

INSTALLATION, OPERATION, MAINTENANCE INSTRUCTIONS FOR GMS THERMAFLOW PLATE HEAT EXCHANGER PACKAGES



The operating and maintenance instructions contained within this package are for 'ThermaFlow' packaged plate heat exchangers. Please refer to separate instructions for the control valve and pump(s) manuals.

The standard ThermaFlow unit design is only suitable for a water primary, up to 110°C maximum and a maximum of 1800 kW.

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.

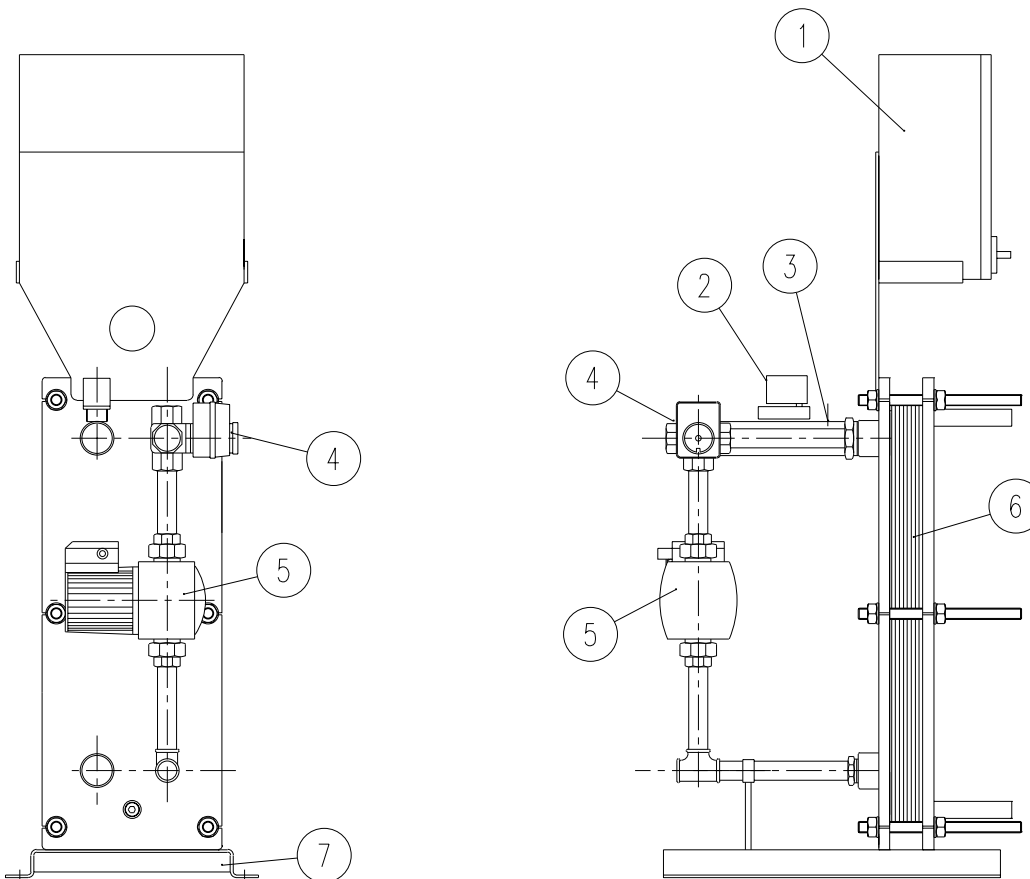
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1. Standard Unit Information & Description

The 'ThermaFlow' range comprises water/water plate heat exchanger packages. These are mostly used in systems to heat domestic hot water. In the majority of applications the water is heated by LTHW (82/71°C) although the heater can be used for primary temperatures up to 110°C if required. Other applications may also arise with different water temperatures and materials of construction.

