

## CONTECA™ heat energy meter

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## 7504 series



### Product range

CONTECA Heat meter kit, complete with heat meter, two integral temperature sensors, two sensor holder bodies and rotary pulse flow meter, and:

7504_0A series	male NPT pipe connections	sizes ½", ¾" & 1" with unions
7504_3A series	female NPT pipe connections	sizes 1", 1¼" & 1½" with unions
7504_6A series	press pipe connections	sizes ½", ¾" & 1" with unions
7504_9A series	sweat pipe connections	sizes ½", ¾" & 1" with unions
Code 750450	Datalogger	
Code 755052	Modbus-to-BACnet gateway	

### Technical specifications

#### Heat meter:

Materials: -Housing & cover: ABS, RAL 9004  
 Power supply: 24 VAC, 50/60 Hz, 1W  
 Data transmission: 2-wire RS485; selectable Modbus or M-bus (for use with datalogger)  
 Ambient temperature: 40 — 113 °F (4 — 45 °C)  
 Environmental rating (protection class): NEMA 3S (IP 54)  
 Pulse inputs: Class 1B per EN 1434-2

#### Temperature sensors:

Cable length\*: 26¼ ft. (8 m)  
 Sensor type: NTC matched  
 Temperature range: heating mode: 50 — 195 °F (10 — 90 °C)  
 Temperature range: cooling mode: 35 — 77 °F (2 — 5 °C)  
 Temperature sensitivity: < 0.1 °F  
 Temperature sensor thermowell: Stainless steel  
 Sensor holder body: Brass  
 Max. working pressure: 150 psi (10 bar)

\*Extra length of 26¼' cable must be carefully coiled and mounted in a safe place. Do not cut or splice.

### Function

CONTECA™ is a direct heat energy meter designed to measure instantaneous and recorded history of thermal energy usage in residential and commercial buildings, for heating only, cooling only, or both heating and cooling.

The CONTECA meter features an 8-digit liquid crystal display that enables easy reading of BTU consumed as well as a range of technical data indicating equipment operating status and data logging.

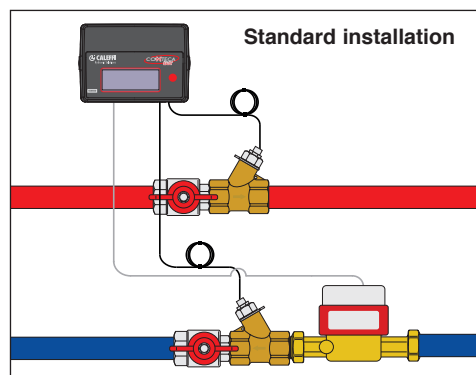
Each CONTECA includes a heat meter with an electronic calculator and user interface, two temperature sensors, sensor holder bodies, fittings included. The rotary pulse flow meter comes with the CONTECA meter kit. In addition to the two temperature inputs and flow meter input, 4 additional pulse inputs are available for optional equipment monitoring. Data logging is available using the CONTECA datalogger via RS-485 connection. The CONTECA is easy to install and commission, and is certified to ASTM E3137/E3137M-17 Standard Specification for Heat Meter Instruments by ICC-ES, and Directive 2014/32/EU EN 1434 (MI 004).

The CONTECA heat meter has integral RS485 protocol 2-wire communication for remote access and configuration. M-bus protocol is used with the CONTECA Datalogger (default). The protocol can be changed to Modbus when using the CONTECA heat meter directly with a Modbus BAS or when using the Modbus-to-BACnet gateway for communication to a BACnet BAS. Up to 250 CONTECA meters can connect to one CONTECA data logger.

