

LST DIRECT STORAGE VESSEL

INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

Models

LST166

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1.0 INTRODUCTION

- The Lochinvar LST is a direct storage vessel, featuring a vitreous enamel lined steel storage vessel, a relief valve tapping and a unique distribution baffle fitted to the inlet connection that maximises peak demand water delivery. Also incorporated is a 100mm clean out access opening to enable inspection of the internal surface of the vessel.
- Sacrificial magnesium anodes are fitted to offer protection from corrosion; a pocket for installing a temperature control device (aqua stat) and drain valve are also fitted.
- There are two bosses providing the facility for immersion heater installation.
- All installations must conform to the relevant Building Regulations. Health & Safety requirements must also be taken into account when installing any equipment. Failure to comply with the above may lead to prosecution.
- If the equipment is to be connected to an unvented (pressurised) system, care must be taken to ensure all extra safety requirements are satisfied should a high or low-pressure condition occur in the system.

1.1 ANCILLARY OPTIONS

- | | |
|---|---------|
| • Correx Non-Sacrificial Electrical Anode | CKT9001 |
| • 6kW 415v Immersion heater 15" | CSI107 |
| • 6kW 415v Immersion heater 16" | CSI111 |
| • 9kW 451v Immersion heater 21" | CSI112 |
| • 12kW 415v Immersion heater 24" | CSI115 |
| • 18kW 415v Immersion heater 27" | CSI416 |
| • De-Stratification Kit | WH9 |

2.0 SAFETY GUIDELINES

Carefully read all the instructions before commencing installation.

Keep these instructions near the water heater for quick reference.

This equipment must be installed by a competent person. All installations must conform to the relevant Building Regulations. Health & Safety requirements must also be taken into account when installing any equipment. Failure to comply with the above may lead to prosecution

Commissioning, maintenance and repair must be done by a skilled installer/engineer, according to all applicable standards and regulations.

2.1 GENERAL DESCRIPTION OF SAFETY SYMBOLS USED



BANNED

A black symbol inside a red circle with a red diagonal indicates an action that should not be performed



WARNING

A black symbol added to a yellow triangle with black edges indicates danger



ACTION REQUIRED

A white symbol inserted in a blue circle indicates an action that must be taken to avoid risk



READ AND UNDERSTAND THE INSTRUCTIONS

Read and fully understand all instructions before attempting to operate maintain or install the unit.



