RHI Solar Heat Metering

Solar Heat Meter Application

Heat Meter Application

The Hamworthy heat meter for RHI is suitable and ready for use with all Hamworthy Trigon solar systems using Tyfocor L solar fluid at 40% solution in the solar circuit. It can also be used with the Dorchester DR-TC solar water heater with integral gas burner, (if this is used with Trigon solar circuit with Tyfocor L solar fluid at 40% solution), to measure only the heating generated by the solar circuit.

The MID Class 2 heat meter is issued with a calibration certificate for use as supporting evidence to accompany the information required for an RHI claim.

"RHI-eligible" Heat Metering

For an RHI claim to be successful, only heating which is "RHI-eligible" can be claimed i.e. heat generated by an eligible heat source such as solar thermal, and for a use that would otherwise be heated by fossil fuels.

This means that the positioning of the solar heat meter is important so that it does not measure heating used for other purposes, or from other heating sources.

The RHI defines two types of installation: "Simple" and "Complex". For Simple systems, only one heat meter is usually required to measure the eligible heat generated from the solar circuit. However in installations deemed "Complex", eligible and non-eligible heating sources, as well as heat usage for eligible purposes may all need to be metered, and a heat metering report, compiled by an independent specialist, must also be submitted to Ofgem to support the RHI claim.

To help the designer and the prospective RHI applicant, The Building and Engineering Services Association (B&ES) have produced a guide "B&ES Guide to Good Practice: Heat Metering for the RHI" available electronically via the B&ES website (www.b-es.org), which is recommended reading, alongside the RHI guidance notes from Ofgem (www.ofgem.gov.uk).

Please note that the heat meter for RHI cannot be used as supplied on the water side of a system to measure heat use, eligible or otherwise, as it has been calibrated for the specific nature and concentration of Tyfocor L solar fluid in water, not for water alone.

Solar Heat Meter Location for RHI

In Trigon systems, including those used with the Dorchester DR-TC, the heat meter's flow meter including cold (blue tag) temperature sensor is fitted on the return line to the collector, and the hot (red tag) sensor is fitted directly, (not using a pocket), into the flow line from the collector perpendicular to the flow axis, and both at positions close to the heat exchanger connections on the calorifier/water heater.

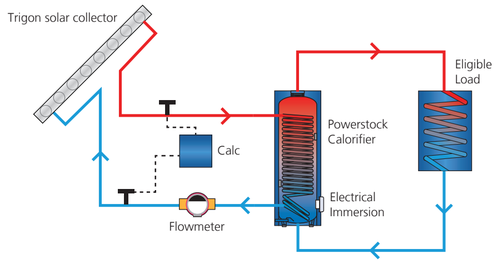
A minimum length of straight pipe 3 x diameter of the pipe is required ahead of the flow meter inlet to minimise turbulence.

Sensor positioning should not be so close to the calorifier/water heater that it can be affected by conduction heat from it.

The flow meter should be fitted with its arrow in the direction of flow, between two isolation valves.

A bypass circuit may be considered to allow removal for calibration.

RHI–permissible meter placement for a simple solar installation that feeds a Powerstock calorifier, with back up electrical emersion heater



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Solar Heat Meter for RHI

Renewable Heat Incentive (RHI) compliant heat meter for Hamworthy Trigon and Dorchester DR-TC solar circuits

MID Class 2-approved and certified for use with Tyfocor L solar fluid @ 40% concentration

Flow rates 0.6–2.5 m^3/h

RHI COMPLIANT MID CLASS 2

Hamworthy

Heating *at work.*

Solar Heat Meter for RHI

For Hamworthy Trigon and Dorchester DR-TC systems

In order to make a valid and continuing claim for the UK Government's Renewable Heat Incentive (RHI) for commercial solar thermal applications, an accurate system for the measurement of the "eligible" solar heat contribution of the installation is necessary, and any heat meter used must conform to the Class 2 requirements listed in Annex MI-004 of the EU Measuring Instrument Directive (MID) 2004/22/EC Heat Meter requirements.

For accurate independent RHI solar contribution metering of a Hamworthy Trigon solar thermal heating and hot water application, Hamworthy offer a compact solar thermal MID Class 2-compliant solar heat meter specifically for this purpose with accuracy better than EN1434.

Hamworthy's solar heat meter is a tamper-protected unit, combining a fluid oscillation type inline flowmeter with a matched pair of PT500 temperature sensors and a pulse-measuring calculator display unit that can be detached from the flowmeter and mounted separately.

With no moving parts, the proven fluidic oscillator static flowmeter design is the ideal choice for long term reliability, accuracy is assured across the full modulation range of the Trigon and Dorchester DR-TC solar pumps.