### Flow meters:

Flow meter type: Single jet (½" - 1": to 10 gpm); Multiple jet (1" to 1½": to 45 gpm)  
 Body material: Brass  
 Pulse output: class OA-OC in accordance with EN 1434-2  
 Body threads: ISO 228 male straight  
 Piping connections: Dual unions, tailpieces NPT, sweat, press

Max. working pressure: 235 psi (16 bar)  
 200 psi (13 bar) max. for press models  
 Maximum fluid temperature: 265 °F (130 °C)





## SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.**



**WARNING:** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**AVERTISSEMENT:** Ce produit peut vous exposer à des produits chimiques comme le plomb, qui est connu dans l'État de Californie pour causer le cancer, dommages à la naissance ou autre. Pour plus d'informations rendez-vous [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



**WARNING:** Caleffi shall not be liable for damages resulting from stress corrosion, misapplication or misuse of its products.

**AVERTISSEMENT:** Caleffi ne sera pas responsable des dommages résultant de la corrosion sous tension, d'une mauvaise application ou d'une mauvaise utilisation de ses produits.



**CAUTION:** All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of systems in accordance with all applicable codes and ordinances.

**ATTENTION:** Tous les travaux doivent être effectués par du personnel qualifié formé à la bonne application, installation et maintenance des systèmes conformément aux codes et règlements locaux.



**CAUTION:** If the heat meter is not installed, commissioned and maintained properly, according to the instructions contained in this manual, it may not operate correctly and may endanger the user.

**ATTENTION:** Si le compteur d'énergie thermique, n'est pas installé, mis en service et entretenu correctement, selon les instructions contenues dans ce manuel, il peut ne pas fonctionner correctement et peut mettre en danger l'utilisateur.



**CAUTION:** Make sure that all the connecting pipework is water tight

**ATTENTION:** S'assurer que tous les raccordements sont étanches.



**CAUTION:** When making the water connections, make sure that the pipework connecting the CONTECA heat meter is not mechanically overstressed. Over time this could cause breakages, with consequent water losses which, in turn, could cause harm to property and/or people.

**ATTENTION:** Lorsque vous effectuez les raccordements d'eau, assurez-vous que la tuyauterie reliant le CONTECA compteur d'énergie thermique n'est pas mécaniquement des overstressed. Au fil du temps, ceci pourrait causer des ruptures, avec pour conséquence des pertes en eau qui, à leur tour, peuvent causer des dommages à la propriété et/ou les gens.



**CAUTION:** Water temperatures higher than 100 °F (38 °C) can be dangerous. During the installation, commissioning and maintenance of the CONTECA heat meter, take the necessary precautions to ensure that such temperatures do not endanger people.

**ATTENTION:** Les températures de l'eau supérieure à 100 °F (38 °C) peut être dangereux. Au cours de l'installation, mise en service et l'entretien de le réducteur de pression, le CONTECA compteur d'énergie thermique, prendre les précautions nécessaires afin de s'assurer que de tels températures ne compromettent pas les gens.



**CAUTION:** To prevent any damage which will cause the heat meter to not operate correctly, treat highly aggressive water before entering the heat meter. Be sure water hardness is less than 10 grains.

**ATTENTION:** Pour prévenir tout dommage qui provoque le compteur d'énergie thermique à ne pas fonctionner correctement, le traitement de l'eau très agressive avant d'entrer dans la vanne le compteur d'énergie thermique. Assurez-vous que la dureté de l'eau est inférieure à 10 grains.



**CAUTION: IMPORTANT:** Risk of electric shock. The back panel and heat meter contain live circuits. Cut off the electric supply before performing work. Failure to follow these instructions may result in injury of persons or damage to property.

**ATTENTION:** Risque de choc électrique. Le fond d'armoire et le compteur d'énergie thermique sont sous tension. Couper l'alimentation électrique avant toute intervention. Le non respect de ces règles de sécurité peut entraîner des dégâts matériels et/ou des blessures aux personnes.



**WARNING:** The outer surface of the device, especially in polymer type components, must not come into contact with any chemical substance, either on purpose or accidentally. The system fluid and any chemical additives used within the water piping system – whether for washing or as protection – must be compatible with the materials used to make the device and with the function it performs.

