No 94/3022

DETAIL SHEET 3

*Fourth issue**

Product



- *THIS DETAIL SHEET RELATES TO THE OSO DIRECT UNVENTED HOT WATER STORAGE SYSTEM WITH A RANGE OF CAPACITIES FROM 100 TO 330 LITRES, A NOMINAL OPERATING PRESSURE OF 2 BAR AND FITTED WITH ONE OR TWO IMMERSION HEATERS.*
- *The system is for use with mains or other suitable potable water supply pressures up to and including 12 bar.*
- *Satisfactory outlet flow rates can only be achieved where the flow rate available at the entry to the system is adequate (see section 5).*
- *It is essential, for reasons of safety and performance, that the product is installed and maintained in accordance with the requirements of this Detail Sheet by a* competent person *(see section 12, regarding* Maintenance, *and section 15 for the definition of a* competent person).

This Detail Sheet must be read in conjunction with the Front Sheets and Detail Sheet 1, which give Conditions of Certification *and the product's position regarding the Building Regulations, respectively.*

Technical Specification

1 Description

1.1 The OSO Direct Unvented Hot Water Storage System is for use in domestic, commercial and public buildings for connection to domestic hot and cold water services to BS 6700 : 1987, and comprises the components shown in Figure 1. The storage capacities and main dimensions are listed in Table 1.

1.2 The system generally comprises a stainless steel storage cylinder complete with one or two factory-fitted immersion heaters. All models are free-standing and connect to a cold feed supply as indicated in Table 1.

1.3 The 100 litres to 250 litres cylinders are insulated with polyurethane foam, the 330 litres cylinder is insulated with glass wool. The cylinders have an external casing of epoxy-coated mild steel sheet.

1.4 For safety of the system, electrical control devices and the combined temperature and pressure relief valve are factory fitted. Other components including additional safety devices are supplied separately for fitting on site (see Figure 1 and sections 2.1) by a *competent person* (see section 15).

1.5 Factory production control is exercised during the manufacture and assembly of each of the components including visual examination, dimensions checks and performance tests. Each storage cylinder is pressure tested and examined for leaks during manufacture and prior to dispatch.

1.6 When the system is commissioned an air gap is trapped at the top of the storage cylinder to accommodate expansion of the heated water (see Figure 2).

2 Delivery and site handling

2.1 The complete system is delivered to site protected by a cardboard box. The following components (see also Detail Sheet 2 of this Certificate) are supplied separately with each storage cylinder for fitting on site by a *competent person*, all other components are factory fitted:

pressure reducing value and line strainer
combined expansion and check valve
tundish tee piece and flexible hose
secondary return/commissioning fitting, drain valve.

2.2 When the system is required to be stored, it must be stored in a dry environment and protected from damage.

2.3 The system must be carefully handled and kept in the cardboard box until required for siting in position. The weight of each system empty and full is stated in Table 1 and on the label attached to each cylinder.

3 Labelling/marking

The system carries a label (or labels) bearing the information set out in Table 2 and is supplied with a comprehensive installation/user manual.

Figure 1 General layout

Key to Figure 1

1 Storage cylinder manufactured from stainless steel Uginox F 18 MT to BS EN 10088-2 : 1995.

2 Insulation, 100 litres to 250 litres cylinders polyurethane foam, and 330 litres cylinder glass wool, 40 mm thick.

3 Combined pressure reducing valve (set at 2 bar), balanced cold take-off (22 mm) (blanked) and line strainer, with a 22 mm diameter inlet, compression fitting to BS 864-2 : 1983.

4 Combined check valve and expansion valve. Expansion valve set at 8 bar.

5 Combined temperature and pressure relief valve. The valve has a set temperature of 90°C and a pressure of 10 bar. Factory fitted.

6 Tundish 22 mm connection.

7 Immersion heater to BS EN 60335-2-73 : 1997, wired to (7A) thermostat/non-self-resetting thermal cut-out to BS 3955 : 1986. Thermostat set to a temperature of 60°C and the cut-out is designed to operate when the stored water reaches 85°C.

8 Hot water draw-off connection, 22 mm diameter.

9 Combined secondary return/commissioning connection, ½" BSP female.

10 Drain valve to BS 2879 : 1980(1988).

11 Cold supply connection, ¾" BSP female + elbow ¾" BSP male by 22 mm compression fitting to BS 864-2 : 1983.

12 Cable entry glands.

13 Electrical boxes.

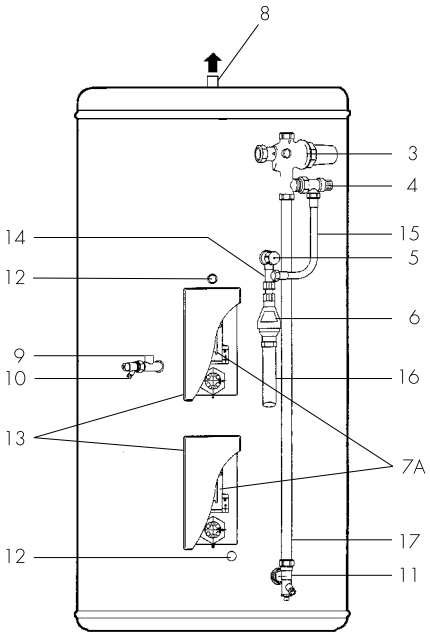
14 Tee piece.

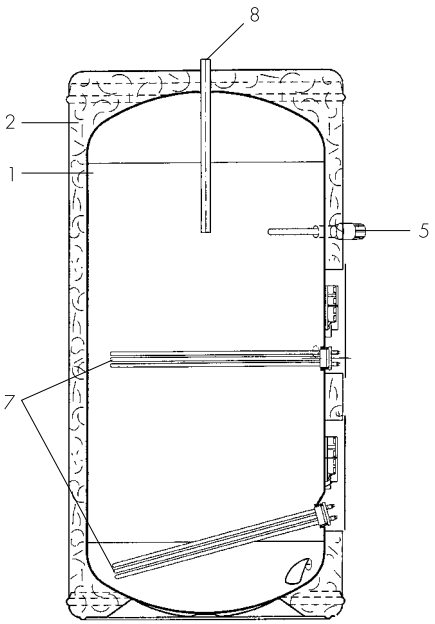
15 Flexible hose.

16 Discharge pipe.

17 Cold feed pipe.

NB Items 3, 4, 6, 10, 11, 14 and 15 are supplied separately for fitting by a *competent person* (see Detail Sheet 2 of this Certificate).





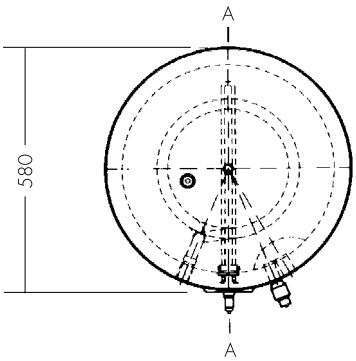


Table 1 Storage capacities and dimensions

	100[1]	125[1]	170	210	250[2]	330[2]
storage capacity (litres) at 2 bar	98	123	165	203	239	317
cylinder size (mm):						
height	670	850	1100	1350	1550	2040
diameter	500	500	500	500	500	500
overall height	720	900	1150	1400	1600	2090
overall diameter	580	580	580	580	580	580
weight of cylinder (kg):						
empty	34	40	48	60	64	82
full (maximum)	150	187	243	303	349	462
connection sizes:						
mains water supply to control valves (mm)	22	22	22	22	22	22
cold water inlet (to unit)	22	22	22	22	22	22
hot water draw-off (mm)	22	22	22	22	22	22
expansion valve discharge (mm)	15	15	15	15	15	15
tundish outlet	22	22	22	22	22	22
immersion heater:						
rating at 240 V (kW)	3	3	3	3	3	3
number of heaters	1	2	2	2	2	2
heater length (mm)	480	480	480	480	480	480

(1) The 100L and 125L capacity are also available as Slimline cylinders. The 20RD 100SL and 125SL Slimline cylinders are fitted with 2 kW immersion heaters and will take 50% longer to heat than the standard units listed in Table 3, columns A, D and E.

(2) The 250L and 330L cylinders can also be supplied with 1" BSP cold inlet and hot supply connections. The 20RD 250FI and 330FI cylinders will deliver approximately 50% more water per minute than the standard cylinders shown in Figure 4 : Flow rates.

Table 2 Labels

General

1 The BBA identification mark incorporating the number of this Certificate.
2 The system uses BEAB (British Electrotechnical Approvals Board) or CE approved electrical controls.
3 UKWFBS (United Kingdom Water Fittings Byelaws Scheme) list number.
4 Manufacturer's name.
5 Produce code number.
6 Order number and year of manufacture.
7 The system is an unvented system.

Design

1 Maximum water supply pressure (bar).
2 Operating pressure (bar).
3 Pressure control valve setting (bar).
4 Expansion system relief via the expansion valve (bar).
5 Storage capacity (litres).
6 Weight of system — full (kg).

Safety warnings/conditions

1 Installation to be carried out only a *competent person*.
2 The removal/replacement of any component to be carried out only by a *competent person* using components supplied by OSO Hotwater (UK) Limited in accordance with their instructions.
3 Any malfunction of the system, such as that resulting in discharge of water to the tundish from the combined temperature and pressure relief valve, to be reported to a *competent person,* after switching off the heat source and prior to any further use of the system.
4 The installation of the system is subject to approval under the Building Regulations, Water Byelaws and Regulations, the Health and Safety at Work etc Act 1974 (where appropriate) and the Health and Safety at Work (Northern Ireland) Order 1978 (where appropriate).
5 If water discharges from the expansion valve, the system must be recommissioned in accordance with the manufacturer's instructions.

Installer[1] details

1 Space for:

(a) Name
(b) Address
(c) Telephone number
(d) Completion date
(e) Registration No ....