EEPROM secure data storage and back-up batteries ensure heat metering can continue and data will not be lost in the event of a mains power outage.

Cumulative solar energy in kWh is clearly displayed by default on the calculator's menu-driven 8-digit display. This and other measured/stored data can be made available for remote reading via an optional RS232 interface module. Other interfaces are available on request.

Options

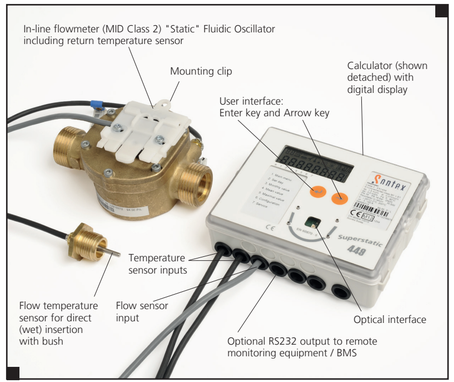
- **RS232 Interface module (allows read-only access to data for remote monitoring systems)**
- **Other interfaces available on request**

BENEFITS

- **Calibrated ready for use in Hamworthy Trigon and Dorchester DR-TC systems**
- **MID Class 2, with certificate for RHI claim**
- **No moving parts to wear**
- **Safe data storage with automatic back-up**
- **Tamper-resistant with seals**
- **Horizontal or vertical mounting**

For a successful RHI claim, the heat meter must compensate for the fluid properties and concentrations of antifreeze and corrosion inhibitor in the solar fluid solution.

Hamworthy's solar heat meter takes these into account, and is supplied calibrated for Tyfocor L @ 40% solution—ready for use in Hamworthy Trigon and Dorchester DR-TC installations.



Hamworthy heat meter for RHI with calculator unclipped

Specifications

Solar Heat Meter for RHI

The solar heat meter for RHI from Hamworthy comprises three main parts, a flow meter to measure flow volume and flow rate in the return to the solar collectors, a matched pair of temperature sensors (one is inside the flowmeter) to measure flow and return temperatures, and an electronic calculator unit which gathers the flow and temperature data to calculate the energy generated by the solar circuit.

Fluidic Oscillator "Static" Flow Meter

The heat meter's flow meter has no moving parts, other than the solar fluid that flows through it. It is an inline "static" flowmeter which uses a fluidic oscillator circuit similar to the one described below to measure flow. This is a specially designed nozzle and channel arrangement that creates a pressurised jet whose stream path is alternately deflected towards one or other of two adjacent receiver channels opposite the nozzle.

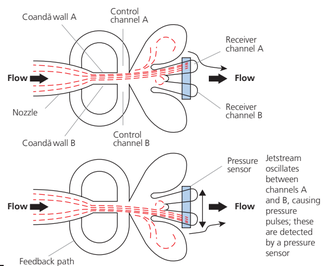
Fluidic Oscillator-Generic Operating Principle

In a typical fluidic oscillator, the fluid being metered is supplied to a nozzle and forms a high velocity jet. Due to the Coandă effect, the ensuing jet sticks to a one or other Coandă wall causing it to deflect towards one or other receiving channel.

The choice of Coandă wall that the jet sticks to first is made at random, but if it begins by sticking to Coandă wall A, then the high velocity jet stream flows across control channel A drawing in fluid into the jet stream, which causes low pressure in control channel A.

As control channel A is connected by a feedback path to control channel B, the pressure gradient builds up in the feedback path until it is sufficient to pull the jet stream over to Coandă wall B—changing the direction of flow over to channel B.

With the jet stream over control channel B, the process is repeated in reverse, with the jet switching back to channel A. The switching cycle continues, oscillating between the channel A and channel B at a frequency proportional to the flow rate.



The oscillation back and forth between channels occurs at a rate proportional to the rate of fluid flow through the meter and gives rise to an alternating pressure differential across the two channels. A pressure sensor situated above the channels registers these pressure pulses and converts them into a series of electrical pulses, which are transmitted to the calculator. The calculator electronically counts the number of pulses and the pulse rate to determine flow volume and flow rate.

The fluidic oscillator flow meter has proven accuracy, and reliability is assured since there are no moving parts to lock up or need replacing due to wear. It can be overdriven with no ill effects, and can be installed in vertical (rising or falling) or horizontal pipework with no levelling needed. It includes a brass coarse filter and ¾" brass reducing connectors and gaskets.

The unit is factory sealed and is supplied pre-wired to the matched calculator and includes a 2-wire PT500 temperature sensor mounted perpendicular to the flow axis which is fitted with a tamper-protected seal.