This symbol shows essential information which is not safety related

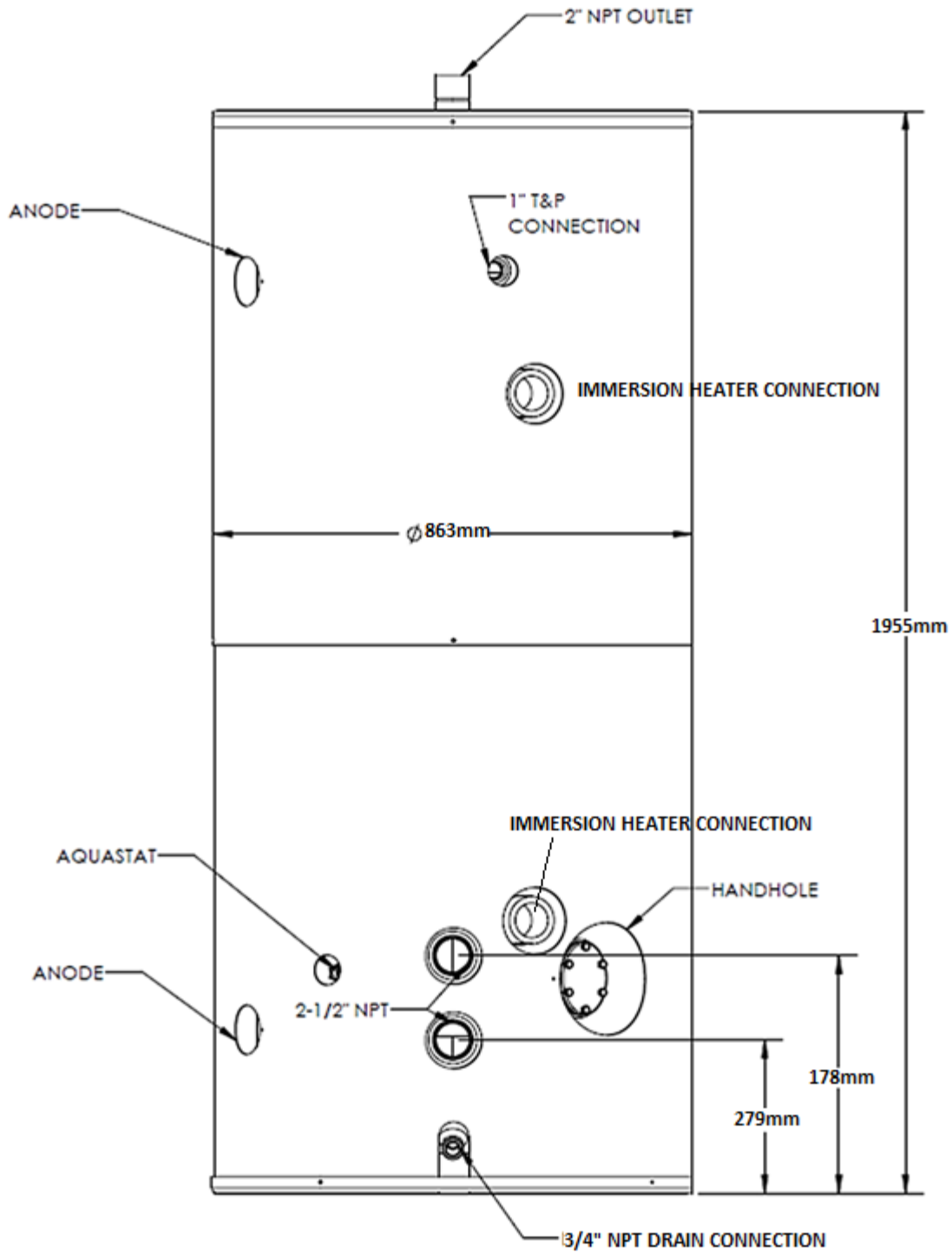


Lochinvar Limited is not liable for any damage caused by inaccurately following these mounting instructions. Only original parts may be used when carrying out any repair or service work.



This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

2.2 DIMENSIONAL DRAWINGS



2.2.1 CONNECTION HEIGHTS AND DIMENSIONS

3.0 TECHNICAL DATA

Model Number	LST166
GENERAL DATA	
Shipping Weight – kg	295
Full Weight – kg	980
Immersion Boss – B.S.P	2 x 2 ¼"
WATER DATA	
Water Content – Litres	685
Max. Water Pressure - bar	10

3.1.1 TECHNICAL SPECIFICATIONS

4.0 GENERAL REQUIREMENTS

The Lochinvar LST direct storage vessel has been designed to operate trouble free for many years. These instructions should be followed closely to obtain the maximum usage and efficiency of the equipment. **PLEASE** read the instructions fully before installing or using the appliance.

4.1 RELATED DOCUMENTS

The installation should follow the relevant guidance offered in the following documents. It is not practical to list all relevant information but emphasis is placed on the following documents, as failure to comply with the guidance given will almost certainly result in an unsatisfactory installation:

BS 6700: 1997	Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages
BS 7074: 1989 Parts 1 and 2	Application, selection and installation of expansion vessels and ancillary equipment for sealed systems
BS 7671: 2008	Requirements for electrical installations, I.E.E. wiring regulations seventeenth edition
CP 342: Part 2 1974	Code of practice for centralised hot water supply-buildings other than dwellings

5.0 WATER QUALITY

Water supply quality may adversely affect the efficiency and performance of water heaters and hot water systems. The situation can intensify where higher temperatures or demands exist.

Water hardness should not exceed 205ppm CaCO₃ and TDS (Total Dissolved Solids) of untreated water should not exceed 350ppm. If these values are exceeded, contact Lochinvar Limited for further guidance.

Also Water hardness requirements stated in the Installation Commissioning and Maintenance Instructions provided with the primary heat source (if not used as an electric storage vessel only) must be taken into account, these requirements override the guidance given in this manual.

5.1 ELECTRICAL ANODE PROTECTION EQUIPMENT

As an optional extra the unit can be factory supplied with a Correx electrical anode protection system. The purpose of this system is to protect the storage vessel from electrolytic attack by passing a small current from an electrode immersed in the water to the internal surface.

Whilst this system protects the unit from electrolytic attack, it should be noted that this is **not** a scale inhibiting or reducing device.

When the protection system is working correctly, a green light should be visible on the Correx unit. If an error occurs, this lamp will flash red. Remedial action should be taken as a matter of urgency if such a situation arises.

See section 0



It is a requirement of the Correx system that the unit is connected to a PERMANENT UNINTERRUPTIBLE 230V POWER SUPPLY. There must be no switches, including time clocks in the electrical system other than the main isolator. Incorrect installation of the electrical supply will invalidate the warranty of the appliance.