**AVERTISSEMENT:** La surface extérieure de l'appareil, en particulier les composants de type polymère, ne doit pas entrer en contact avec des substances chimiques, que ce soit volontairement ou accidentellement. Le produit et les additifs chimiques utilisés dans les canalisations d'eau - que ce soit pour le lavage ou la protection - doivent être compatibles avec les matériaux utilisés pour la fabrication de l'appareil et avec la fonction qu'il remplit.

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## Flow rates

Code*	Size	Flow meter type & code	Liters per pulse	Minimum Flow rate (gpm)	Maximum flow rate (gpm)
		Single jet			
75044xA	1/2"	750405	1	0.25	10
75045xA	3/4"				
75046xA	1"				
		Multiple jet			
750463A	1"	750406	2.5	0.3	15
750473A	1 1/4"	750407	10	0.5	25
750483A	1 1/2"	750408		1	45

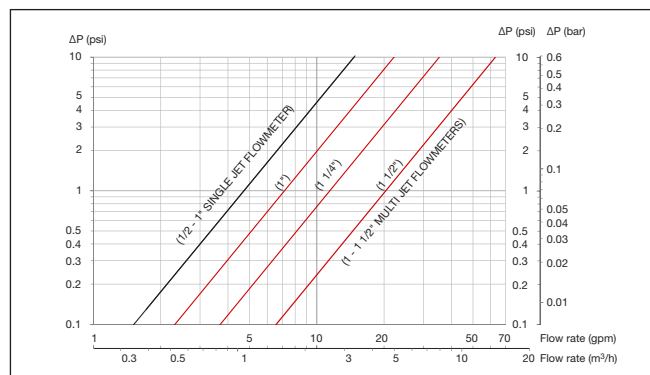
Flow rate range for combined flow meter and 2 sensor holder bodies.

\*position x for codes with Single jet flow meters as follows:

0=NPT male; 3=NPT female; 6=press; 9=sweat

NOTE: press models limited to 200 psi max. working pressure.