Standard Material Schedule		Design Data	Primary	Secondary
Primary Pipework	Carbon Steel	Maximum Working Pressure	6.0 BarG	10.0 BarG
Secondary Pipework	Stainless Steel	Hydraulic Test Pressure	9.0 BarG	13.0 BarG
Exchanger Plates	Stainless Steel	Design Code	Commercial Standards & PED 1999 (SI 1999/2001)	
Exchanger Gaskets	NBR		Higher pressures on request	
(Other materials on request)				

Typical Arrangement			
Ref	Description	Ref	Description
1	Electrical Control Panel	5	Primary Shunt Pump
2	High Limit Thermostat	6	Plate Heat Exchanger
3	Control Sensor	7	Mild Steel Skid Base
4	4-Port Primary Control Valve		



1. Standard Unit Information & Description

SPECIFICATION

CONTROL PANEL

General

Panel to IP55 or better

Steel Enclosure with hinged door, painted finish.

Inputs

Power supply with neutral & earth

Thermocouple Type T (West 6170 controller) or NTC thermistor (Carel IR32W controller)

Thermostat - Hi-Limit - Self-resetting (OPEN = Hi-Limit)

Remote Start Signal - 240V ac (continuous) = ON

(Late 1999 onwards units provide this internally and require only connection to an external switch for remote start)

Outputs

Pump Power: details will be specific to each unit

Hi-Temperature limit volt-free contact (fail-safe - opens on power failure)

Pump Trip volt-free contact (fail-safe - opens on power failure)

Control Valve Positioning & Actuation - 2 at 240V AC

Optional Output: 0-10V DC for remote temperature indication

Panel Facia

Door Interlock Isolator

Door Lock with key

LOCAL/STAND-BY/REMOTE switch

Power on light

High Temperature Light (red)

High Temperature Reset Button (reset at thermostat)

Pump Run light(s)

Pump Trip light(s)(red)

West Instruments 6170 Digital Temperature Controller/Indicator

- or - (from May 2001 onwards) Carel IR32W Digital Temperature Controller/Indicator

Traffolyte Label (black print on white background).

Twin primary pump option:-

PUMP1/AUTO/PUMP2 switch

Other Items

Pump starter and protection devices

Control circuit protection device

Terminal blocks for user connections to pump(s), switches etc.

Relays and wiring to ensure correct operation.

Earth block with connectors for pump(s) plus 4 spare.

PUMP(S)

Primary: Either single or twin head, cast iron, glandless inline circulating pump, multi-speed, Wilo Manufacture

CONTROL VALVE

Sauter 4-port control valve, cast iron, rotary show valve. Actuator 230v 3-point control, 60 second run time.

2. PED Information

The standard range of 'ThermaFlow' packages 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 standard ThermaFlow unit is designed for a primary medium up to 110°C

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: ThermaFlow Plate Heat Exchanger Packages
Country of Origin: England

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

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

Applicable Design Standards: BS853 1996 Part 1 Grade A

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 TF35 to TF1800 (Refer to brochure for actual Duties)	Chart 4 Group 2 Liquids	SEP	A

3. Installation

IMPORTANT NOTES.

Bolting Down: To minimise floorspace requirements, the ThermaFlow unit is designed to have a small “footprint”. To ensure stability during and after installation the unit must be bolted to the floor.

Separate instructions and a record of initial set-up are provided for the unit’s digital controller and should be kept safe with these instructions and the unit wiring diagram by the unit operator for future reference.

INSTALLATION

The unit must be installed indoors, away from damp, frost and ambient temperatures exceeding 40°C and bolted to a firm base. Provide adequate space at sides and front for access for operation and servicing.

The unit is supplied ready for connection to site services.

Pipe-work considerations. The unit has as standard one in-built primary pump which draws water from a low loss header or similar arrangement and circulates the water through the unit. This pump cannot be used as the boiler circulation pump. As an option, the unit may be fitted with an additional backup primary pump. If the boiler circulation pump generates a high differential pressure (>10kPa) at the connections to the unit the differential pressure should be reduced by fitting a bypass.

Standard Units: Secondary water flows through the unit under its own pressure.

Ensure that pipework is adequately sized and supported.