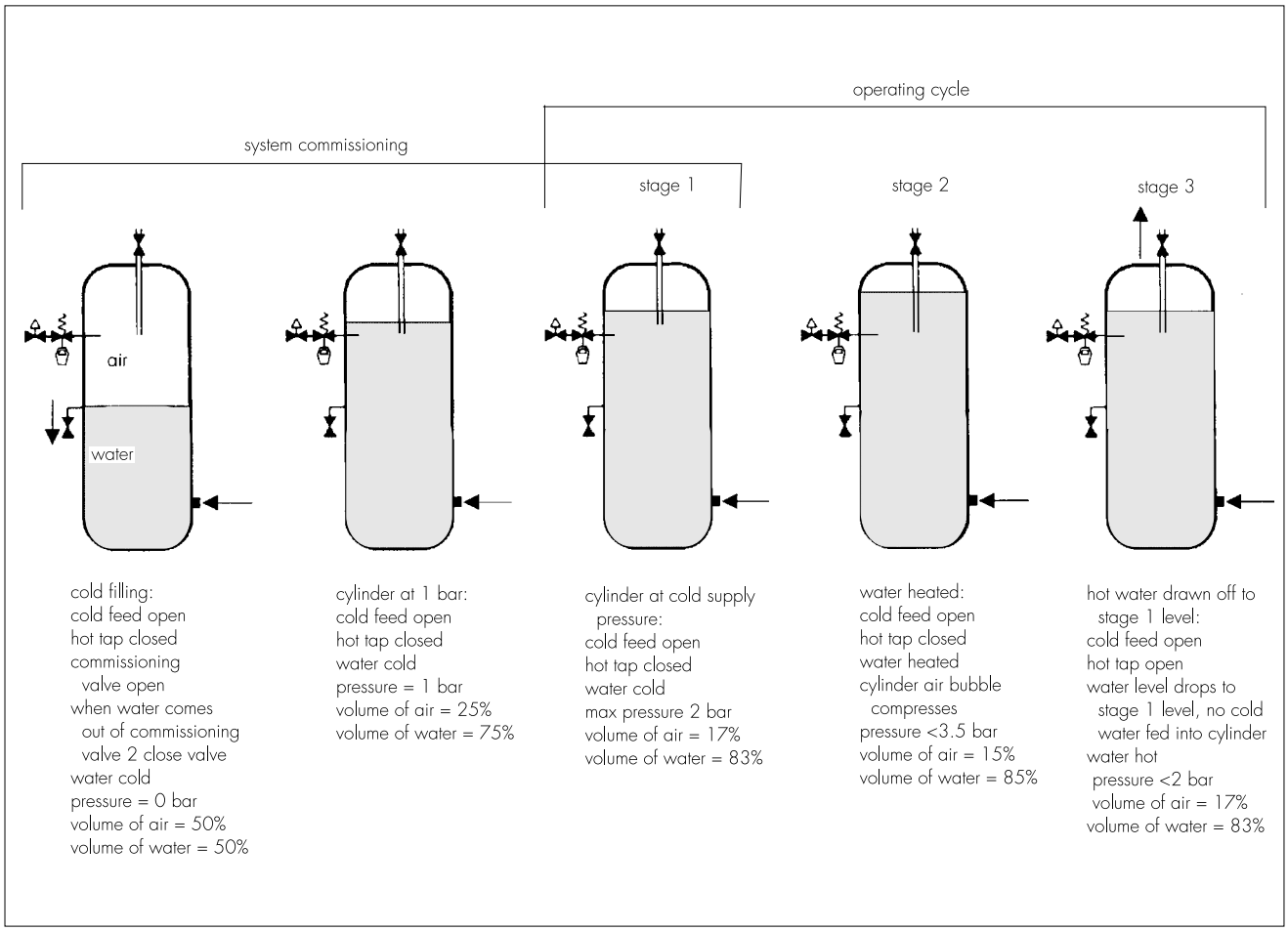
2 A declaration that installation has been in accordance with BBA Certificate No 94/3022 with space for the signature of the installer[1].

CE mark

1 The system complies with the Low Voltage Directive 73/23/EEC.
2 The system when installed correctly will comply with the Electromagnetic Compatibility Directive 89/336/EEC.
3 A CE mark applied to these products by the manufacturer relates only to the Low Voltage and Electromagnetic Compatibility Directives. In the opinion of the BBA, the application of the CE mark does not infer compliance with the requirements of the applicable Building Regulations.

(1) The installer must meet the definition of a *competent person* as defined in section 15.2.

Figure 2 Expansion system



Design Data

4 General

4.1 The OSO Direct Unvented Hot Water Storage System (see Figure 3) has been assessed in accordance with MOAT No 38 : 1986. When used in accordance with this Detail Sheet the system will perform in a safe and satisfactory manner.

4.2 The hot water system capacity, etc should be selected in accordance with the recommendations of BS 6700 : 1987 to meet the demands made upon the installation.

4.3 The pressure and flow available from the water mains should be obtained from the local water undertaker or by testing existing supplies to establish the likely performance of the system at peak periods. The water supply should be capable of maintaining a minimum cylinder pressure of 0.5 bar during draw-off. To maintain this dynamic pressure and adequate availability of hot water to each draw-off point it is recommended that when the static pressure is less than 2 bar, at least 1 metre of 15 mm diameter pipe be incorporated in the pipe run to each draw-off point.

4.4 It is essential, for reasons of safety and performance, that installation of the system is undertaken only by a *competent person* working in accordance with this Detail Sheet.

4.5 The data shown in Table 3 and 4 of this Detail Sheet represent the results of tests carried out by the BBA. Slight variations in the results occur with changes in the water mains supply pressure.

5 Hot water storage and supply

Hot water storage

5.1 The capacities of the system range are comparable with conventional systems (see Table 1). When heated to 60°C the system can supply 70% of the storage capacity at the mean temperature given in Table 3.

Figure 3 Schematic layout — direct

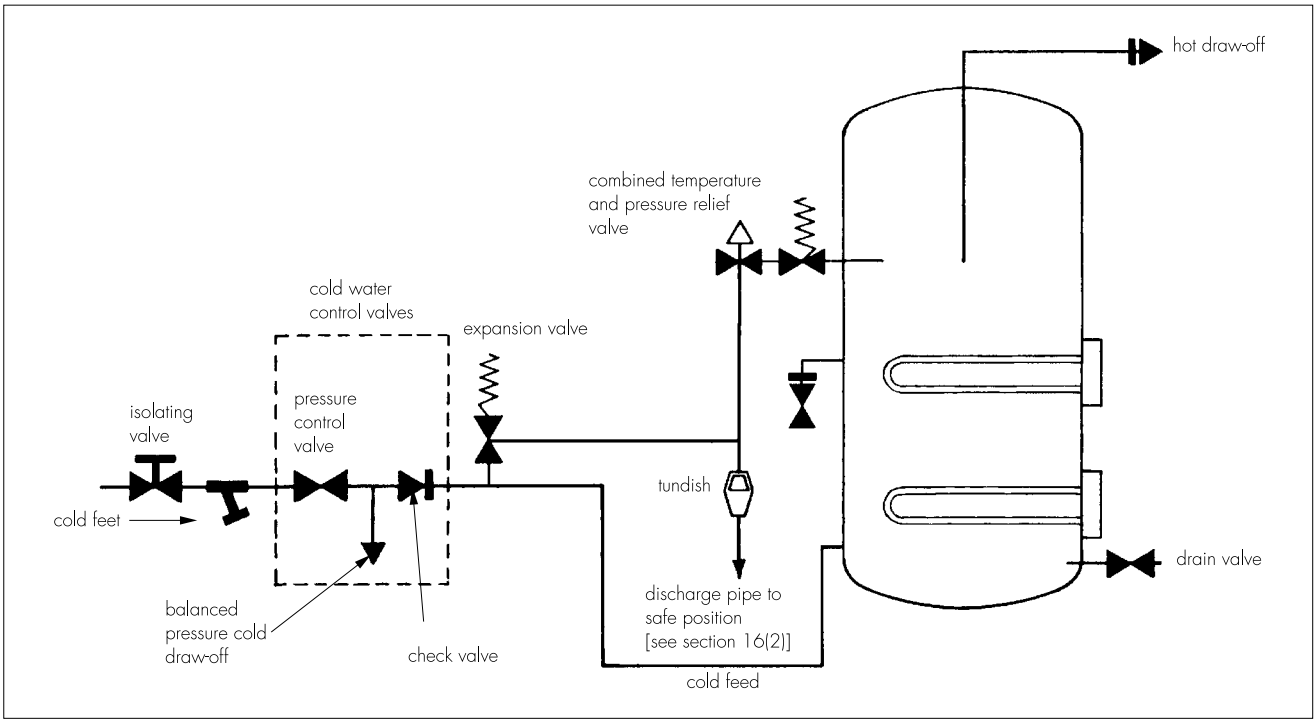
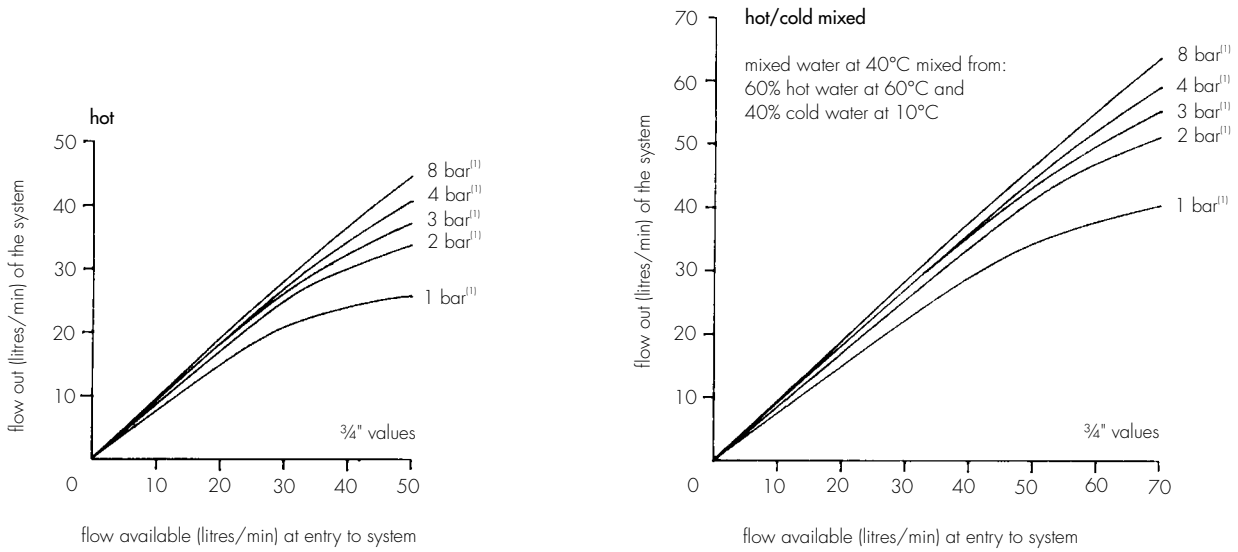