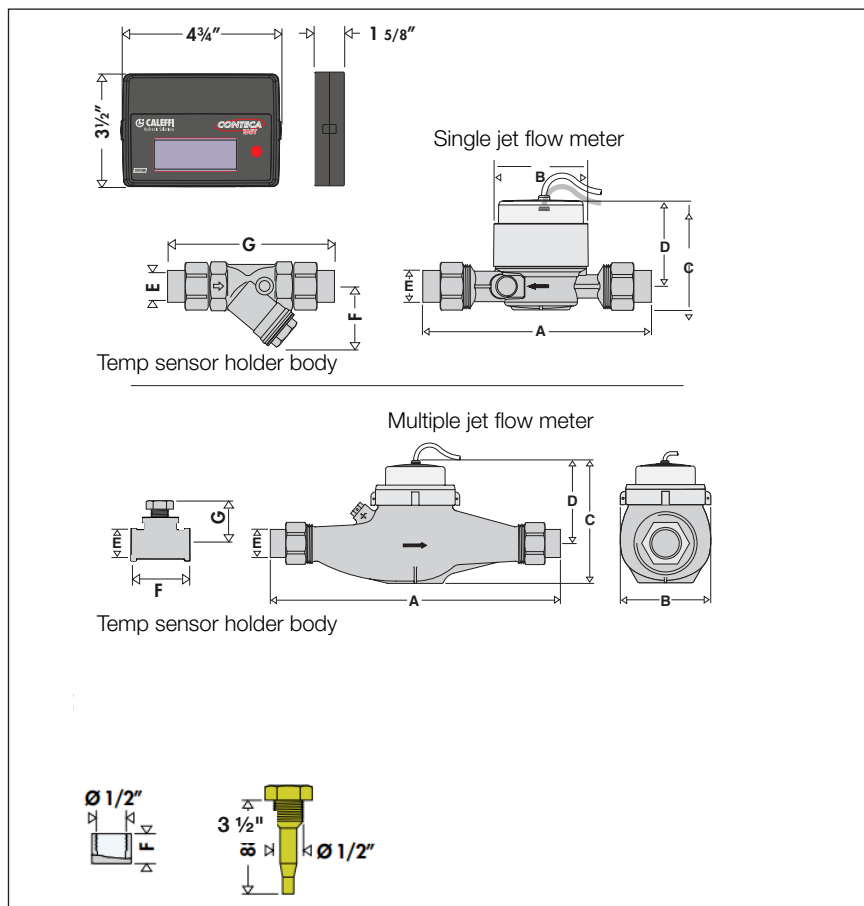
## Hydraulic characteristics



	Single jet flow meter			Multiple jet flow meter		
	1/2"	3/4"	1"	1"	1 1/4"	1 1/2"
Cv	5.0			6.8	11.7	19.6

Flow rate range for combined flow meter and 2 sensor holder bodies.

## Dimensions



Code	A	B	C	D	ends*	E	F	G	Wt (lb)
750449A	6 7/8"	3 1/8"	4 1/4"	3 1/2"	sweat	1/2"	7 1/4"	2"	6.2
750440A	8 3/8"				mnpt		8 3/4"		
750446A	7 1/2"				press		4 7/8"		
750459A	7 3/8"				sweat	3/4"	7 3/4"		7.1
750450A	7 5/8"				mnpt		8"		
750456A	7 7/8"				press		8 1/4"		
750469A	8 5/8"				sweat	1"	9"		7.9
750460A	8 3/8"				mnpt		8 3/4"		
750466A	8 5/8"				press		8 1/2"		
750405A	5 1/8"	5 1/4"	6 7/16"	4 5/8"	male	1"	5 1/8"	2 5/16"	6.0
750463A	12 1/4"				fnpt	1"	5 1/8"		12
750473A	12 1/4"					1 1/4"	5 7/8"		13
750483A	17 1/4"					1 1/2"	5 5/8"		19

\*end connections are the same for the flowmeter and sensor holder bodies for each code.  
example: code 750449A has union sweat ends on both the flow meter and the sensor holder bodies.

**NOTE:** press models limited to 200 psi max. working pressure.

## Installation

To ensure accurate energy measurement, plan the installation for easy initial installation, commissioning and future maintenance. Install the flow meter in a location that will be easy to perform periodic maintenance. Locate the sensors (inserted in provided brass sensor holder bodies) and the flow meter in straight runs of unobstructed pipe as long as possible.

Install shut-off valves upstream and downstream of the flow meter to aid installation and maintenance. Install a clean strainer or other filtering device upstream of the flow meter.

Install the temperature sensor thermowells into the brass sensor holder bodies, following the respective flow directions and properly located for the supply (red label) and return (blue label) positions. The corresponding supply and return pipes must be integral to the same flow rate as measured by the flow meter.



Do not modify the length of the sensor cables. The sensor cables must not be spliced for shortening or extending because this will adversely affect functionality and accuracy.

The flow meter must be installed on the return pipe and in the horizontal position with the turbine axis vertical, following the flow direction indicated by the arrow on the body.

