

INSTALLATION, OPERATION, MAINTENANCE INSTRUCTIONS FOR GMS THERMAX SEMI-STORAGE CALORIFIERS



The operating and maintenance instructions contained within this package are for standard semi-storage calorifiers (vessels fitted with a heat exchanger and circulation pipework & pump).

Please note that an electronic version of these instructions are available from our website and also on a CD. Please contact our sales office for further information.

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1. Standard Unit Information & Description

The THERMAX semi-storage calorifier is a compact unit designed to meet wide variations of Domestic Hot Water (DHW) load without making excessive demands on the primary heat source. A heat exchanger with matched bronze pump continuously supplies hot water at the required temperature to a small storage vessel. The stored hot water provides the capacity to meet peak demands.

The THERMAX minimum configuration is Calorifier Shell, Heat Exchanger, Integral Circulation Pump with Pipe-work and Pump Isolation / Flow Regulation Valves.

Two types of heat exchanger are available:-

- 1) Integral U-Tube type: Primary medium in tubes, DHW over tubes. This type is usually fitted partially inside the calorifier shell.
- 2) Compact Fixed Tube Plate type: Primary medium over tubes, Secondary medium through tubes. This type is always fitted externally to the calorifier shell.

Depending on the scope of the order the unit may be supplied complete with Ancillary Mountings (Thermometer, Altitude Gauge, Steam Pressure Gauge (if applicable), Safety Valve & Drain Valve). Temperature Control Valve, High Temperature Cut-out Valve, Steam Trap-set (if applicable) may also be included. Some or all of these items may be supplied loose with the unit to be fitted on site.

Units with copper -lined steel vessels will always be fitted with an anti-vacuum valve. This is an essential safe-guard. Vacuum will damage the thin copper lining.

The General Assembly drawing specific to each unit gives details. In any case some or all of the above items must be fitted to give safe and satisfactory operation.

Standard Material Options Schedule	
Shell	Copper (CS) Copper-Lined Steel (CL) Galvanised Steel (GS) Stainless Steel (SS) Glass-Lined Steel (PL)
Header	Carbon Steel
Heater Tubes	Copper 'low-fin' Integron Plain Copper Stainless Steel
Tubeplate	Brass Stainless Steel
(Other materials on request)	

Vessel Design Data	Shell Side	Tube Side
Maximum Working Pressure	7.0 BarG	10.0 BarG
Hydraulic Test Pressure	11.55 BarG	15.0 BarG
Design Code	BS853 1996 Part 1 Grade A & PED 1999 (SI 1999/2001)	
Higher pressures on request		

Please refer to our brochure for standard connection and dimensional data.

2. PED Information

The standard range of semi-storage calorifiers are designed in accordance with the requirements of the Pressure Equipment Directive 97/23/EC. Units classed as SEP in the PED category are not supplied with a CE mark. Units in category I & II are CE marked and appropriate markings and certification is supplied with each unit.

It is the responsibility of the user and/or installer to ensure that the unit is installed and operated safely, and in accordance with the instructions supplied within this manual. The 'SC' unit is designed for a steam or water primary medium (in the tubes) and water secondary medium (in the shell).

EC DECLARATION OF CONFORMITY

We

Manufacturer Name: GMS Thermal Products Ltd
Address: Riverside Works, Egmont Street
Mossley, OL5 9NE
Country: England

declare, in sole responsibility, that the following equipment

Product: 'TM' Semi-Storage Calorifiers
Country of Origin: England

are in accordance with the requirements of the Pressure Equipment Directive 97/23/EC

GMS PED Certificate Number: PED-TM-11-05
Date of issue: 4th November 2005

Applicable Design Standards: BS853 1996 Part 1 Grade A OR:
GMS Commercial Standards

Subject products are designed, manufactured and tested according to the appropriate quality control procedures.

Date: 4/11/05
Steve Rawlins
Technical Director
GMS Thermal Products Ltd

Size (Litres)	Fluid Group	PED Category	Module
All Sizes From 450 Litres To 4500 Litres (Refer to brochure for actual capacities)	Chart 4 Group 2 Liquids	SEP	A

PED Information for the primary medium can be supplied after the unit has been ordered and issued for manufacture.

3. Installation

Lifting & Handling: Use lifting eyes where fitted. Do not lift a calorifier using the insulation (if fitted). Straps may crush the insulation. The shell of the calorifier may be made of relatively light gauge metal and care should be exercised when handling and moving the unit not to damage the shell. Do not lift the calorifier using chains directly in contact with the shell. Do not allow operatives to stand on the calorifier

Siting: Unless specifically ordered for outside siting the calorifier must be sited indoors. Foundations must be firm and level to prevent settling, pipe strain or distortion of the calorifier. Unless specifically ordered differently, the calorifier should be installed in a level position. For calorifiers with removable tube bundles, ensure enough room exists to withdraw the bundle from the shell. For calorifiers with inspection openings ensure enough room exists to gain access to the opening.