Table 3 Heat-up, re-heating and water draw-off temperature

System ref	Actual capacity	Heat source immersion heater	A Heat-up time	B Percentage of draw-off within 10°C of set temperature		C Mean draw-off temperature	D Re-heating time	E Upper immersion heat-up time	F Average temperature of a 55 litre draw-off
	(litres)	(kW)	(minutes)	(%)	(litres)	(°C)	(minutes)	(minutes)	(°C)
100	98	3	89	64	63	57	81	—	—
125	123	3	116	85	104	60	102	36	38
170	165	3	161	79	130	60	148	64	45
210	203	3	200	84	171	60	175	68	48
250	239	3	240	95	226	60	202	72	51
330	317	3	327	83	264	60	263	77	56

Figure 4 Flow rates



Notes:
Flow rates shown apply to situations where the supply is capable of supplying an adequate dynamic pressure.
The graph represents the results of tests carried out by the BBA.
Where static water supplies are less than 1 bar, consult OSO Hotwater (UK) Limited or the BBA.

(1) Static supply pressures of incoming water supply.

Flow rates

5.2 The flow rates achieved at the hot water draw-off point will depend on all the normal factors including the layout of the pipework from the tap to the cylinder, the cold water supply pressure and the flow rate available at the supply to the system.

5.3 For design purposes the graphs in Figure 4 show the relationship between:

flow available,
mains pressure, and
the maximum hot water flow rate out of the system(1).

(1) Flow characteristics shown in the graphs reflect the worst combination of cold water control components that may be installed (see Detail Sheet 2 of this Certificate).

5.4 The hot/cold mixed flows are for draw-off temperatures of 40°C (assume 60% at 60°C and 40% at 10°C).

Heat-up, re-heating and hot water draw-off temperature

5.5 The heat-up and re-heat times are comparable with conventional systems supplying hot water.

5.6 The immersion heaters will heat the stored water from 15°C to 60°C in the time listed in columns A and E of Table 3.

5.7 The amount of water that can be drawn off within 10°C of the set temperature is listed in column B of Table 3, the mean temperature of 70% of the water draw off immediately after reaching 60°C in column C and the time taken to re-heat the stored water to 60°C in column D. The average temperature of a 55 litre draw-off after using the upper immersion heater to achieve 60°C is given in column F.

Temperature control

5.8 The direct thermostat wired to the immersion heater is satisfactory for controlling the temperature of the stored water.

Pressure control

5.9 The pressure control valve is satisfactory for controlling the pressure of the water supplied from the water mains or other suitable potable supply. However, during the heat-up period from cold to 60°C, the water expands and compresses the air gap at the top of the storage cylinder causing an increase in pressure to a maximum of 3.5 bar (see Figure 2). Under failure conditions the expansion valve ensures the pressure will not exceed 8 bar. Each storage cylinder is factory tested to 16 bar.

Insulation

5.10 The system is provided with adequate insulation to satisfactorily limit the energy loss from the stored water and meets the requirements described in the national Building Regulations:

England and Wales

Approved Document L, Section 3.2

Scotland

Regulation 22, Standard J5.3

Northern Ireland

Technical Booklet F, paragraph 3.3.

5.11 The heat loss of each system while maintaining the temperature of the stored water at 65°C is shown in Table 4.

Table 4 Standing energy losses[1]

System ref	Heat loss (W)	Energy loss[2] (kWh/24h)
100	73	1.75
125	74	1.78
170	85	2.04
210	102	2.45
250	118	2.83
330	200	4.80

(1) See section 4.5.
(2) These figures relate to a 45°C differential between the stored water and ambient temperature.

Connections

5.12 The system is designed to be connected to copper tube conforming to BS EN 1057 : 1996, tables X, Y and Z, using conventional plumbing fittings (see Table 1 for details of connection sizes and threads). The connections are of adequate size.

6 Safety

Excessive temperature — Prevention of explosion – Safe discharge of hot water

6.1 The safety devices provided to ensure that the temperature of the stored water will not exceed 100°C and safeguard the operation of the system, are:

(a) the combined temperature and pressure relief valve, and

(b) the direct non-self-resetting thermal cut-out fitted to the immersion heaters.

6.2 The system has a safety warning label attached to the storage cylinder, bearing an explanation of the action to be taken in the case of any malfunction of the system. It is essential that these instructions are followed.

6.3 The system has adequate provision for safe disposal of discharges to a tundish from the combined temperature and pressure relief valve [see also section 16(1)].

Physical contact

6.4 The surfaces of the storage cylinder are protected by the insulation. In normal use the temperatures of the surfaces of the various parts of the system are comparable with those in a conventional vented hot water storage system.

Strength and stability

6.5 The system has adequate resistance to internal pressures and the vacuum relief valve is effective in preventing reduced pressure within the system.

6.6 The system's pressure control devices will ensure that the operating pressure will be controlled to a nominal 2 bar and that the design pressure is not exceeded. Each storage cylinder has been satisfactorily pressure tested to twice the design pressure, ie 16 bar.

6.7 The weight of the system is stated on the label attached (see also Table 1); the support arrangements appropriate to a conventional system apply.

6.8 Care must be taken to avoid damage to the system during handling and installation.

Electrical safety

6.9 The direct thermostat and the non-self-resetting thermal cut-out are approved by BEAB to BS 3955 : 1986. The immersion heater is approved by BEAB to BS EN 60335-2-73 : 1997. To ensure safety it is essential that the electrical wiring is carried out in accordance with BS 7671 : 1992.

7 Properties in relation to fire

7.1 The rigid polyurethane foam insulation applied to the cylinder is combustible, but is difficult to ignite. When installing the system, care should be exercised in the presence of a source of ignition, such as plumber's blowlamp, as the foam will flame locally and emit toxic fumes. Flaming and fume emission will stop when the source of ignition is removed.

7.2 The glass wool insulation material and outer casing are not easily ignited and will not contribute significantly to any fire.

7.3 In service, normally the cylinder will be enclosed and risk of ignition will be minimal. During installation care should be exercised when using a blowlamp to make soldered joints on pipework adjacent to the cylinder. Installation does not require soldered joints to be made direct to the system.

8 Effect on water quality and prevention of waste of water

The system is manufactured from materials and components listed in WRc's *Water Fittings and Materials Directory* and will have no detrimental effect on water quality. Under normal operating conditions the system will remain watertight and the integral expansion system will prevent expansion to waste provided adequate maintenance is carried out (see section 12).

9 Watertightness

The storage cylinder remains watertight at pressures in excess of 1.5 times the design pressure, ie factory tested to 16 bar.

10 Noise

The system is quiet in normal operation, the flow of water being via conventional water pipe fittings, and compares favourably with a vented hot water storage system.

11 Physiological effects

The insulation used is a conventional material. It will not encourage vermin or bacteria and is not susceptible to damage from moisture.

12 Maintenance

12.1 It is recommended that annually a *competent person:*

(a) inspects and cleans the line strainer

(b) recommissions the system in accordance with the manufacturer's instructions (see section 18).

12.2 The replacement or servicing of components must be carried out by a *competent person,* using the OSO installation instruction leaflet, or by OSO Hotwater (UK) Limited under their responsibility as the product manufacturer, including that required by their warranty, using components supplied by OSO Hotwater (UK) Limited.

12.3 The system may be drained through the drain valve.

12.4 After maintenance it is important to recommission the system correctly (see section 18).

12.5 When the system is used in buildings subject to the Health and Safety at Work etc Act 1974, an inspection of the system must be carried out every six months.

13 Site checks

On site the following should be checked:

By the Client

(1) The installer is a *competent person* — by reference to his/her identity card.

(2) The system being installed is BBA certificated — by reference to the label.

(3) That the installation complies with the BBA Certificate — by reference to the installer's signature on the label attached to the cylinder.

By the Building Control Officer or Approved Inspector

(1) 1, 2 and 3 (as above).

(2) The combined temperature and pressure relief valve, thermostats, non-self-resetting thermal cut-out, and the immersion heater(s) are as described in the Certificate.

(3) The tundish and discharge pipework are correctly located and fitted.

14 Durability

The system is manufactured from durable materials and conventional plumbing components and will have a life equal to that expected of a vented system. It may be necessary to replace some of the system components, for example, the immersion heater, thermostat, etc (see section 12.2 and Detail Sheet 2 of this Certificate).

Installation

15 The installer

15.1 It is essential, for reasons of safety and performance, that the installation, commissioning and maintenance of the system is carried out by a person with suitable training and practical experience. However, the assessment of training arrangements and continuing competence of installers falls outside the scope of this Certificate.

15.2 In England and Wales it is the view of the DETR, and stated in its Approved Document G3, that, to meet the requirements of the Building Regulations, concerned with unvented hot water storage systems, installation should be undertaken by a *competent person,* defined as 'one holding a current Registered Operative Identity Card for the installation of unvented domestic hot water storage systems, issued by the Construction Industry Training Board (CITB), the Institute of Plumbing, the Association of Installers of Unvented Hot Water Systems (Scotland and Northern Ireland), or an equivalent body'.