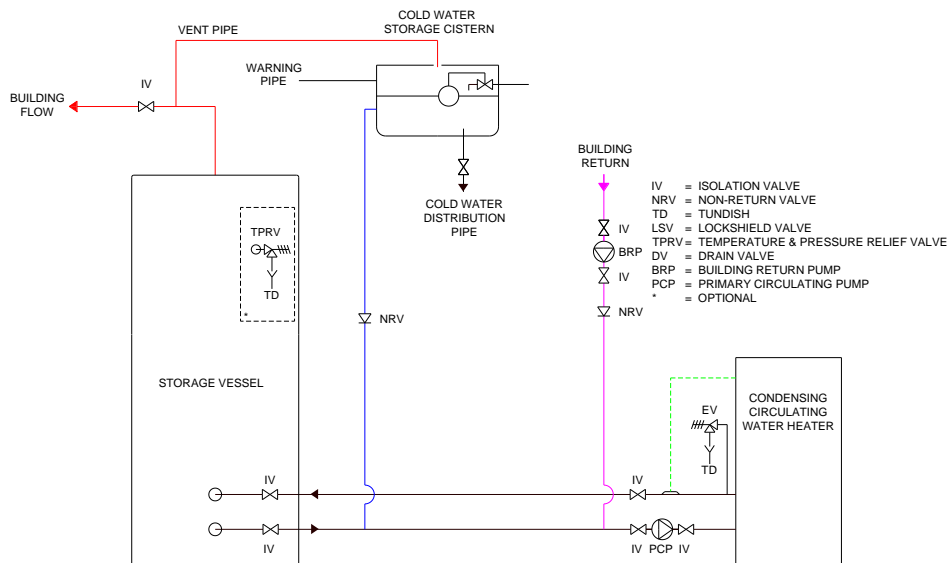
6.0 WATER CONNECTIONS

6.1 GENERAL

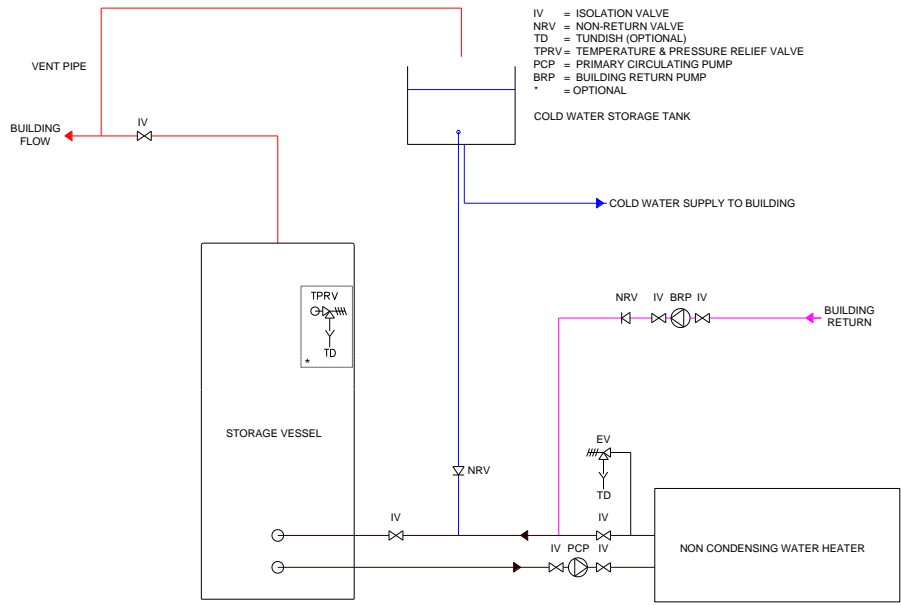
1. Circulating pipework should be insulated; cisterns, expansion vessels and pipework situated in areas exposed to freezing conditions should also be insulated.
2. Drain valves must be located in accessible positions that will permit draining of the entire system.
3. Ideally, individual valves should be fitted to each unit to enable isolation from the system.

6.2 OPEN VENTED SYSTEM

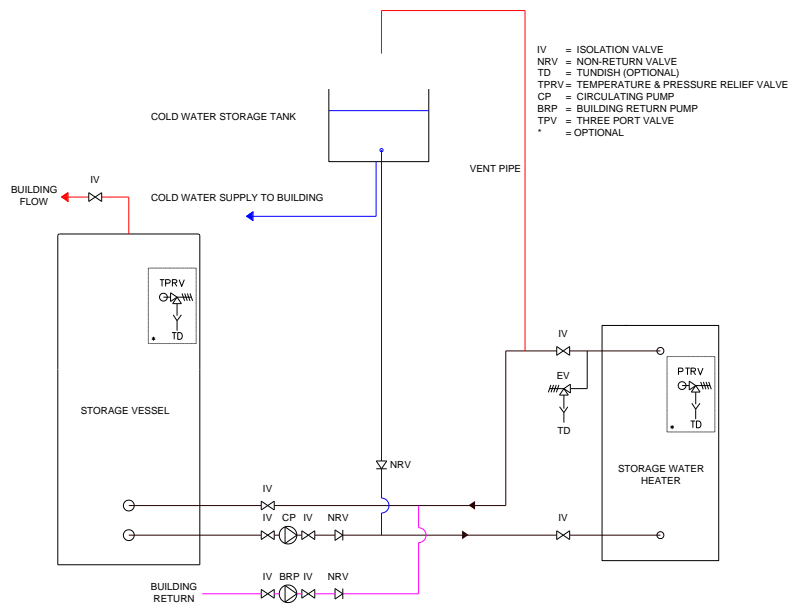
The Lochinvar LST can be used in an open vented arrangement provided that a vent pipe in accordance with **CP342** or **BS6700** is fitted. The minimum static head requirement for an open vented system will be detailed in the ICM Instructions of the primary heat source. If you require a pipework schematic for multiple appliances please contact Lochinvar Limited.