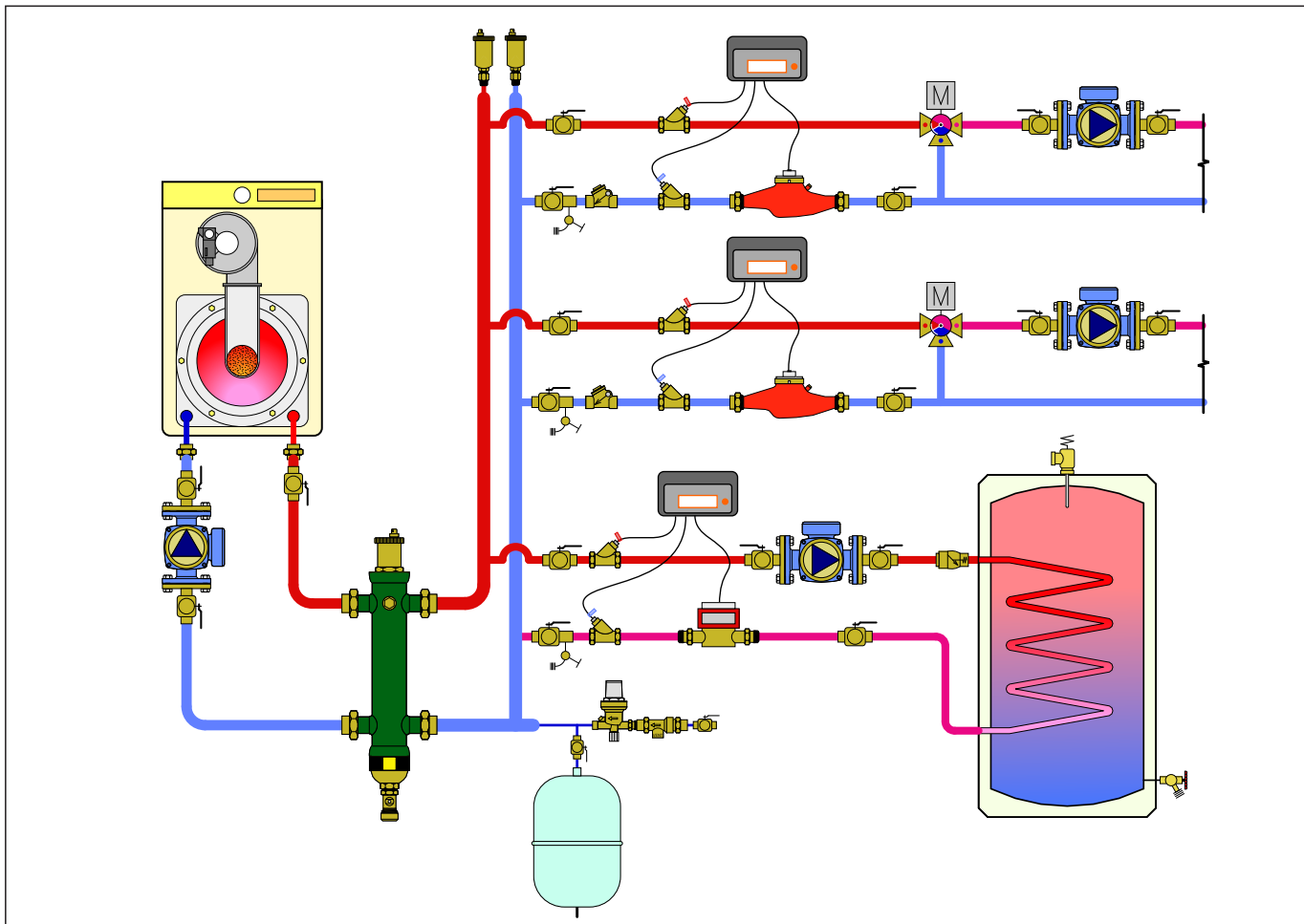
After installing all CONTECA heat meter kit components follow the electrical connections instructions on page 6.

When all work is completed all components need to be lead sealed, follow instructions on pages 10.