15.3 In Scotland, it is the requirement of the deemed-to-satisfy provision to Technical Standard P3.1 *Unvented Hot Water Storage System* for compliance with Regulation 28 of the Building Standards (Scotland) Regulations that such systems be 'in the form of a proprietary unit or package which is the subject of a BBA Certificate'. The Standard contains no specific requirements for installers but the Certificates referred to state that installation must be undertaken by a *competent person,* as defined in section 15.2.

15.4 In Northern Ireland, it is the requirement of Regulation P5 *Unvented hot water storage systems* that systems with a capacity not greater than 500 litres, and a heat input not greater than 45 kW be certified as meeting the relevant requirements of Regulation P5 by a member body of EOTA operating a Technical Approvals Scheme, eg by the BBA under MOAT No 38 : 1986. Agrément Certificates will refer to a need for installation by a *competent person,* as defined in section 15.2.

16 Conditions

The following conditions abstracted from the manufacturer's instructions must be observed:

(1) The combined temperature and pressure relief valve tundish must be in a clearly visible position within 500 mm of the cylinder and in the same compartment as the cylinder. The discharge pipe to and from the tundish must be of metal and laid to fall. It must terminate at a visible safe place, such as a gully, where there is no risk of contact with the hot water by persons on or about the building. Further details are given in the BBA Information No 33 : 1989 *Unvented Hot Water Storage Systems — Hot Water Discharges from Safety Devices. BBA Requirements and Guidance.*

(2) The system must be connected to a water supply with a pressure not exceeding 12 bar and of a quality supplied by a water undertaker under the Water Byelaws and Water Regulations, as appropriate.

(3) The system is installed in locations similar to those for storage cylinders used in a conventional vented system or in other locations advantageous to the building designer (see Table 1 for load weight of the system when 'full'). It is important to ensure there is adequate clearance for the removal of the immersion heater.

(4) Electrical wiring must be carried out in accordance with BS 7671 : 1992 (IEE Wiring Regulations). The immersion heater circuit must be protected by a suitably rated fuse, eg 13A, and an isolating switch with a double-pole disconnection.

17 Procedure

17.1 The storage cylinder is located in position (see the OSO installation instruction leaflet) and the plumbing connections made to the inlet and outlet pipes in the same manner as for a conventional storage cylinder except that the water supply pipe is taken directly from the mains or other suitable potable supply, via the line strainer and cold water control valves (ensuring the arrow markings on the components are pointing downstream) to the cold water inlet of the storage cylinder (see Figure 3). Where balanced pressures are required, the cold water take-off is provided on the pressure reducing valve assembly (see Figure 3).

17.2 The discharge pipe is connected to and from the tundish to a safe and visible termination point [see section 16(2)]. The air gap at the tundish must remain clear.

17.3 The appropriate electrical connections are made.

18 Commissioning

18.1 The system is filled with water in the sequences set out in the OSO installation instruction leaflet.

18.2 When the commissioning instructions are followed, an air gap at the top of the storage cylinder is formed (see Figure 2). It is important to ensure that the air gap is formed properly, by adopting the following procedure:

(1) All hot water taps are closed and the commissioning valve on the secondary return fitting opened. The cold water supply valve is opened.

(2) When water issues from the commissioning valve, the valve is closed.

(3) 10 to 15 minutes is allowed for the system to stabilise.

(4) To slowly release trapped air, the nearest hot water tap to the cylinder is gradually opened.

(5) To ensure all air is expelled from the system, the remaining taps are opened in turn.

18.3 The system is checked for watertightness. The combined temperature and pressure relief valve is manually operated to ensure water discharge from the valve runs freely through the tundish to the discharge point. The valve is visually checked to ensure that it re-seats satisfactorily. Heat is applied to the system and is allowed to reach normal working temperature. The operation of the direct thermostat is checked and an examination carried out to ensure that no water has discharged from the combined temperature and pressure relief valve during the heat-up.

18.4 On completion of the commissioning process the *competent person* completes the label attached to the system, stating that the installation complies with the Certificate (see section 3).

Technical Investigations

The following is a summary of the technical investigations carried out on the OSO Direct Unvented Hot Water Storage System.

19 Tests and investigations

19.1 Tests were carried out in accordance with MOAT No 38 : 1986 to determine:

capacity of storage cylinder
dimensional accuracy
mean supply temperature
outlet flow rate at various supply flow rates and pressures
time taken to heat to 60°C
re-heat time to 60°C
standing energy loss (adequacy of insulation)
watertightness
resistance of the storage cylinder to an internal hydrostatic pressure of 1.5 times the design pressure = 15 bar (factory tested to 16 bar)
resistance to partial vacuum of 0.1 bar absolute
flow capacity of the tundish and discharge pipework.

19.2 Other tests were carried out to determine:

variations of storage capacities with variations in supply pressure
satisfactory performance of the expansion system.

19.3 Tests were carried out to confirm satisfactory operation of the following components when fitted in a system:

cold water control valves, to include:

pressure control valve
check valve
expansion valve
line strainer
combined temperature and pressure relief valve
direct immersion heater thermostat and non-self-resetting thermal cut-out.

19.4 An examination was made of existing data in relation to the performance requirements of the relevant British Standards, etc to determine the suitability and performance of:

cold water control valves, to include:

pressure control valve to BS 6283-4 : 1991
check valve to BS 6282-1 : 1991
expansion valve to BS 6283-1 : 1991
line strainer
combined temperature and pressure relief valve to BS 6283-3 : 1991
immersion heater to BS EN 60335-2-73 : 1997
direct thermostat and non-self-resetting thermal cut-out to BS 3955 : 1986.

19.5 An examination was made of existing data relating to:

adequacy of installation instructions
practicability of installation by the *competent person*
electrical safety
effect on water quality and prevention of waste of water
properties in relation to fire
practicability and adequacy of maintenance requirements
durability of materials used.

19.6 An evaluation of tests in accordance with MOAT No 38 : 1986, and existing data relating to standing energy loss with polyurethane foam insulations.

20 Other investigations

The manufacturing and assembly process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of materials used.

Bibliography

BS 864 *Capillary and compression tube fittings of copper and copper alloy*
BS 864-2 : 1983 *Specification for capillary and compression fittings for copper tubes*

BS 2879 : 1980(1988) *Specification for draining taps (screw-down pattern)*

BS 3955 : 1986 *Specification for electrical controls for household and similar general purposes*

BS 6282 *Devices with moving parts for the prevention of contamination of water by backflow*
BS 6282-1 : *1991 Specification for check valves of nominal size up to and including DN 54*

BS 6283 *Safety and control devices for use in hot water systems*
BS 6283-1 : 1991 *Specification for expansion valves for pressures up to and including 10 bar*
BS 6283-3 : 1991 *Specification for temperature and pressure relief valves for pressures up to and including 10 bar*
BS 6283-4 : 1991 *Specification for drop-tight pressure reducing valves of nominal size up to and including DN 54 for supply pressures up to and including 12 bar*

BS 6700 : 1987 *Specification for design, installations, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*

BS 7671 : 1992 *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition*

BS EN 1057 : *1996 Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary heating applications*

BS EN 10088 *Stainless steels*
BS EN 10088-2 : 1995 *Technical delivery conditions for sheet/plate and strip for general purposes*

BS EN 60335 *Specification for safety of household and similar electrical appliances*
BS EN 60335-2 : *Particular requirements*
BS EN 60335-2-73 : 1997 *Fixed immersion heaters*

MOAT No 38 : 1986 *The assessment of unvented hot water storage systems and the approval and surveillance of installers*

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

On behalf of the British Board of Agrément

Date of Fourth issue: 7th June 2001

Chief Executive

**Original Detail Sheet 3 issued 6th June 1994. This revised version includes update of Standards, reference to Slimline cylinders and additional connection details.*

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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

OSO Hotwater (UK) Limited

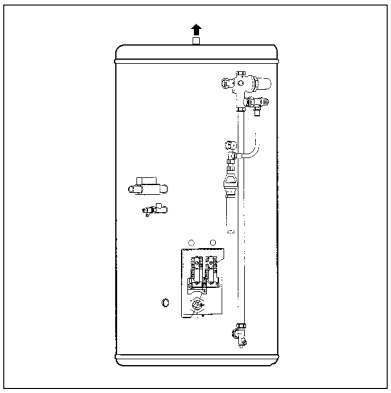
OSO INDIRECT UNVENTED HOT WATER STORAGE SYSTEM

Certificate No 94/3022

DETAIL SHEET 4

*Fourth issue**

Product



- *THIS DETAIL SHEET RELATES TO THE OSO INDIRECT UNVENTED HOT WATER STORAGE SYSTEM WITH A RANGE OF CAPACITIES FROM 100 TO 330 LITRES, A NOMINAL OPERATING PRESSURE OF 2 BAR AND FITTED WITH ONE IMMERSION HEATER.*
- *The system is for use with mains or other suitable potable water supply pressures up to and including 12 bar.*
- *The system is for use with gas, electric or oil fired boilers.*
- *The system can be used with a vented or pressurised primary with a maximum primary pressure of 3.5 bar.*
- *Satisfactory outlet flow rates can only be achieved where the flow rate available at the entry to the system is adequate (see section 5).*
- *It is essential, for reasons of safety and performance, that the product is installed and maintained in accordance with the requirements of this Detail Sheet by a* competent person *(see section 12, regarding* Maintenance *and section 15 for the definition of a competent person).*

This Detail Sheet must be read in conjunction with the Front Sheets and Detail Sheet 1, which give the Conditions of Certification *and the product's position regarding the Building Regulations, respectively.*

Technical Specification

1 Description

1.1 The OSO Indirect Unvented Hot Water Storage System is for use in domestic, commercial and public buildings for connection to domestic hot and cold water services to BS 6700 : 1987, and comprises the components shown in Figure 1. The storage capacities and main dimensions are listed in Table 1.