6.2.1 RECOMMENDED PIPEWORK FOR A CONDENSING CIRCULATING APPLIANCE



6.2.2 RECOMMENDED PIPEWORK FOR A NON-CONDENSING CIRCULATING APPLIANCE



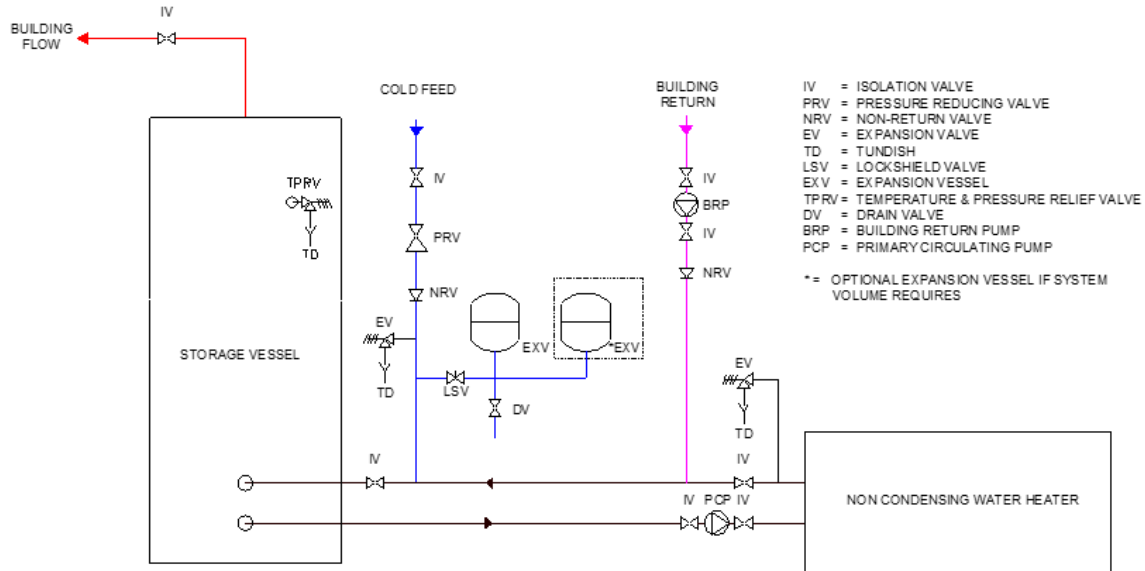
6.2.3 RECOMMENDED PIPEWORK FOR A STORAGE APPLIANCE

6.3 UN-VENTED SYSTEM

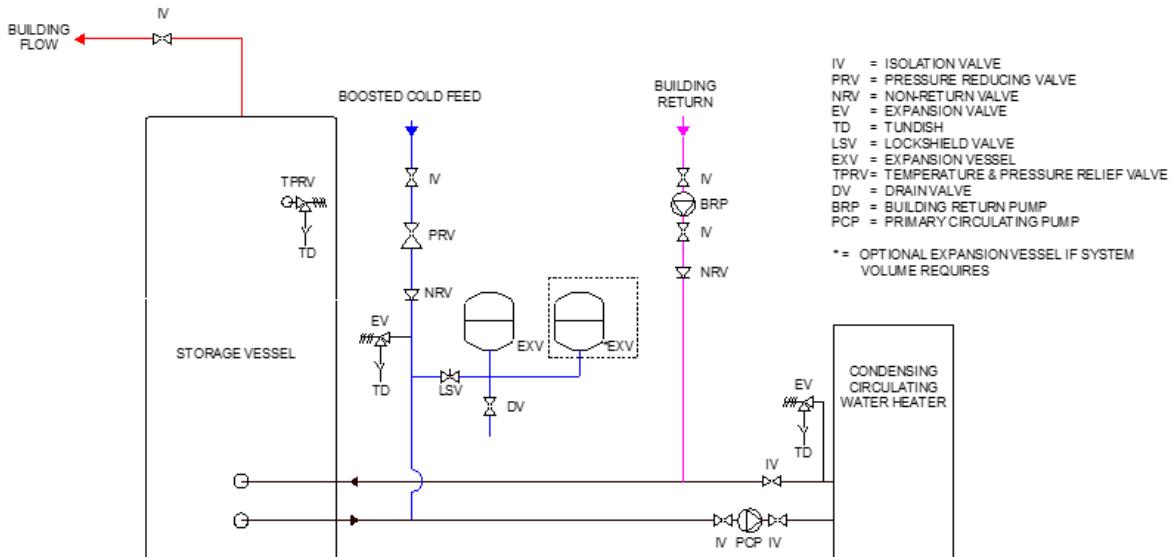


It is the law that all unvented hot water systems be installed by an approved installer.