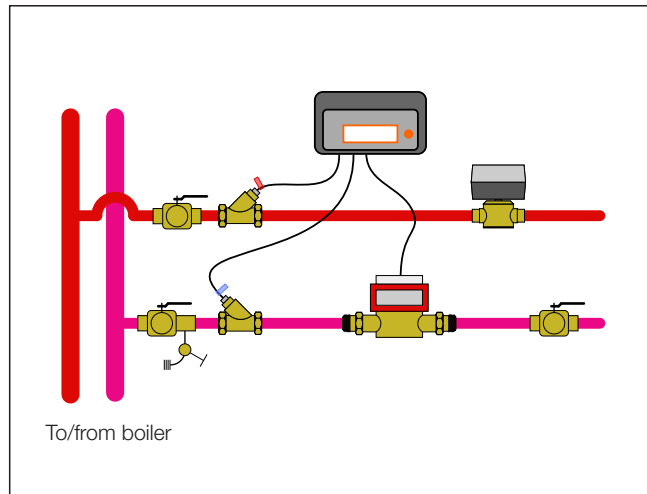


**Scan to view  
Installation Tip**  
7504 CONTECA™

### 1) Diagram of system with metering on manifold with several stages.



## 2) Diagram of user circuit - Control with 2-way zone valves



## Maintenance

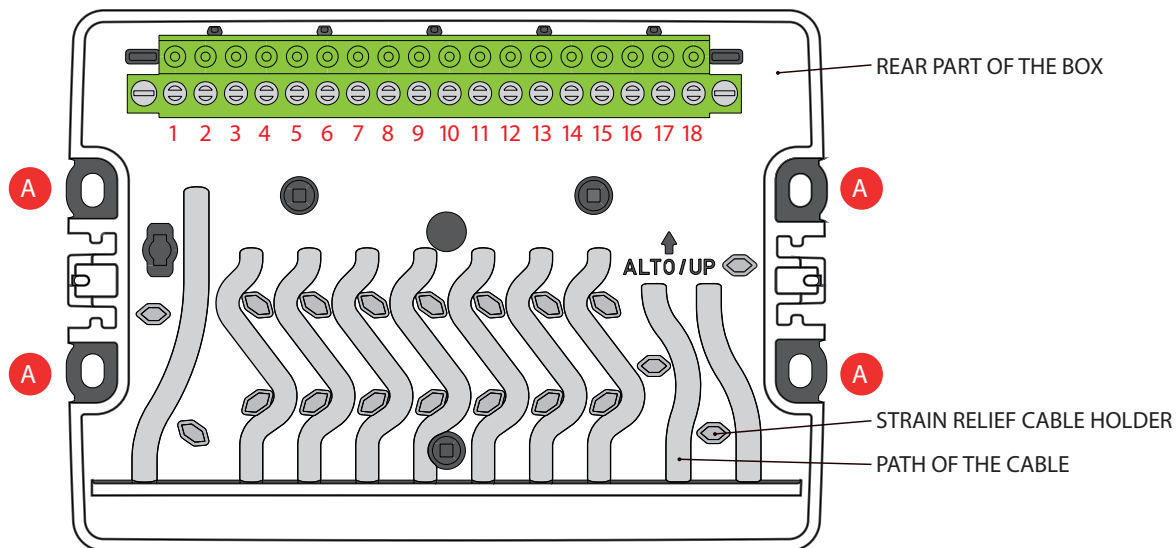
### Filter cleaning

It is necessary to keep clean the strainer or other filter device installed in the flow circuit in a position that protects the flow meter.

By observing the instantaneous flow rate and temperature difference values (flow rate significantly reduced in relation to the nominal value and temperature drop significantly increased), filter clogging can be easily detected for cleaning.

## CONTECA heat meter electrical connections

When mounting in a box or directly on a wall, use the screws provided in the package, insert them in the slots **A** in order to level the device correctly.



Pins	Description
1 - 2	OUT 2 - Open collector pulse output for COOLING units. GND=2 / duration 120 ms / Vmax 24V (dc) - 50 mA
2 - 3	OUT 1 - Open collector pulse output for HEATING units. GND=2 / duration 120 ms / Vmax 24V (dc) - 50 mA
4	NOT used
5 - 6	IN 4 - 4th pulse input (generic). GND=6
6 - 7	IN 3 - 3rd pulse input (generic). GND=6
8 - 9	IN 2 - Pulse input for optional DCW. GND=9
9 - 10	IN 1 - Pulse input for optional DHW. GND=9
11 - 12	Pulse input for the heating volume meter
13 - 14	Digital input (Dry contact: it must be a volt free contact)
15 - 16	Power supply 24 V (ac) 50 Hz - 1W
17 - 18	Transmission Bus RS-485 / RS-485 A=18 (Rx) RS-485 B=17 (Tx)

### • Power supply and energy flow meter inputs

15 - 16 Power supply 24 V (AC).