Protective covers/plugs may be fitted to connections to protect them in transit. These must be removed prior to use. If a connection is not required seal it appropriately. Check for and remove any foreign material which may have got into the vessel. Pipe-work connected to the calorifier should be supported to prevent loads being transmitted to the calorifier. Provide for thermal expansion with bends and expansion joints. To avoid corrosion do not use copper pipework with galvanised steel calorifiers or vice-versa. Fit isolation valves prior to calorifier connections (NOT TO THE VENT) to facilitate servicing. For flanged connections tighten bolts in a diametrically opposite sequence to load the flanges evenly onto the gasket. For screwed connections use a thread sealant approved for use with potable water by the local water authority. Ensure that the tube bundle can be isolated and easily disconnected for removal during maintenance. The vent must not be blocked so, if the unit may need to be isolated from the vent, fit a 3 way vent valve. Ensure adequate venting for air removal during filling and operation ("sealed" systems should have an auto-air-vent and a manual air vent valve for this). Pressure and temperature relief valves (and bursting discs if fitted) should have their outlets piped away to a safe disposal point, preferably via an air-break and tun-dish so that discharge is unrestricted and easily visible. Water expansion must be accommodated by separate expansion vessel on the cold feed side (on sealed systems) or via the vent pipe on vented systems. Allowing expanded water back into the cold feed tank on vented systems is not recommended as the resultant warm water will encourage bacterial growth. On steam heated units arrangements must be made for condensate removal, usually via float type trap with thermostatic vent to a condensate return line at a lower level.

To avoid damage in transit the pipe-work and integral circulation pump of the THERMAX may be supplied loose for fitting on site. The pump should be installed to circulate water from the bottom of the cylinder to the top. The unit should be flushed thoroughly with clean water prior to operation.

A suitable starter should be provided for the pump (pump starting and running currents will be advised on request) and connected to the electrical supply. The pump must not be run dry (see below).

4. Commissioning & Operation

Do not operate the equipment at pressures or temperatures in excess of those specified on the nameplate of the vessel marking. Do not subject the equipment to conditions of vacuum or partial vacuum. This is particularly vital for copper-lined steel calorifiers, which are supplied complete with anti-vacuum valve - which must not be removed. For example partial vacuum can be caused if the cold feed or the vent are restricted during draw off or drain down.

- 1) Open any cold feed and vent valves to the THERMAX and valves either side of integral circulation pump. Fill with cold water ensuring unit is vented fully, but do not open downstream DHW system valve.
- 2) For unvented systems ensure that the pre-charge pressure in the expansion vessel is correct and that the expansion vessel is open to the unit.
- 3) Ensure that the unit is full of water and that valves either side of the integral circulation pump are open. Turn integral circulation pump on and check that rotation of pump is correct. The pump must be left running constantly
- 4) Referring to the commissioning booklet of the primary medium control and high limit valve (if fitted), set these as required and GRADUALLY introduce primary medium to the unit. (Gradually open the primary isolation valve manually to do this).
- 5) After a short time period the water at the top of the THERMAX will reach the control temperature, as indicated by a gauge on the top of the vessel. When the THERMAX contents are fully heated (indicated by closure of the control valve) the unit is ready to operate at design load conditions and the downstream DHW system valve may be opened.

NOTE - The site Health and Safety rules regarding hot water storage should be consulted - it may be necessary to leave the unit running isolated from the downstream DHW system until the entire contents of the vessel are fully heated and for some defined period after that before opening the valve to the downstream DHW system.

Check that all gaskets are effective when the unit is operating - some bolt tightening may be necessary after the unit has been first heated and subsequently from time to time. Following installation and commissioning it is advisable to remove, clean and re-assemble any strainers.

This completes the commissioning procedure.

NOTE: All fluids must be drained when the unit is out of operation to prevent freezing or possible corrosion.

5. Maintenance

The THERMAX is designed to operate efficiently with a minimum of attention. A regular maintenance programme will ensure continued high operating efficiency and trouble-free operation.

Annual maintenance should include cleaning debris from the base of the calorifier to comply with guidelines on prevention of legionella bacteria proliferation. Also the site insurers may require annual inspection of heat exchanger and calorifier shell condition.

GENERAL POINTS:-

Do not blow steam through single tubes - this will cause the tube to expand and disrupt the tube joint.

Do not blow air through tubes if they may contain inflammable fluids (explosion hazard)

It is recommended that a set of gaskets be carried for use when the unit is stripped down for insurance inspection, or cleaning.

Maintenance of the pump and other ancillary equipment should be carried out in accordance with the instructions supplied for these items by their respective manufacturers. Copies of these are included with these instructions.

If a loss of performance or increase in primary pressure drop has been observed the following are possible causes:-

- a) Primary fluid restriction (blocked strainer, faulty control valve etc.)
- b) Air lock on primary side.
- c) Scale deposits on the heat exchanger surfaces (primary or secondary side). This can severely affect heat transfer rates.

To drain the THERMAX calorifier down (secondary side)

Obtain a complete set of replacement gaskets from GMS Thermal Products Ltd.