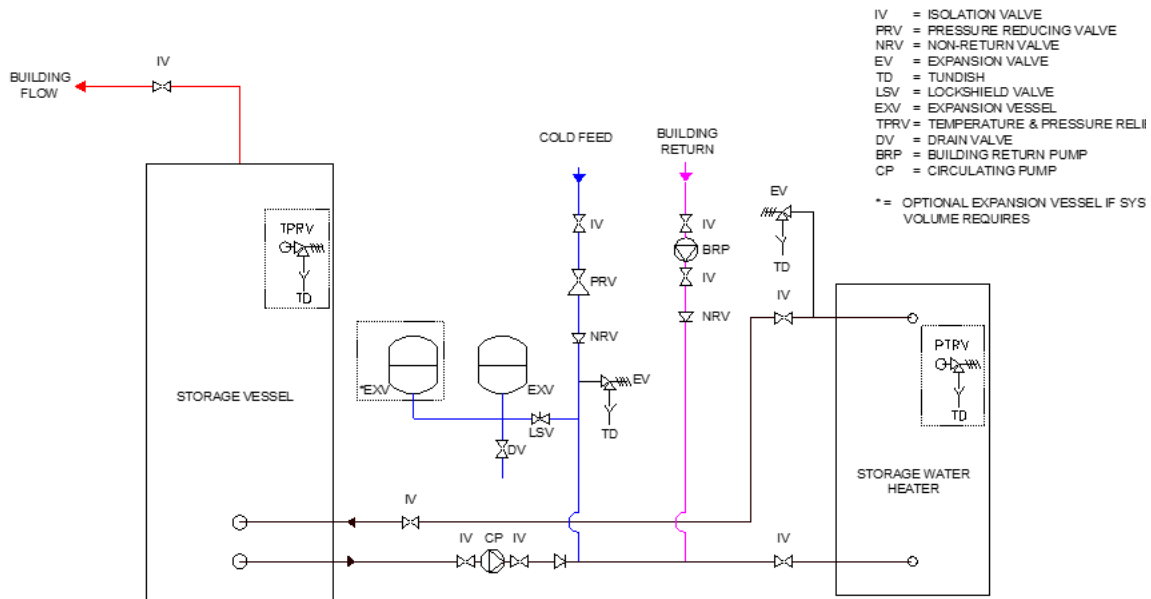
If the Lochinvar LST is to be used in an unvented arrangement, the system should follow the guidance given in **BS6700** and must comply with **The Building Regulations: Part G3 in England and Wales, P5 in Northern Ireland and P3 in Scotland**. A kit of components that have been suitably sized for the unvented or boosted operation of the appliance is available from Lochinvar Limited. For further information, contact Lochinvar Limited.



6.3.1 RECOMMENDED PIPEWORK FOR A NON-CONDENSING CIRCULATING APPLIANCE



6.3.1 RECOMMENDED PIPEWORK FOR A CONDENSING CIRCULATING APPLIANCE



6.3.2 RECOMMENDED PIPEWORK FOR A STORAGE APPLIANCE

6.3.3 TEMPERATURE AND PRESSURE RELIEF VALVE

A temperature and pressure relief valve is provided in the unvented water system kit. This valve has a lift pressure of 7 bar and a lift temperature of 90°C. The valve must be fitted to the relief valve tapping.



The storage vessel relief valve connection should not be used for any other purpose.

6.3.4 RELIEF VALVE DISCHARGE PIPEWORK

It is important that any discharge water does not collect in the discharge pipe-work and can run freely to the tundish. The tundish should be mounted in a vertical and visible position located in the same space as the unvented hot water storage system and be fitted as close as possible and within 600mm of the safety device e.g. the temperature relief valve.

The discharge pipe 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 or other material that has been demonstrated to be capable of safely withstanding temperatures of the water discharged and is clearly and permanently marked to identify the product and performance standard, 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 18 and 27m at least 3 sizes larger, and so on. Bends must be taken into account in calculating the flow resistance.

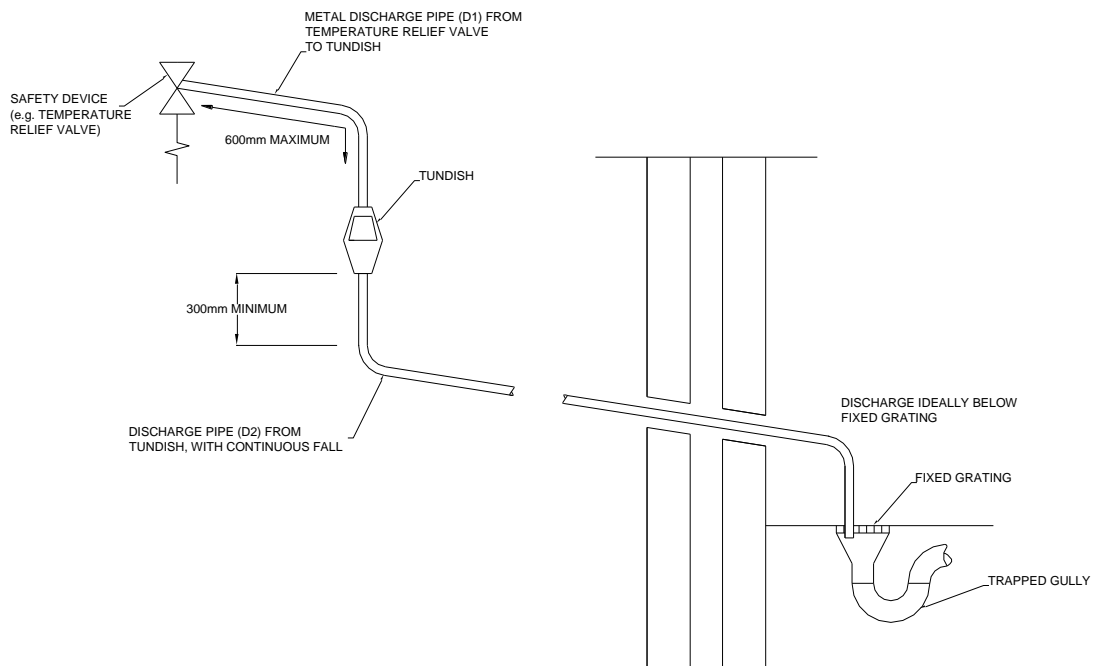
An alternative approach for sizing discharge pipes would be to follow BS6700 Specification for design installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.