11 - 12 Flow meter pulse input.

The 24 V (AC) electric supply line should be used solely for the heat meters.

### • Network connection

In the case of data transmission via bus use the following terminals:

17 - 18 Polarized transmission bus - Bus RS-485

17 Tx (RS-485-B) 18 Rx (RS-485-A)

For the transmission bus, use a shielded 2-conductor AWG 22.

**Note: The transmission polarity must be fully observed.**

### • Energy pulse outputs

2 - 3 Heating units output to remote data gathering device (kBTU)

1 - 2 Cooling units output to remote data gathering device (kBTU)

Output specifications:

1 PULSE = 1 kBTU - open collector contact

Pulse duration: 120 ms

**Max. frequency - 1 Hz**

### • Domestic hot and cold water inputs

Separately sourced domestic water meter with pulse outputs.

8 - 9 Pulse input for optional DCW (gal)

9 - 10 Pulse input for optional DHW (gal)

1 PULSE = 1 gal

Pulse duration: 120 ms

**Max. frequency - 1 Hz**

### • Additional pulse inputs

ie: Watt Hour meter - Gas meter

The metering system must be provided with a volt free contact and the weight of the pulse must be indicated.

1 Pulse = 0.1 kWh electric energy

1 Pulse = 1 Nm<sup>3</sup> gas

6 - 7 3rd pulse input

5 - 6 4th pulse input

Minimum pulse duration: 120 ms

**Max. frequency - 1 Hz**

### • Digital input

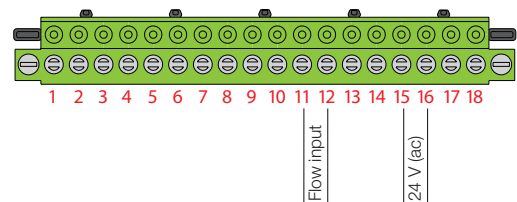
The digital input must be potential free (class IB).

13 - 14 Connection of the auxiliary microswitch of the zone valve (ON/OFF status). When in the ON status an internal register logs the hours of circuit operation. This input does not affect the meter calculations or function.

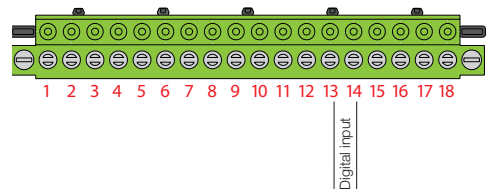
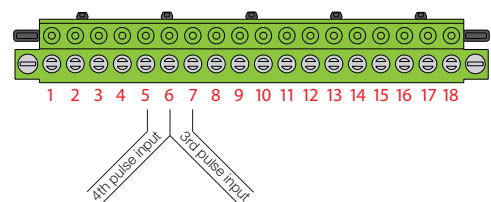
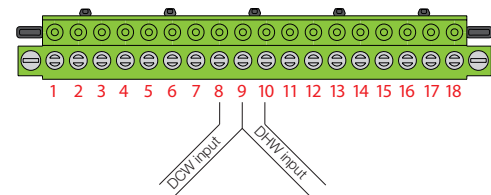
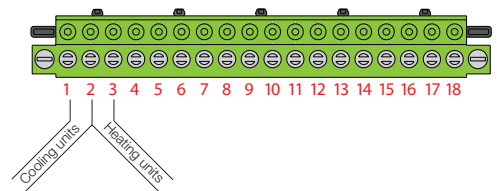
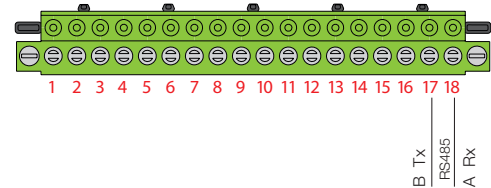
**Notes:** - Each 7504 series device is supplied with a tamper-proof lead sealing kit for the temperature probes and for the plastic electronics box.