1.2 The system generally comprises a stainless steel storage cylinder complete with a factory-fitted stainless steel coil heat exchanger and one immersion heater. All models are free-standing and connect to a cold feed supply as indicated in Table 1.

1.3 The 100 litres to 250 litres cylinders are insulated with polyurethane foam, the 330 litres cylinder is insulated with glass wool. The cylinders have an external casing of epoxy-coated mild steel sheets.

1.4 For safety of the system, electrical control devices and the combined temperature and pressure relief valve are factory fitted. Other components are supplied separately for fitting on site (see Figure 1 and section 2.1) by a *competent person* (see section 15).

1.5 Factory production control is exercised during the manufacture and assembly of each of the components including visual examination, dimensional checks and performance tests. Each storage cylinder is pressure tested and examined for leaks during manufacture and prior to dispatch.

1.6 When the system is commissioned, air is trapped at the top of the storage cylinder to accommodate expansion of the heated water (see Figure 2).

2 Delivery and site handling

2.1 The complete system is delivered to site protected by a cardboard box. The following items (see also Detail Sheet 2 of this Certificate) are supplied separately with each storage cylinder for fitting on site by a *competent person*, all other components are factory fitted:

combined pressure reducing valve and line strainer
combined expansion and check valve
secondary return/commissioning fitting
drain valve
motorized valve

tundish
tee piece and flexible hose.

2.2 When the system is required to be stored, it must be stored in a dry environment and protected from damage.

2.3 The system must be carefully handled and kept in the cardboard box until required for siting in position. The weight of each system empty and full is stated in Table 1 and on the label attached to each system.

3 Labelling/marking

The system carries a label (or labels) bearing the information set out in Table 2 and is supplied with a comprehensive installation/user manual.

Figure 1 General layout

Key to Figure 1

1 Storage cylinder manufactured from stainless steel Uginox F 18 MT, to BS EN 10088-2 : 1995.

2 Insulation, 100 litres to 250 litres cylinders polyurethane foam, and 330 litres cylinder glass wool, 40 mm thick.

3 Combined pressure reducing value (set at 2 bar), balanced cold take-off (22 mm) (blanked) and line strainer, with a 22 mm diameter inlet, compression fitting to BS 864-2 : 1983.

4 Combined check valve and expansion valve. Expansion valve set at 8 bar.

5 Combined temperature and pressure relief valve. The valve has a set temperature of 90°C and a pressure of 10 bar. Factory fitted.

6 Tundish, 22 mm connection.

7 Immersion heater to BS EN 60335-2-73 : 1997, wired to (7A) thermostat/non-self-resetting thermal cut-out to BS 3955 : 1986. Thermostat set to a temperature of 60°C and the cut-out is designed to operate when the stored water reaches 85°C.

8 Hot water draw-off connection, 22 mm diameter.

9 Combined secondary return/commissioning connection, ½" BSP female.

10 Drain valve to BS 2879 : 1980(1988).

11 Cold supply connection, ¾" BSP female + elbow ¾" BSP male by 22 mm compression fitting to BS 864-2 : 1983.

12 Cable entry glands.

13 Primary flow connection ¾" BSP female.

14 Primary return connection ¾" BSP female.

15 Motorized valve 22 mm diameter compression fittings to BS 864-2 : 1983, wired to the non-self-resetting thermal cut-out, designed to operate when the stored water reaches 85°C.

16 Electrical box.

17 Tee piece.

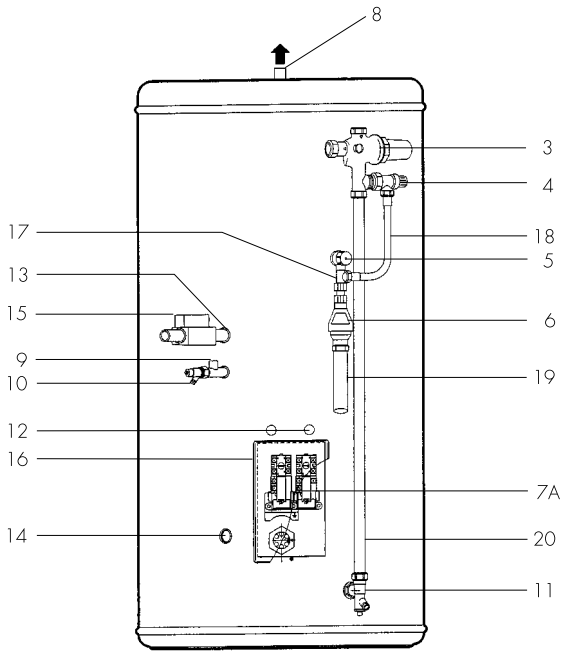
18 Flexible hose.

19 Discharge pipe.

20 Cold feed pipe.

NB Items 3, 4, 6, 10,11, 15, 17 and 18 are supplied separately for fitting by a *competent person* (see Detail Sheet 2 of this Certificate).

volume	H
100	720
125	900
170	1150
210	1400
250	1600
330	2090



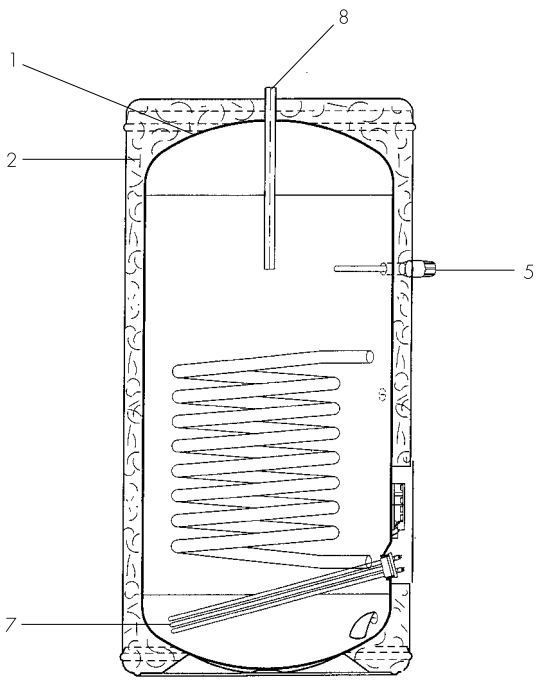


Table 1 Storage capacities and dimensions

	Manufacturer's system reference					
	100[1]	125[1]	170	210	250[2]	330[2]
storage capacity (litres) at 2 bar	98	123	165	203	239	317
cylinder size (mm):						
height	670	850	1100	1350	1550	2040
diameter	500	500	500	500	500	500
overall height	720	900	1150	1400	1600	2090
overall diameter	580	580	580	580	580	580
weight of cylinder (kg):						
empty	34	40	48	60	64	82
full (maximum)	150	187	243	303	349	462
connection sizes:						
mains water supply to control valves (mm)	22	22	22	22	22	22
cold water inlet (mm)	22	22	22	22	22	22
hot water draw-off (mm)	22	22	22	22	22	22
expansion valve discharge (mm)	15	15	15	15	15	15
tundish outlet (mm)	22	22	22	22	22	22
immersion heater:						
rating at 240 V (kW)	3	3	3	3	3	3
number of heaters	1	1	1	1	1	1
heater length (mm)	480	480	480	480	480	480
primary coil:						
connection size (BSP inches)	¾	¾	¾	¾	¾	¾
heating surface area (m^2)	0.47	0.47	0.71	0.71	0.71	0.71

(1) The 100L and 125L capacity units are also available as Slimline cylinders. The 20RI 100SL and 125SL Slimline cylinders are fitted with one 2 kW immersion heater and will take 50% longer to heat than the standard units listed in the direct heating of Table 3, columns A and D.

(2) The 250L and 330L cylinders can also be supplied with 1" BSP cold inlet and hot supply connections. The 20RI 250FI and 330FI cylinders will deliver approximately 50% more water per minute than the standard cylinders shown in Figure 4 : Flow rates.

Table 2 Labels

General

1 The BBA identification mark incorporating the number of this Certificate.
2 The system uses BEAB (British Electrotechnical Approvals Board) or CE-approved electrical controls.
3 UKWFBS (United Kingdom Water Fittings Byelaws Scheme) list number.
4 Manufacturer's name.
5 Product code number.
6 Order number and year of manufacture.
7 The system is an unvented system.

Design

1 Maximum water supply pressure (bar).
2 Operating pressure (bar).
3 Expansion valve setting (bar).
4 Storage capacity (litres).
5 Weight of system — full (kg).

Safety warnings/conditions

1 Installation to be carried out only by a *competent person*.
2 The removal/replacement of any component to be carried out only by a *competent person* using components supplied by OSO Hotwater (UK) Limited in accordance with their instructions.
3 Any malfunction of the system, such as that resulting in discharge of water to the tundish from the combined temperature and pressure relief valve, to be reported to a *competent person,* after switching off the heat source and prior to any further use of the system.
4 The installation of the system is subject to approval under the Building Regulations, Water Byelaws and Regulations, the Health and Safety at Work etc Act 1974 (where appropriate) and the Health and Safety at Work (Northern Ireland) Order 1978 (where appropriate).
5 If water discharges from the expansion valve, the system must be recommissioned in accordance with the manufacturer's instructions.