- 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 of at least 1 in 200.

- 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 the fixed grating and above the water seal in a trapped gully.
- II. Downward discharges at a low level; i.e. up to 100mm above external surfaces such as car parks, hard standings, grassed areas etc. are acceptable providing that where children 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 a high level; e.g. into a metal hopper and metal down pipe with the end of the discharge pipe clearly visible (tundish visible or not) or onto a roof capable of withstanding high temperature discharges of water and 3m from any plastic guttering systems 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 any installation can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe 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.



6.3.5 RELIEF VALVE DISCHARGE PIPEWORK

6.3.6 EXPANSION VESSEL SIZING

The following information is based on an inlet pressure of 3.5 bar. If a different inlet pressure is to be used, please consult **BS6700**.

$$V V = \frac{S V * e}{0.45}$$

Where:

- V V = Vessel Volume
S V = System Volume
e = Coefficient of Expansion (See Table 5.1)

Stored Temp. °C	30	35	40	45	50	55	60
e	0.005	0.006	0.008	0.010	0.012	0.015	0.017
Stored Temp. °C	65	70	75	80	82	85	90
e	0.020	0.023	0.026	0.030	0.031	0.033	0.037

6.3.7 COEFFICIENT OF EXPANSION OF WATER AT 3.5 BAR INLET PRESSURE

6.4 DE-STRATIFICATION

6.4.1 GENERAL

The De-stratification Pump Kit works by using a pump to circulate water from the top of the vessel to the bottom of the vessel. This action ensures that the water held in the unit is maintained at a consistent temperature throughout. By achieving a uniformed stored water temperature of at least 60°C, the risk of any bacterial contamination is virtually eliminated.

If the LST is to be installed alongside a circulating water heater then a De-stratification pump may not be required due to the high turbulent flow created by the matched primary shunt pump supplied.

Systems that have a building loop incorporated onto the vessel may not require a De-stratification kit, as the circulation around the building from the top of the vessel back to the bottom should provide sufficient mixing.

6.4.2 REQUIREMENTS

Lochinvar has developed this kit to meet the stringent recommendations of both the HSE Approved Code of Practice L8 and Department of Health Memorandum HTM 04-01 relating to the control of legionella. For full compliance, a timer should be used to operate the pump for a period of at least 1 hour each day.

7.0 COMMISSIONING AND TESTING

7.1 ELECTRICAL INSTALLATION

Any ancillary item that requires an electrical supply should be installed and commissioned as per instructions.

7.2 WATER CONNECTION

For design see **Section 5: Water connections**



The system should be thoroughly flushed out with cold water without any circulating pumps in position. Ensure all the valves are open.

If a building return pump is to be fitted, it should be fitted before the system is filled and air locks cleared. Check the system for leaks and repair as necessary. If the system is configured in an unvented arrangement, check the expansion vessel cushion pressure.

7.3 PRIMARY HEAT SOURCE

The primary heat source operating in conjunction with the storage vessel should be installed and commissioned in accordance with the relevant ICM Instructions provided.

8.0 MAINTENANCE

8.1 GENERAL

Regular servicing is recommended, preferably by a Lochinvar appointed person, to ensure trouble free operation. Even if a maintenance schedule is determined to be less than annually, it is important that all controls and safety features are checked for correct operation on an annual basis.

8.2 MAINTENANCE SCHEDULE

It is good practice to service the LST every 12 months. Lochinvar Limited recommend that this is the maximum service interval, however in hard water areas, it may be necessary to reduce this time period to ensure correct operation of the storage vessel and associated equipment.

8.3 DRAINING THE WATER SYSTEM

Maintenance and service procedures for the LST require draining the water heater. The water heater must also be drained if it is to be shut down and exposed to freezing temperatures.

1. Turn off the water heater if applicable.
2. Connect a hose to the system drain valve.
3. Locate hose's discharge in an area where hot water will not cause any damage or injury.
4. Close the cold-water inlet valve to water heater system.
5. Open a nearby hot water outlet to vent the system.
6. Open the drain valve.
7. If the vessel is being drained for an extended shutdown, it is suggested the drain valve be left open during this period.