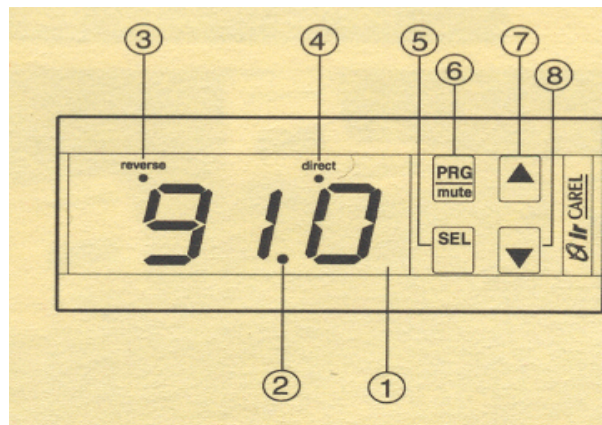
Fit isolating valves and make provision for air venting, draining and thermal expansion of both pipework and water.

The maximum working pressures of the unit (normally 6 BarG primary, 10 BarG secondary but check data plate) must not be exceeded.

Electrical. Electrical connection should be done by a competent person. Make Electrical connections in accordance with the wiring diagram supplied with the unit. For your information the Control Panel Specification is given below.

4. Commissioning & Operation

CAREL IR32W Temperature Controller with NTC Probe - Instructions for Set-up and Use – PWM mode



General: These instructions are a simplified extract of the Carel instruction manual (available in PDF electronic format on request) and are intended solely for setting up the temperature controllers fitted on the ThermaFlow plate heat exchanger packages.

This particular version is for setting up in PWM mode – used on some units 2004 onwards. PWM mode gives steadier temperature control than “dead-band mode” previously used.

1. Normal Operation - Set Point Adjustment:

The only user adjustment commonly required will be Set Point Adjustment as follows:
Refer to instrument facia diagram above.

Press SEL (key 5) and hold for a few seconds until “St1” flashes.

Release SEL (key 5).

Press UP or DOWN arrows (keys 7 and 8) as required until the desired value shows.

Press SEL (key 5) to confirm the value and restore normal operation.

2. Set-Up

2.1 Function Mode (C0) selection

The instrument should be set to operate in “PWM” mode (C0 = 4) as follows:

Press SEL (key 5) and PRG/mute (key 6) together and hold for 5 seconds.

Press UP arrows (key 7) to give value 22. (this is a security code)

Press SEL (key 5) to confirm security code

Display shows “C0”. Press SEL (key 5).

Press UP or DOWN arrows (keys 7 and 8) as required to give value 4

Press SEL (key 5) to confirm the value

Press PRG/mute (key 6) to restore normal operation.

2.2 Setting other parameters

2.2.1 General procedure for setting parameters:

a) Press PRG/mute (key 6) and hold for 5 seconds. Parameter code “P1” is displayed.

b) Press UP or DOWN arrows (keys 7 and 8) until the required parameter code is displayed.

c) Press SEL (key 5) to accept the parameter and display current value

d) Press UP or DOWN arrows (keys 7 and 8) to give required value

e) Press SEL (key 5) to confirm the value

f) The display shows the code for the modified parameter.

g) Repeat (b) to (f) to modify other parameters if required.

h) Press PRG/mute (key 6) to restore normal operation.

4. Commissioning & Operation

2.2.2 Guideline values for parameters

These values assume a set point of 63 deg. C. (for DHW generation – PWM mode). However, if set-point is too close to high alarm value (see below) an alarm condition may occur in normal operation. This will cause an error display on the Carel display and a buzzer may sound (depending on model).

Parameter	Description:	Value	Comment
St1	Setpoint (°C.)	63	Typical value for DHW
P1	Hysteresis (°C.)	4.0	Hysteresis below dead band in which PWM mode operates
P2	Hysteresis (°C.)	4.0	Hysteresis above dead band in which PWM mode operates
P3	Dead Band (°C.)	0.1	x 2 = Dead band inside which control actions do not occur
C12	PWM cycle time (seconds)	30	Time between successive PWM actions
P14	Probe Calibration	0	Do not adjust this value
P25	Lower alarm (°C.)	-50	Do not adjust this value
P26	Higher alarm (°C.)	90	Do not adjust this value
P27	Alarm Hysteresis (°C.)	2	Do not adjust this value
P28	Alarm Delay (mins)	60	Do not adjust this value