Temperature Sensors

In addition to the PT500 temperature sensor in the flow meter, a second matched PT500 flow sensor is supplied pre-wired to the calculator with approximately 2m of cable, and includes a ¾" sensor mounting bush. This sensor must be fitted to the flow line from the collector, and inserted perpendicular to the flow axis in direct contact with the solar fluid.

Calculator

The calculator measures the number and frequency of pulses from the flow sensor and so determines flow volume and flow rate respectively. It also measures flow and return temperatures every 3 seconds (or every 30 seconds if back-up battery power is used). It uses this measured data, together with programmed formulae and data relating to the fluid properties of the solar fluid in the circuit, to calculate solar energy usage.

Cumulative values of energy usage in kWh as well as a host of other measured and calculated parameter values are safely stored in dual-EEPROM memory, and is available for display on the calculator's LCD (Liquid Crystal Display). The display has a primary 8-digit display frame for parameter values and error messages, with additional digits and symbols above and below, for related information such as units, monthly "max" or "avg" value, current menu level indication, etc.

Information is ordered in a multi-level menu structure, which is navigated via Arrow and Enter keys. After 3 minutes the display automatically returns to the main menu. The default display is cumulative heat in kWh.

The calculator's orientation is adjustable for ease of reading, independent of the flowmeter orientation. The calculator can be detached for wall–mounting or DIN rail mounting using the clip.

Technical Data and Dimensions

Parameter		Units	Value
Flow-nominal Qp		m^3/h	1.5
Pipe pressure minimum		bar	0.8
Operating temperature–permanent maximum		°C	90
Integrator ambient operating temperature (min./max)		°C	5–55
Material			brass
Maximum flow Qs		m^3/h	3
Minimum flow Qi		l/h	15
Low flow threshold		l/h	10
Pressure loss at Qp		bar	0.2
Cable length, flowmeter to calculator		mm	800
Temperature sampling rate	Mains	Samples/min	20
	Battery	Samples/min	2
Display resolution t/ Δt		K	0.1/0.01
Temperature range–admissible		°C	2-200
Nominal supply voltage			230 V 1Ph 50Hz
Weight		Kg	1.4

Data Storage

Measurements and data is safely stored, with automatic hourly back-ups, using dual-EEPROM memory which will not lose data with loss of power. Data can be read via an optional RS232 interface using equipment (not HHL supply) such as a remote PC, modem, or remote display unit.

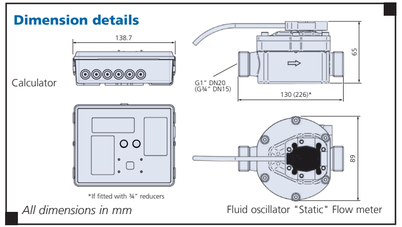
Power

The heat meter is mains powered 230V 1PH 50Hz with internal auto-recharging back–up battery which is enabled in the event of loss of mains power. When battery powered, the unit operates in power save mode to preserve the battery with temperature sampling rate reduced from once every 3 seconds to once every 30 seconds, preserving data measurement but disabling any optional data communications.

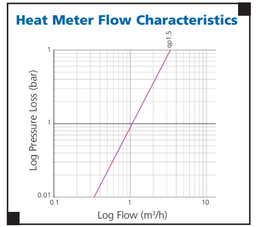
If the two halves of the calculator are separated, this disconnects the upper (display) circuit from the back-up battery in the lower circuit. A button cell with 3 month's power capacity is included in the upper circuit to ensure continuity of supply during separation.

For added security it is recommended to power the unit via an Uninterruptable Power Supply (UPS) and 1 amp fuse.

Dimension details



Heat Meter Flow Characteristics



Cables

The cable between the flow meter and calculator must not be lengthened or shortened. Temperature sensors are supplied as a matched pair and if one becomes damaged then both must be replaced as a pair.

Heat Meter Menus

The top level menus include:

- Main menu
- Set day menu
- Monthly values
- Average values
- Maximum values
- Configuration
- Service
- Test mode

Main Menu Displays

Main menu options include:

- Cumulated energy, kWh. (Default display)
- Cumulated volume, m^3
- High and low temperature, °C
- Temperature difference, K
- Power, kW
- Flow, m^3h
- Glycol curve and mounting position
- Segment test

Refer to the installation guide supplied with the heat meter for details of all menus displays and error codes.

Installation Notes

For horizontal mounting, the sensor head must be placed to the side ± 45° in relation to the pipe axis to avoid influence of air inclusions (top) or dirt (bottom). Automatic Air Vents (AAV) are recommended to minimise air in the system.