8.4 INSPECTION AND CLEANING

1. Drain the storage vessel.
2. Remove cover and gasket from cleanout opening.
3. Remove scale or sediment using care not to damage the vitreous enamel lining.
4. Inspect cleanout plate gasket and replace if necessary.
5. Install gasket and cleanout plate. Draw plate up square by tightening screws evenly.

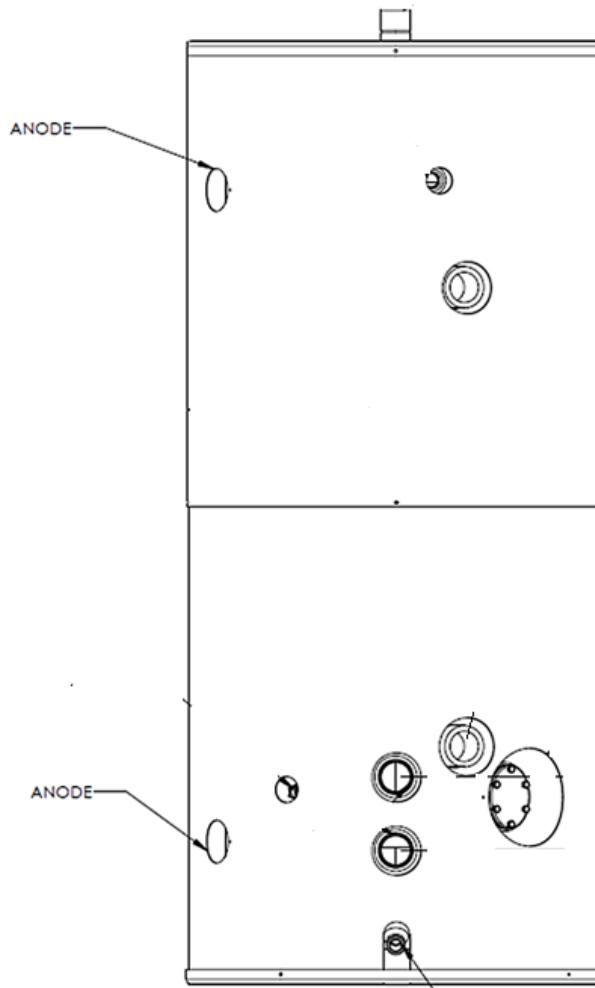
8.5 SACRIFICIAL ANODES: INSPECTION AND REPLACEMENT



The sacrificial magnesium anodes **must** be inspected at least once a year unless the Correx non-sacrificial anode protection system is used, in which case there is no requirement to check the condition of the anodes.

Protection against corrosion is given by sacrificial anodes fitted in the side of the storage vessel. The rate at which the anodes are depleted is dependent on the quality of the water; therefore it is important that the anodes are inspected as follows:

1. Drain the storage vessel.
2. Remove the outer caps covering the anodes.
3. Remove each anode and inspect its condition.





If the anodes have reduced in size by more than 40% at any point along their length or if they are severely pitted, new anodes should be fitted. Particular attention should be paid to the ends of each anode to ensure excessive localised depletion has not occurred. Where the anodes are covered with particles they should be cleaned.



When refitting the inspected or replaced anode, a suitable jointing compound should be applied to the threads of the anode to prevent water leakage.