Installer[1] details

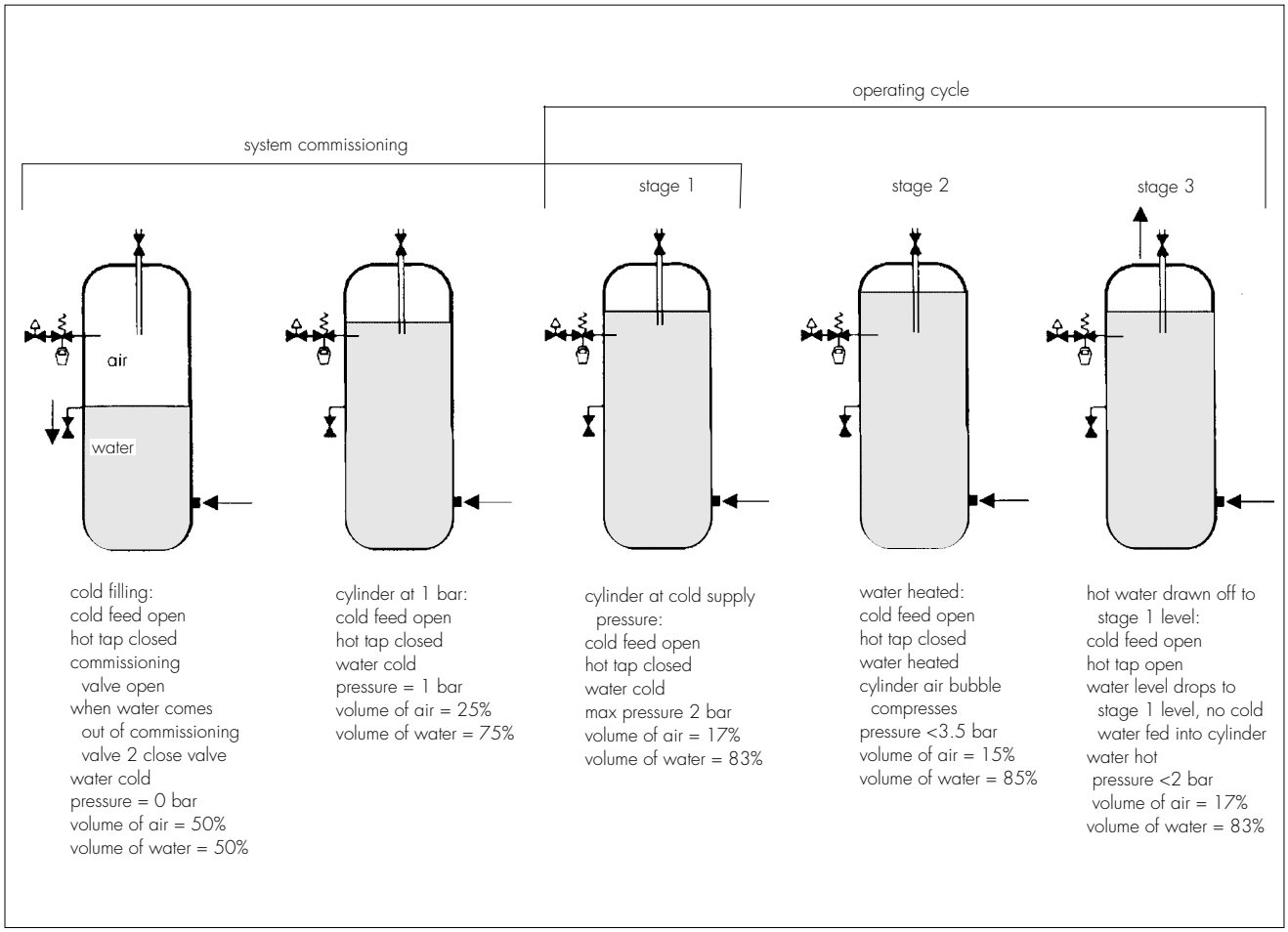
1 Space for:
(a) Name
(b) Address
(c) Telephone number
(d) Completion date
(e) Registration No ….
2 A declaration that installation has been in accordance with BBA Certificate No 94/3022 with space for signature of the installer[1].

CE mark

1 The system complies with the Low Voltage Directive 73/23/EEC.
2 The system when installed correctly will comply with the Electromagnetic Compatibility Directive 89/336/EEC.
3 A CE mark applied to these products by the manufacturer relates only to the Low Voltage and Electromagnetic Compatibility Directives. In the opinion of the BBA, the application of the CE mark does not infer compliance with the requirements of the applicable Building Regulations.

(1) The installer must meet the definition of a *competent person* as defined in section 15.2.

Figure 2 Expansion system



Design Data

4 General

4.1 The OSO Indirect Unvented Hot Water Storage System (see Figure 3) has been assessed in accordance with MOAT No 38 : 1986. When used in accordance with this Detail Sheet, the system will perform in a safe and satisfactory manner.

4.2 The hot water system capacity, etc should be selected in accordance with the recommendations of BS 6700 : 1987, to meet the demands required from the installation. The primary circuit pipework associated with indirect heating systems should be designed in accordance with BS 6700 : 1987 and BS 5449 : 1977. Particular consideration should be given to the inclusion of a primary circuit by-pass to prevent excessive pressure on the motorized valve and also safeguard against 'nuisance tripping' of the non-self-resetting thermal cut-out.

4.3 The pressure and flow available from the water mains should be obtained from the local water undertaker or by testing existing supplies to establish the likely performance of the system at peak periods. The water supply should be capable of maintaining a minimum cylinder pressure of 0.5 bar during draw-off. To maintain this dynamic pressure and adequate availability of hot water to each draw-off point, it is recommended that when the static pressure is less than 2 bar, at least 1 metre of 15 mm diameter pipe be incorporated in the pipe run to each draw-off point.

4.4 It is essential, for reasons of safety and performance, that installation of the system is undertaken only by a *competent person* working in accordance with this Detail Sheet.

4.5 The data shown in Tables 3 and 4 of the Detail Sheet represent the analysis of tests carried out by the BBA. Slight variations in the results occur with changes in the water mains supply pressure.

5 Hot water storage and supply

Hot water storage

5.1 The capacities of the system range are comparable with conventional systems (see Table 1). When heated to 60°C the system can supply 70% of the storage capacity at the mean temperature given in Table 3.