It is assumed here that all isolation valves (except drain) are open at the start.

Isolate the primary fluid inlet and outlet - switch off primary pump and boilers if necessary.

Switch off secondary system return pump and isolate secondary return to calorifier.

Switch off integral circulation pump power.

Isolate the secondary flow

Isolate the cold feed

For sealed systems reduce the residual calorifier pressure by manually operating the safety valve - some hot water will come out

For sealed systems open a manual vent valve to allow air in during drain-down

For copper-lined steel calorifiers ensure that the anti-vacuum valve is not stuck shut - also ensure that a vent is available at the top of the calorifier of flow area at least one half the flow area of the drain connection. Remove one of the fittings on the top of the calorifier if necessary to achieve this. Partial vacuum, caused by inadequate venting of copper-lined calorifiers during drain-down, will cause damage to the thin copper lining.

If the calorifier is open vented and shares a vent with other calorifiers, isolate it from the common vent using the 3 way valve (it will now vent to atmosphere).

Pipe the drain to a drain point and open the drain valve.

The THERMAX calorifier shell internal condition can be inspected by removing the inspection cover to allow visual examination

5. Maintenance

Re-fit new gaskets and re-fill the calorifier according to the commissioning instructions above.

Constant circulation through the THERMAX heat exchanger minimises fouling. However, a clean heater gives maximum efficiency and capacity, and it is much easier to clean tubes with a light coat of scale, than it is to clean tubes which have been permitted to get excessively fouled. The THERMAX should be cleaned periodically to ensure maximum efficiency. Higher operating temperatures cause scale to accumulate in the heat exchanger more quickly than lower temperatures. Hard untreated water causes much faster scale accumulation than treated soft water. Cleaning frequency will be determined by experience.

CLEANING THE HEAT EXCHANGER (SECONDARY SIDE)

1) Integral U-Tube type fitted partially inside the calorifier shell.

Because U-tube bundles are fairly tightly packed, chemical cleaning, e.g. using a mild acid solution containing inhibitors, will generally give the best results. Take care that the chemicals used will not cause any adverse or hazardous reaction with the materials of the tube bundle or the deposits being cleaned.

Drain as above.

Allow primary pipe-work to cool to a safe temperature.

a) Cleaning In Place (CIP)

Disconnect and remove the integral circulation pump and the secondary pipework above the heat exchanger. Take care not to damage any control capillary tubes. Connect CIP hoses directly to the heat exchanger and circulate cleaning chemicals as necessary. Do not exceed normal heat exchanger flow-rate by more than 50%. Fully remove all traces of cleaning chemicals by flushing with fresh water after the CIP process.

b) If the heat exchanger tube bundle is to be removed for chemical cleaning.

Disconnect primary pipe-work and remove primary header. The tube bundle may be heavy. Ensure that adequate facilities are available to withdraw the bundle without distortion or damage. Avoid damaging surfaces of flanges. When lifting or working on the tube bundle support it by the tubeplates and the support plates - ideally on wooden blocks cut to fit the curvature of the tube bundle. The tube bundle must not be supported on the tubes. Do not bend or distort supports and baffles.

Re-fit the tube bundle using new gaskets and re-fill the calorifier. Check all gaskets and joints for signs of leaks.

2) Compact Fixed Tube Plate type fitted externally to the calorifier shell.

These can usually be isolated from the shell by valves supplied so that it can be worked on without draining the shell. CIP can then be carried out as above. Alternatively the entire heat exchanger can be removed for cleaning elsewhere. The tubes in these units are essentially straight and therefore some mechanical cleaning (with a fine circular brush for example) may be possible.

Re-fit using new gaskets and re-fill. Check all gaskets and joints for signs of leaks. See commissioning instructions for procedure to restore the heater to service.

6. Recommended Spares

Please contact our sales department for recommended spares prices and availability. The recommended quantities given are per unit supplied.

Description	Part Ref.	450-550 Litres	600-2000 Litres	2000-4500 Litres	All Copper Lined
Inspection Gasket	RG250-P	1			
Inspection Gasket	RG380-P		1		
Inspection Gasket	RG450-P			1	1
Pump Seal Kit	TBA	1	1	1	1

Please refer to the issued manufacturing drawing for the following sizes for the heater battery. The quantities shown are per battery, not calorifier as some calorifiers can be supplied with more than one battery.

Description	Part Ref.	Nominal Heater Size					
		80NB	125NB	150NB	200NB	250NB	300NB
Chest Gasket	NG075-P	1					
Chest Gasket	NG125-P		1				
Chest Gasket	NG150-P			1			
Chest Gasket	NG200-2P				1		
Chest Gasket	NG250-2P					1	
Chest Gasket	NG300-2P						1
Shell Gasket	NG075-P	1					
Shell Gasket	NG125-P		1				
Shell Gasket	NG150-P			1			
Shell Gasket	NG200-P				1		
Shell Gasket	NG250-P					1	
Shell Gasket	NG300-P						1