Note:

PWM (pulse width modulation) acts as follows:

- a) When measured temperature (T) is within the dead band no control action occurs
- b) When measured temperature (T) is within the hysteresis band control action occurs as follows

E.g. measured temperature (T) is within the lower hysteresis band (too cool)

- Control valve actuator is energised for time t equal to a fraction of PWM cycle time
- t equals $C12 \times (T - St1 - P3)/P1$
- The actuator is then de-energised for the remainder of time C12
- The above procedure is repeated until T is within the dead band

- c) When measured temperature (T) is outside the hysteresis band the actuator is energised without time limit until T comes within the hysteresis band.

4. Commissioning & Operation

METHOD OF OPERATION

The door interlock isolator prevents door opening when in ON position. In OFF position it isolates main power AND remote start input.

When door interlock isolator is ON and LOCAL/STAND-BY/REMOTE switch is at STAND-BY the control circuit is energised but pump(s) will not run.

The pump(s) can be switched on by turning the switch to LOCAL

Single primary pump units: Primary pump (and secondary pump if fitted) will start

Twin primary pump units: Switch the Pump Select Switch to PUMP 1. This will start pump 1 (and secondary pump if fitted). If Pump Select Switch is set at AUTO a primary pump will be automatically selected and started (and secondary pump, if fitted, will start).

If the unit is switched to REMOTE the control circuit will be energised and the pump(s) will start only when the REMOTE START signal (from an external source) is present.

Fault Conditions:

Pump Trip: Light comes on and Pump Trip VFC opens. On twin primary pump units the back-up pump is automatically switched on if the other pump trips.

High Temperature. Light comes on, Pump(s) stop, Control Valve closes, Hi Temp. Limit VFC opens. Requires manual re-set.

Power Failure: VFC's open. Late 1999 units onwards self-reset on restoration of power. On most 1999 & earlier units (those with panel mounted Hi Temp. Limit alarm reset button) the system will require a manual re-set after power failure.

4. Commissioning & Operation

COMMISSIONING

Fill the secondary water side first. Fill the unit slowly, avoiding water hammer. Switch on any external secondary water recirculation pump.

Fill the primary side slowly, avoiding water hammer. The unit is designed to vent air to the primary pipework. Vent the pumps in accordance with the instructions specific to them and supplied as part of the unit's documentation package.

INITIAL OPERATION

Commission the unit first as above.

Ensure that the Control Panel door is closed

Turn LOCAL/STAND-BY/REMOTE switch to STAND-BY

Turn DOOR INTERLOCK ISOLATOR to ON

Turn LOCAL/STAND-BY/REMOTE switch to LOCAL

Set High Limit Thermostat to approximately 10°C above Control set-point temperature. (The high limit thermostat is not a precision device and is only there to shut the unit down in the event of main controller or control valve failure. Further adjustment of this may be required in the first day or so of operation to prevent nuisance shut-down)

Single Primary Pump Units

- The OVER TEMP light should come on - press re-set button to clear this
- The PUMP RUN light should come on. Check that the pump is actually running in correct rotation.
- If PUMP TRIP light comes on the panel must be switched off and the overload inside be re-set before trying again.
- If PUMP TRIP light comes on repeatedly the pump may be seized and must be freed before trying again.

If remote starting and stopping of the unit is required then turn LOCAL/STAND-BY/REMOTE switch to REMOTE. Check the remote function using an external initiating signal.

Twin Primary Pump Units

1) Turn Pump Select Switch to PUMP 1

- The OVER TEMP light should come on - press re-set button to clear this
- The PUMP 1 RUN light should come on. Check that the pump is actually running.
- If PUMP 1 TRIP light comes on the panel must be switched off and the overload inside be re-set before trying again.
- If PUMP 1 TRIP light comes on repeatedly the pump may be seized and must be freed before trying again. Refer to pump manufacturer's instructions.

2) Turn Pump Select Switch to Pump 2. Repeat procedures in step 1.

3) Turn Pump Select Switch to AUTO. One of the pumps should run.