Figure 3 Schematic layout

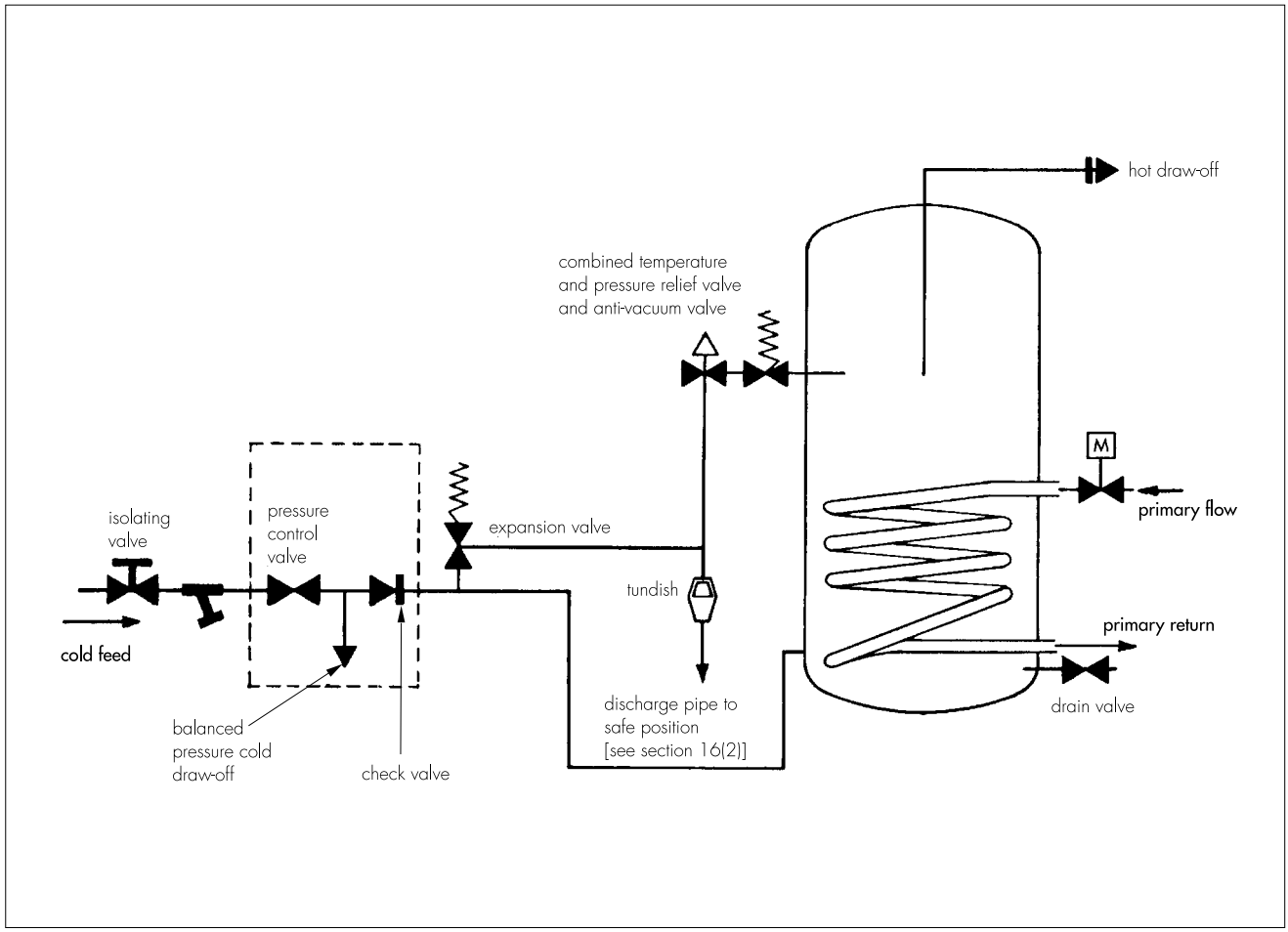


Table 3 Heat-up, re-heating and water draw-off temperature

Indirect heating

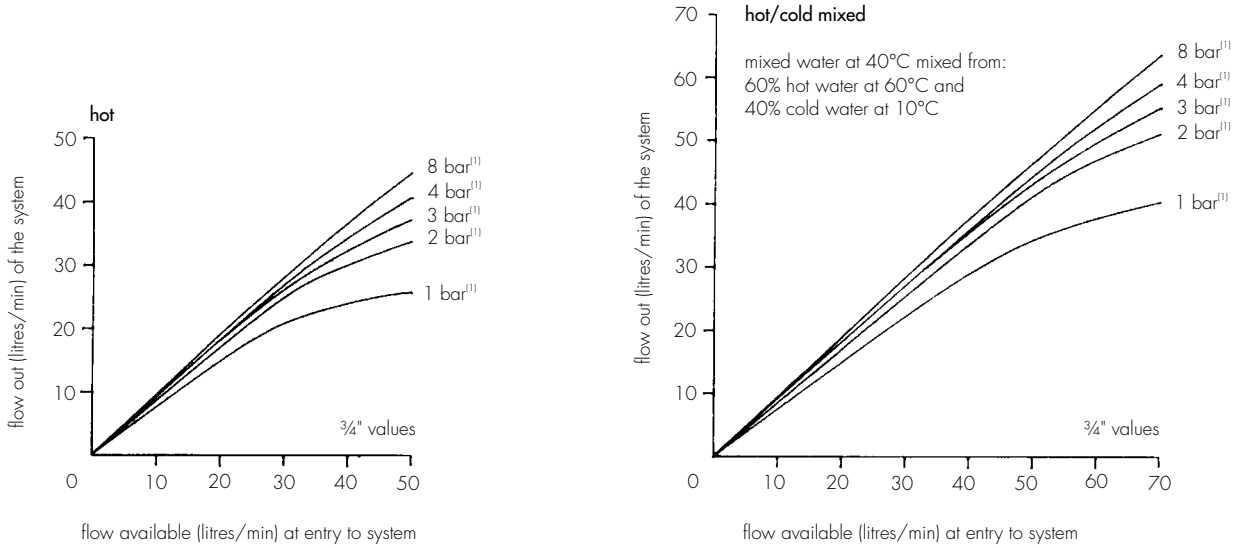
System ref	Actual capacity	Primary flow (litres per minute)	A Heat-up time[1]	B Percentage of draw-off within 10°C of set temperature		C Mean draw-off temperature	D Re-heating time
	(litres)	(litres)	(minutes)	(%)	(litres)	(°C)	(minutes)
100	98	15	25	64	63	57	22
125	123	15	32	85	104	60	28
170	165	15	33	79	130	60	30
210	203	15	39	84	171	60	33
250	239	15	45	95	226	60	37
330	317	15	65	83	264	60	52

(1) These heat-up times assume a boiler of adequate output is connected to the system. Primary flows of 15 litres per minute can be attained normally with a standard domestic circulating pump.

Direct heating

System ref	Actual capacity	Heat source immersion heater	A Heat-up time	B Percentage of draw-off within 10°C of set temperature		C Mean draw-off temperature	D Re-heating time	E Average temperature of a 55 litre draw-off
	(litres)	(kW)	(minutes)	(%)	(litres)	(°C)	(minutes)	(°C)
100	98	3	89	64	63	57	81	—
125	123	3	116	85	104	60	102	38
170	165	3	161	79	130	60	148	45
210	203	3	200	84	171	60	175	48
250	239	3	240	95	226	60	202	51
330	317	3	327	83	264	60	263	56

Figure 4 Flow rates



Notes:
Flow rates shown apply to situations where the supply is capable of supplying an adequate dynamic pressure.
The graph represents the results of tests carried out by the BBA.
Where static water supplies are less than 1 bar, consult OSO Hotwater (UK) Limited or the BBA.

(1) Static supply pressures of incoming water supply.

Flow rates

5.2 The flow rates achieved at the hot water draw-off point will depend on all the normal factors including the layout of the pipework from the tap to the cylinder, the cold water supply pressure and the flow rate available at the supply to the system.

5.3 For design purposes the graphs in Figure 4 show the relationship between:

flow available,
mains supply pressure, and
the maximum hot water flow rate out of the system(1).

(1) Flow characteristics shown in the graphs reflect the worst combination of cold water control components that may be installed (see Detail Sheet 2 of this Certificate).

5.4 The hot/cold mixed flows are for draw-off temperatures of 40°C (assume 60% at 60°C and 40% at 10°C).

Heat-up, re-heating and hot water draw-off temperature

5.5 The heat-up and re-heat times are comparable with conventional systems of a similar size supplying hot water.

5.6 The coil heat exchanger, with a primary flow at 80°C ± 2°C, or the immersion heater will heat the stored water from 15°C to 60°C in the time listed in columns A and D of Table 3.

5.7 The amount of water that can be drawn off within 10°C of the set temperature is shown in column B of Table 3, the mean temperature of 70% of the water drawn off immediately after reaching 60°C in column C, and the time taken to re-heat the stored water to 60°C in column D. The average temperature of a 55 litre draw-off after using the immersion heater to achieve 60°C is given in column E.

Temperature control

5.8 The indirect thermostat is fitted to the system and connected via the wiring loom to the motorized valve and provides adequate control of the stored water. The direct thermostat wired to the immersion heater is satisfactory for controlling the temperature of the stored water when this form of heating is used.

Pressure control

5.9 The pressure control valve is satisfactory for controlling the pressure of the water supplied from the water mains or other suitable potable supply. However, during the heat-up period from cold to 60°C, the water expands and compresses the air gap at the top of the cylinder, causing an increase in pressure to a maximum of 3.5 bar (see Figure 2).

Under failure conditions the expansion valve ensures the pressure will not exceed 8 bar. Each storage cylinder is factory tested to 16 bar.

Insulation

5.10 The system is provided with adequate insulation to satisfactorily limit the energy loss from the stored water and meets the requirements described in the Building Regulations:

England and Wales

Approved Document L, Section 3.2.

Scotland

Standard J5.3.

Northern Ireland

Technical Booklet F, Paragraph 3.3.

5.11 The heat loss of each system while maintaining the temperature of the stored water at 65°C is shown in Table 4.

Table 4 Standing energy losses[1]

System ref	Heat loss (W)	Energy loss[2] (kWh/24h)
100	73	1.75
125	74	1.78
170	85	2.04
210	102	2.45
250	118	2.83
330	200	4.80

(1) See section 4.5.

(2) These figures relate to a 45°C differential between the stored water and ambient temperature.

Connections

5.12 The system is designed to be connected to copper tube conforming to BS EN 1057 : 1996, Tables X, Y and Z, using conventional plumbing fittings (see Table 1 for details of connection sizes and threads). The connections are of adequate size.

6 Safety

Excessive temperature — Prevention of explosion — Safe discharge of hot water

6.1 The safety devices provided to ensure that the temperature of the stored water will not exceed 100°C, and safeguard the operation of the system, are:

For the indirect coil heat exchanger

(a) the combined temperature and pressure relief valve, and

(b) the indirect non-self-resetting thermal cut-out wired to the motorized valve.

For the direct immersion heater

(a) the combined temperature and pressure relief valve, and

(b) the direct non-self-resetting thermal cut-out fitted to the system and wired to the immersion heater.

6.2 The system has a safety warning label attached to the storage cylinder, bearing an explanation of the action to be taken in the case of any malfunction of the system. It is essential that these instructions are followed.

6.3 The system has adequate provision for safe disposal of discharges to a tundish from the combined temperature and pressure relief valve [see also section 16(2)].

Physical contact

6.4 The surfaces of the storage cylinder are protected by the insulation. In normal use the temperatures of the surfaces of the various parts of the system are comparable with those in a conventional vented hot water storage system.

Strength and stability

6.5 The system has adequate resistance to internal pressures and the vacuum relief valve is effective in preventing reduced pressure within the system.

6.6 The system's pressure control devices will ensure that the operating pressure will be controlled to a nominal 2.1 bar and that the design pressure of 10 bar is not exceeded. Each storage cylinder has been satisfactorily pressure tested to twice the design pressure, ie 16 bar.

6.7 The weight of the system is stated on the label attached (see also Table 1); the support arrangements appropriate to a conventional system apply.

6.8 Care must be taken to avoid damage to the system during handling and installation.

Electrical safety

6.9 The indirect thermostat, non-self-resetting thermal cut-out and motorized valve, and the direct thermostat and non-self-resetting thermal cut-out are approved by BEAB to BS EN 60335-2-73 : 1997. To ensure safety it is essential that the electrical wiring is carried out in accordance with BS 7671 : 1992.

7 Properties in relation to fire

7.1 The rigid polyurethane foam insulation applied to the cylinder is combustible, but is difficult to ignite. When installing the system, care should be exercised in the presence of a source of ignition, such as plumber's blowlamp, as the foam will flame locally and emit toxic fumes. Flaming and fume emission will stop when the source of ignition is removed.

7.2 The glass wool insulation material and outer casing are not easily ignited and will not contribute significantly to any fire.

7.3 In service, normally the cylinder will be enclosed and risk of ignition will be minimal. During installation care should be exercised when using a blowlamp to make soldered joints on pipework adjacent to the cylinder. Installation does not require soldered joints to be made direct to the system.

8 Effect on water quality and prevention of waste of water

The system is manufactured from materials and components listed in WRc's *Water Fittings and Materials Directory* and will have no detrimental effect on water quality. Under normal operating conditions the system will remain watertight and the integral expansion system will prevent expansion to waste provided adequate maintenance is carried out (see section 12).

9 Watertightness

The storage cylinder remains watertight at pressures in excess of 1.5 times the design pressure, ie factory tested to 16 bar.

10 Noise

The system is quiet in normal operation, the flow of water being via conventional water pipe fittings, and compares favourably with a vented hot water storage system.

11 Physiological effects

The insulation is a conventional material. It will not encourage vermin or bacteria and is not susceptible to damage from moisture.

12 Maintenance

12.1 It is recommended that, annually, a *competent person*:

(a) inspects and cleans the line strainer

(b) recommissions the system in accordance with the manufacturer's instructions (see section 18).