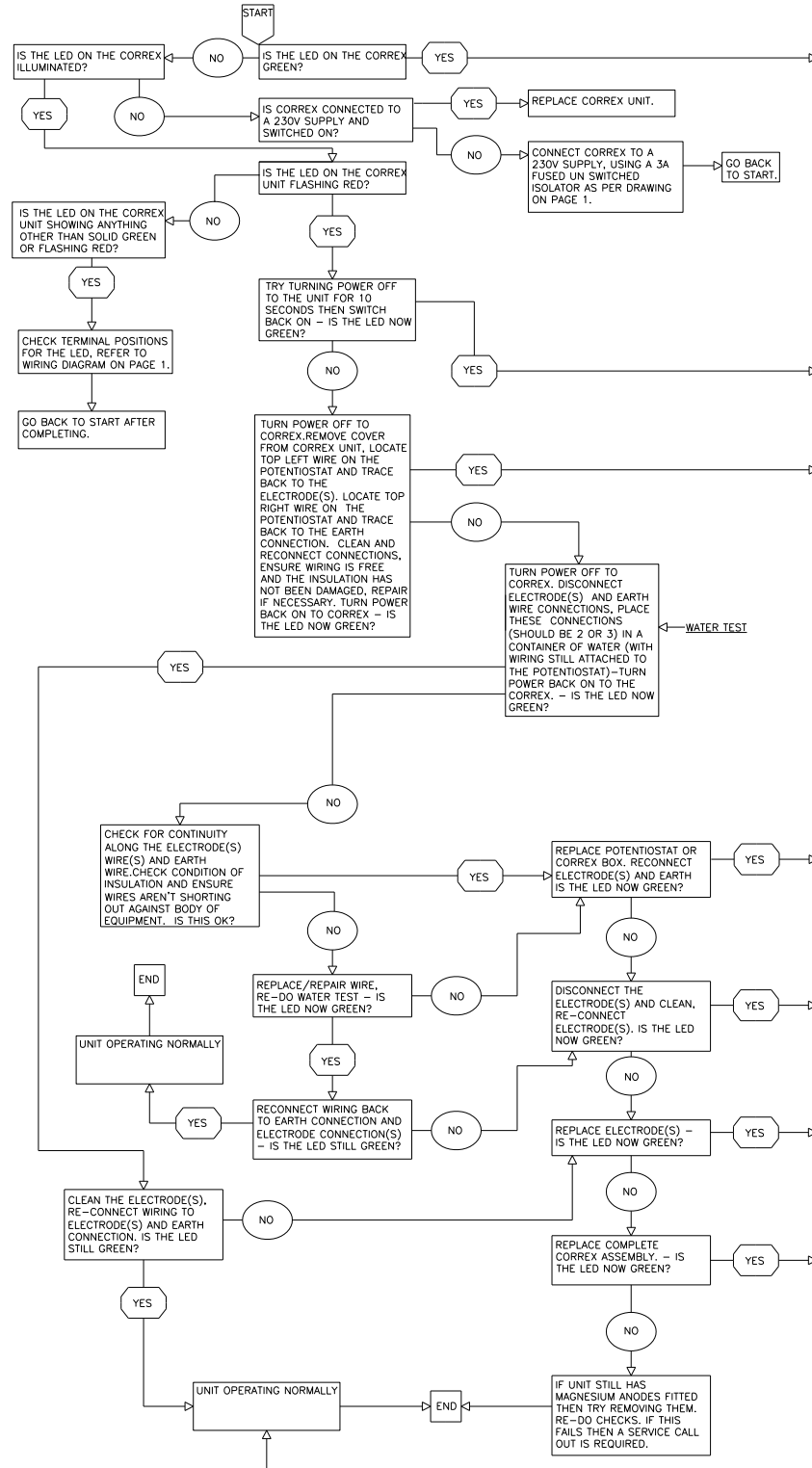


Where a water softener is used, the treated water may increase the rate of anode depletion therefore the condition of the anodes must be checked more frequently.

8.6 CORREX ELECTRICAL ANODE PROTECTION SYSTEM

When the protection system is working correctly, a green light should be visible on the Correx unit. If an error occurs, this lamp will flash red. Remedial action should be taken as a matter of urgency if such a situation arises.

Use the below chart for possible causes



The Correx system passes and monitors an electrical current flow through the water. If this current flow becomes too high or too low, a fault is indicated. Factors that may cause incorrect current flow include:

- Short-circuiting of the cables between the potentiostat and electrodes.
- Poor conductivity between the electrode cables and electrode connection tabs.
- Poor conductivity between the electrode connection tabs and electrode PCB.
- Poor conductivity between the tank and earth tab.
- Poor conductivity between the earth tab and earth cable.
- Deposits forming on the electrodes.

8.7 RE-FILLING THE SYSTEM

1. Close the drain valve.
2. Open a hot water fixture to allow air to escape.
3. Open the cold water supply to water heater and allow the vessel to fill.
4. Check for water leakage.

8.8 OTHER CHECKS

8.8.1 RELIEF VALVE

At least once a year, the temperature and pressure relief valve and safety valve should be checked to ensure that they are in operating condition. To check each valve, lift the lever or turn the screw cap at the end of the valve several times. The valve should operate freely and seat properly.

If water does not flow, remove and inspect for obstructions or corrosion. Replace with a new valve of the recommended size as necessary.

9.0 USER INSTRUCTIONS

Your LST Direct storage vessel has been designed to give many years of trouble free service. Where applicable, it may be fitted with an electric immersion heater which heats the water to 60°C for use as a back-up should the primary heat source fail for any reason. Note that the hot water supply will be limited whilst using the immersion heaters.

The flow temperature of the hot water can be set to your requirements on the immersion heater (ideally 60°C maximum). Higher temperatures can cause tripping of the high limit thermostat and introduce more energy loss from the cylinder.

When a hot tap is turned on there may be a short surge of water, this is quite normal with unvented systems and does not mean there is a fault.

When you first fill a basin the water may sometimes appear milky. This is due to very tiny air bubbles in the water which will clear very quickly.



Warning: If cold/warm water exits from the temperature and pressure relief valve (tpv) or from the pressure relief valve (prv) call your installer. If very hot water exits from either valve switch off the heat source immediately and isolate the electricity supply to the cylinder and separate heat source.



The solar system is configured to heat the water to its maximum economic temperature which may vary with ambient temperature and weather conditions. The immersion may be programmed to operate during fixed periods of the day or night.



If the hot water runs cool it may be necessary to manually switch on the immersion to heat the water – please see the relevant instructions for your alternative energy device.

10.0 ERP DATA TABLE

Model	Unit	LST166
Energy label		N/A
P _{STBY}	Watts	124
Storage volume	Litres	685



IMPORTANT INFORMATION

These instructions must be read and understood before installing, commissioning, operating or maintaining the equipment.