If remote starting and stopping of the unit is required then turn LOCAL/STAND-BY/REMOTE switch to REMOTE. Check the remote function using an external initiating signal.

Pumps will auto-change-over with each remote start.

If remote starting and stopping of the unit is NOT required then turn LOCAL/STAND-

BY/REMOTE switch to LOCAL. Turn Pump Select Switch to PUMP 1. Switch between PUMP 1 and PUMP 2 at intervals of 1 week.

4. Commissioning & Operation

The unit is pre-set for a temperature of 60 to 65°C depending on order requirements. This can be altered on the digital temperature controller if required. In hard water areas a lower temperature (58-60°C) may be desirable to minimise potential for scale deposition. The instructions for the digital temperature controller are supplied with the unit and should be consulted before attempting to change settings. It is advisable to familiarise yourself with these instructions.

The unit can now be left running.

5. Maintenance

The Pump and control valve should be maintained in accordance with the instructions specific to them and supplied as part of the unit's documentation package.

The plate heat exchanger plates may occasionally require cleaning or de-scaling. To do this the heat exchanger plates must be removed from the frame by un-bolting the heat exchanger:

IMPORTANT: Prior to disassembly measure the tightening distance (the gap between the thick pressure plates which clamp the heat exchanger together). Note sequence and orientation of plates on disassembly.

MAINTENANCE OF THE PLATE HEAT EXCHANGER PACK

Opening the heat exchanger

- Cool the heat exchanger. If possible allow the heat exchanger to stand and cool overnight.
- Disconnect any connections to the movable cover plate (multi-pass units).
- Slacken nuts & remove bolts alternately, so that the movable cover plate can move parallel with the frame plate.

Taking out the plates

Use gloves - the plate edges are sharp!

If two or more plates have stuck together they must be separated carefully so that the gaskets are kept on the correct plate.

The plates support each other in pairs. If a plate has been so damaged that it must be taken out and cannot be repaired or replaced with an identical one, its adjacent plate must also be taken out of the exchanger.

If the number of plates are changed, so is the thickness of the clamped plate pack, A. (Dimension A refers to the distance in between the painted steel end plates - see supplied data sheet).

Special plates, such as the first and last plates, and turning plates in multi-pass heat exchangers, must be replaced with identical plates.

Cleaning the plates

Fouling of the plate heat exchanger often depends on the flow velocity through the heat exchanger being too low. Where the possibility exists to increase the flow this should be tried out if the heat exchanger shows signs of reduced capacity or increased pressure drop. However, with products that crystallize or heavily foul the plates, or if the heat transfer surfaces have been scorched, opening and cleaning the heat exchanger is necessary.

- The heat exchanger is opened according to 4.1.1.
- Steel wool or brushes of carbon steel must not be used, nor may stainless steel be used on titanium plates.
- Firstly, the heat transfer surface should be cleaned by rinsing with a powerful jet of water and scrubbing with a nylon or similar brush
- Take care not to damage the gaskets.

5. Maintenance

- Oxide or chalk deposits are removed with a soft brush and 2.5% nitric acid solution, (Hydrochloric or sulphuric acid may not be used). Organic deposits containing proteins are removed with a soft brush and 2% solution of sodium hydroxide solution at 50°C.
- Surfaces with greasy deposits are cleaned with kerosene and a soft brush. After cleaning, rinse thoroughly with water.

IMPORTANT: SODIUM HYDROXIDE AND CONCENTRATED NITRIC ACID CAN SERIOUSLY HARM THE SKIN AND MUSCOUS MEMBRANES. THE SOLUTION MUST BE HANDLED WITH THE GREATEST CARE. ALWAYS WEAR PROTECTIVE GOGGLES AND PROTECT HANDS WITH RUBBER GLOVES.

Gaskets

GX heat exchange plates differ from conventional plates. Because the gasket groove lies in the plate's neutral plane alternate plates have gaskets on both their sides, while the interleaving alternate plates have no gaskets at all. The gaskets used next to the cover plates are half thickness. The double 'ring' sections of the gasket are always placed at the top right and the bottom left of the plate.