12.2 The replacement or servicing of components must be carried out by a *competent person*, using the OSO installation instruction leaflet, or by OSO Hotwater (UK) Limited under their responsibility as the product manufacturer, including that required by their warranty, using components supplied by OSO Hotwater (UK) Limited.

12.3 The system may be drained using the drain valve.

12.4 When the system is used in buildings subject to the Health and Safety at Work etc Act 1974, an inspection of the system must be carried out every six months.

13 Site checks

On site the following should be checked:

By the Client

(1) The installer is a *competent person* — by reference to his/her identity card.

(2) The system being installed is BBA Certificated — by reference to the label.

(3) That the installation complies with the BBA Certificate — by reference to the installer's signature on the label attached to the cylinder.

By the Building Control Officer or Approved Inspector

(1) 1, 2 and 3 (as above).

(2) The combined temperature and pressure relief valve, thermostats, non-self-resetting thermal cut-outs, motorized valve and the immersion heater(s) are as described in the Certificate.

(3) The tundish and discharge pipework are correctly located and fitted.

14 Durability

The system is manufactured from durable materials and conventional plumbing components and will have a life equal to that expected of a vented system. It may be necessary to replace some of the system components, for example, the immersion heater, thermostat, etc (see section 12.2 and Detail Sheet 2 of this Certificate).

Installation

15 The installer

15.1 It is essential, for reasons of safety and performance, that the installation, commissioning and maintenance of the system is carried out by a person with suitable training and practical experience. However, the assessment of training arrangements and continuing competence of installers falls outside the scope of this Certificate.

15.2 In England and Wales it is the view of the DETR and stated in its Approved Document G3, that, to meet the requirements of the Building Regulations, concerned with unvented hot water storage systems, installation should be undertaken by a *competent person*, defined as 'one holding a current Registered Operative Identity Card for the installation of unvented domestic hot water storage systems, issued by the Construction Industry Training Board (CITB), the Institute of Plumbing, the Association of Installers of Unvented Hot Water Systems (Scotland and Northern Ireland), or an equivalent body'.

15.3 In Scotland, it is the requirement of the deemed-to-satisfy provision to Technical Standard P3.1 *Unvented Hot Water Storage System* for compliance with Regulation 28 of the Building Standards (Scotland) Regulations that such systems be 'in the form of a proprietary unit or package which is the subject of a BBA Certificate'. The Standard contains no specific requirements for installers but the Certificates referred to state that installation must be undertaken by a *competent person*, as defined in section 15.2.

15.4 In Northern Ireland, it is the requirement of Regulation P5 *Unvented hot water storage systems* that systems with a capacity not greater than 500 litres, and a heat input not greater than 45 kW, be manufactured

and installed in compliance with Certificates issued by the BBA under MOAT No 38 : 1986. Agrément Certificates will refer to a need for installation by a *competent person*, as defined in section 15.2.

16 Conditions

The following conditions abstracted from the manufacturer's instructions must be observed:

(1) The system is for connection to oil, electric or gas fired boilers.

(2) The combined temperature and pressure relief valve tundish must be in a clearly visible position within 500 mm of the cylinder and in the same compartment as the cylinder. The discharge pipe to and from the tundish must be of metal and laid to fall. It must terminate at a visible safe place, such as a gully, where there is no risk of contact with the hot water by persons in or about the building. Further details are given in BBA Information No 33 : 1989 *Unvented Hot Water Storage Systems — Hot Water Discharges from Safety Devices. BBA Requirements and Guidance.*

(3) The system must be connected to a water supply with a pressure not exceeding 12 bar and of a quality supplied by a water undertaker under the Water Byelaws and Water Regulations, as appropriate.

(4) The system is installed in locations similar to those for storage cylinders used in a conventional vented system or in other locations advantageous to the building designer (see Table 1 for load weight of the system when 'full'). It is important to ensure there is an adequate clearance for the removal of the immersion heater.

(5) Electrical wiring must be carried out in accordance with BS 7671 : 1992 (IEE Wiring Regulations). The immersion heater circuit must be protected by a suitably rated fuse and an isolating switch with a double-pole disconnection.

(6) It is essential that the motorized valve supplied with the system is installed and is not substituted by any other motorized valve which may exist and be in service at the site of installation, eg a motorized valve installed in a central heating circuit.

17 Procedure

Summary of installation procedure

17.1 The storage cylinder is located in position (see the OSO installation instruction leaflet) and the plumbing connections made to the inlet and outlet pipes in the same manner as for a conventional storage cylinder, except that the water supply pipe is taken directly from the mains or other suitable potable supply, via the line strainer and cold water control valves (ensuring the arrow markings on the components are pointing downstream) to the cold water inlet of the storage cylinder (see Figure 3). Where balanced pressures are required, the cold water take-off is provided on the pressure reducing valve assembly (see Figure 3), using components supplied by OSO Hotwater (UK) Limited.

17.2 The discharge pipe is connected to and from the tundish to a safe and visible termination point [see section 16(2)]. The air gap at the tundish must remain clear.

17.3 The appropriate electrical connections are made.

18 Commissioning

18.1 The system is filled with water in the sequences set out in the *OSO Installation and Operating Instructions*.

18.2 When commissioning instructions are followed, an air gap at the top of the storage cylinder is formed (see Figure 2). It is important to ensure that the air gap is formed properly, by adopting the following procedure:

(1) All hot water taps are closed and the commissioning valve on the secondary return fitting opened. The cold water supply valve is opened.

(2) When water issues from the commissioning valve, the valve is closed.

(3) 10 to 15 minutes is allowed for the system to stabilise.

(4) To slowly release trapped air, the nearest hot water tap to the cylinder is gradually opened.

(5) To ensure all air is expelled from the system, the remaining taps are opened in turn.

18.3 The system is checked for watertightness. The combined temperature and pressure relief valve is manually operated to ensure water discharge from the valve runs freely through the tundish to the discharge point. The valve is visually checked to ensure that it re-seats satisfactorily. Heat is applied to the system and allowed to reach normal working temperature. The operation of the indirect and direct thermostats and motorized valve is checked and an examination carried out to ensure that no water has discharged from the combined temperature and pressure relief valve during the heat-up.

18.4 On completion of the commissioning process the *competent person* completes the label attached to the system, stating that the installation complies with the Certificate (see section 3).

Technical Investigations

The following is a summary of the technical investigations carried out on the OSO Indirect Unvented Hot Water Storage System.

19 Tests and investigations

19.1 Tests were carried out in accordance with MOAT No 38 : 1986 to determine:

capacity of storage cylinder
dimensional accuracy
mean supply temperature
outlet flow rate at various supply flow rates and pressures
time taken to heat to 60°C
re-heat time to 60°C
standing energy loss (adequacy of insulation)
watertightness
resistance of the storage cylinder and expansion vessel to an internal hydrostatic pressure of 1.5 times the design pressure = 15 bar (factory tested to 16 bar)
resistance to partial vacuum of 0.1 bar absolute
flow capacity of the tundish and discharge pipework.

19.2 Other tests were carried out to determine:

variations of storage capacities with variations in supply pressure
satisfactory performance of the integral expansion system.

19.3 Tests were carried out to confirm satisfactory operation of the following components when fitted in a system:

cold water control valves, to include:

pressure control valve
check valve
expansion valve
combined temperature and pressure relief valve
indirect cylinder thermostat and non-self-resetting thermal cut-out
motorized valve.

19.4 An examination was made of existing data in relation to the performance requirements of the relevant British Standards, etc, to determine the suitability and performance of:

cold water control valves, to include:

pressure control valve to BS 6283-4 : 1991
check valve to BS 6282-1 : 1991
expansion valve to BS 6283-1 : 1991
line strainer
combined temperature and pressure relief valve to BS 6283-3 : 1991

immersion heater to BS EN 60335-2-73 : 1997
indirect cylinder thermostat and non-self-resetting thermal cut-out to BS 3955 : 1986
motorized valve to BS 3955 : 1986.

19.5 An examination was made of existing data relating to:

adequacy of installation instructions
practicability of installation by the *competent person*
electrical safety
effect on water quality and prevention of waste of water
properties in relation to fire
practicability and adequacy of maintenance requirements
durability of materials used.

19.6 An evaluation of tests in accordance with MOAT No 38 : 1986, and existing data relating to standing energy loss with polyurethane foam insulations.

20 Other investigations

The manufacturing and assembly process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of materials used.

Bibliography

BS 864 *Capillary and compression tube fittings of copper and copper alloy*
BS 864-2 : 1983 *Specification for capillary and compression fittings for copper tubes*

BS 2879 : 1980(1988) *Specification for draining taps (screw-down pattern)*

BS 3955 : 1986 *Specification for electrical controls for household and similar general purposes*

BS 5449 : 1977 *Code of practice for central heating for domestic premises — Forced circulation hot water systems*

BS 6282 *Devices with moving parts for the prevention of contamination of water by backflow*
BS 6282-1 : 1991 *Specification for check valves of nominal size up to and including DN 54*

BS 6283 *Safety devices for use in hot water systems*
BS 6283-1 : 1991 *Specification for expansion valves for pressures up to and including 10 bar*
BS 6283-3 : 1991 *Specification for combined temperature and pressure relief valves for pressures from 1 bar to 10 bar*
BS 6283-4 : 1991 *Specification for drop-tight pressure reducing valves of nominal size up to and including DN 50 for supply pressures up to and including 12 bar*

BS 6700 : 1987 *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages*

BS 7671 : 1992 *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition*

BS EN 1057 : 1996 *Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications*

BS EN 10088 *Stainless steels*
BS EN 10088-2 : 1995 *Technical delivery conditions for sheet/plate and strip for general purposes*

BS EN 60335 *Specification for safety of household and similar electrical appliances*
BS EN 60335-2 *Particular requirements*
BS EN 60335-2-73 : 1997 *Fixed immersion heaters*

MOAT No 38 : 1986 *The Assessment of Unvented Hot Water Storage Systems and the Approval and Surveillance of Installers*

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

On behalf of the British Board of Agrément

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Chief Executive

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