Adjusting the gaskets

A gasket that has come loose, either partly or entirely, must be glued in place, If only a short length has become detached, gluing can be carried out immediately before clamping, with the plate still sitting in the frame, If the entire gasket has become detached, the plate should be taken out of the heat exchanger,

Suitable gasket glue

Only certain glues may be used for gluing gaskets, namely 'Bostik' 1782, 3M EC 1099, Bond Spray 77 or 'Pliobond 20/30' Synthetic glue. Do not use other types of glue as they may contain chlorine or other substances that may attack the plate material. To facilitate application with a brush, the glue should be diluted with acetone, Maximum dilution 1:1.

Cleaning the gasket groove

The solvent must not contain chlorine. Clean the plates from residues of old gaskets. – Small patches of glue, hard to remove, that are securely stuck to the gasket groove may remain there. They provide an excellent foundation for the new gasket. Wash the gasket groove so that it is completely free of oil and other greasy substances, using a rag and acetone or other solvent not containing chlorine compounds. Then let the plate dry off.

Gluing the gaskets

The glue is applied with a small flat brush to those parts of the plate's gasket groove in which the gasket shall lie. These parts of the gasket groove are easily recognised as they differ in colour arising from previous residues of glue. The gasket is then placed into position on the plate. After drying for about 30 seconds (the time depends on the thickness of the glue film and how much the glue has been diluted), the glue holds the rubber gasket firmly in place in the gasket groove, thus facilitating mounting. The plate must then be held under light pressure with the aid of other plates or a stiff sheet of other material of suitable weight for about 30 minutes.

When the glue joint has dried the gasket should be coated with talc to prevent the plates subsequently sticking to each other. The plates are then ready to assemble into the frame.

5. Maintenance

THE PLATES

Marking

A GX plate is identified by means of an embossed code letter. This letter can be found to the RIGHT of the UPPER carrying bar cut out, when the plate is facing TOWARDS the frame plate.

Assembly

Before the heat exchanger is assembled, inspect all gaskets and surfaces that are against the gaskets. Particles that may jeopardise the integrity of the seats or damage the gaskets or sealing surfaces must be removed. Note that contaminants usually collect at the lower part of the plates. Plates that have been provided with new gaskets must be checked to make sure that the gaskets are in the correct gasket groove. Also check the half thickness gaskets on the first and last plates.

Inserting the plates.

Each delivery is accompanied by a computer printout of the grouping scheme, giving each Plate's code letter together with the plate's position in the heat exchanger.

When the plates are correctly positioned the flanged cut outs at the upper carrying bar should point towards each other.

The plate edges form a regular honeycomb pattern

Tightening the heat exchanger

The plate pack must be compressed to a specific thickness - the A-dimension. The A-dimension +/- 3% gives the inside length in millimetres between the fixed cover plate and the movable cover plate.

The A dimension: (plate thickness 0.5 mm).

Up To 140 kW (GX-7)	3.0 x number of plates
Over 140 kW (GL-13)	3.4 x number of plates

Example:

A plate heat exchanger GL13 has a total of 51 plates in the pack. The tightening length of the pack is:

$$51 \times 3.4 = 173.4 \pm 3\%.$$

NOTE:

With large plate packs the A-dimension, due to tolerances in the plate thickness and depth of pressing, can deviate somewhat from that given above +/- 3%. With the correct 'A' dimension the plates lie in metallic contact with each other. Check this by examining the plate edges around the heat exchanger. Further compression can deform the plates. The nuts must be tightened alternately. The movable cover plate must always be moved parallel to the frame at all times and not drawn out of alignment.

Tighten bolts alternately.

5. Maintenance

Check the A dimension along the heat exchanger.

NOTE! NEVER TIGHTEN THE EXCHANGER WHILE IT IS UNDER PRESSURE!

Lubrication

The tightening bolts must be kept lubricated with molybdenum disulphide or its equivalent, particularly on the sections of thread used for opening and closing the equipment.

ORDERING SPARE PARTS

When ordering spare parts, the heat exchanger type and serial number must be quoted. These are given on the unit's nameplate.