- Make the cables to pass through the cable fairleads and the strain relief cable holders.

The basic function of the partition is to protect the electronics card from dust and jets of water.



(Pin 4 is not used)



### Operating information

The accumulated energy amounts are retrieved in a non-volatile memory device (EEPROM) each time the units of measurement are completed (1 BTU) and, at the same time, this increase causes the display to be updated (see "User information cycle").

The CONTEGA heat meter has a liquid crystal display. The display is activated by pressing the button on the front. Scroll through the various information windows by repeatedly pressing the button briefly. In some views, holding the button for several seconds allows additional information to be shown on the display.



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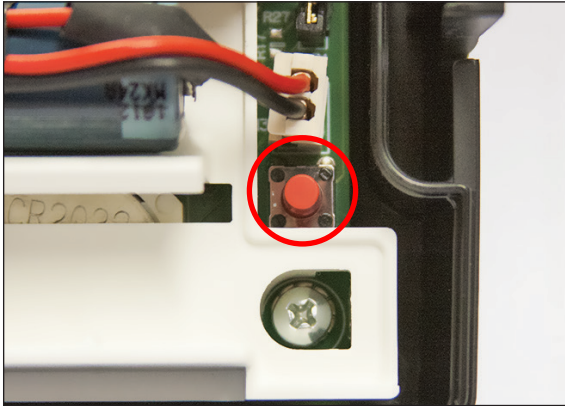


## Test instructions

The 7504 series heat meter is equipped with a quick output test feature, located inside the plastic box. Access this, by removing the seal and take out the screws.

The PCB has a button on the very edge of the right-hand side (figure 1) which can be used to select the technical menu.

Figure 1



Use the button (push) on the display front panel to scroll through the screens. The unit of measurement for the energy, when in test mode, is kBTU/h (figure 2).

Figure 2



mean temp °F	water (K)	50% propylene glycol (K)
40	8.37150	7.37765
60	8.32908	7.42281
80	8.28925	7.46177
100	8.25115	7.49449
120	8.21388	7.52096
140	8.17651	7.54117
160	8.13813	7.55510
180	8.09777	7.56276
200	8.05449	7.56414

## Operating specifications

- 1) The software used to control the metering process, in order to avoid energy metering under non-operating conditions, implements the following principle, based on calculated energy used depending on a specific supply temperature value (FT):

Heating metering is activated for a FT value >71.6 °F (factory set).

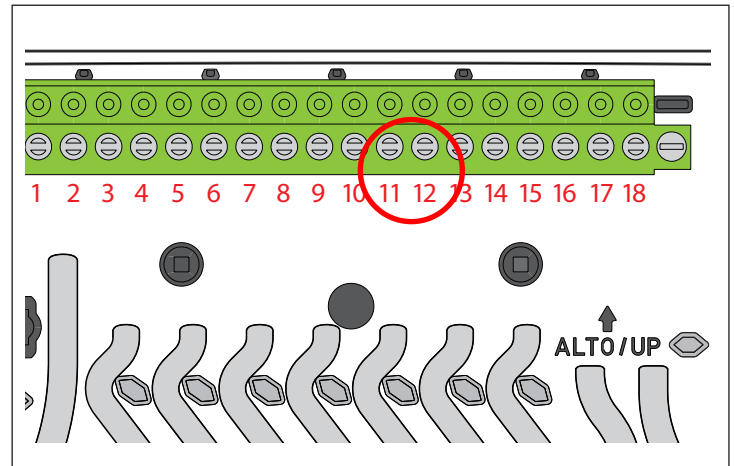
The set values may be modified by an authorized technician on request.

- 2) The software used to control the metering process also operates on the principle that consumption processing depends on the presence of a minimum temperature difference in order to further safeguard against unnecessary measurements or minimal unwanted metering deriving from tolerances in temperature detection a dead band of 0.7 °F is therefore defined.

- 3) The software used to control the metering process also requires the flow meter to be installed on the return pipe. Authorized technicians can, on request, adapt the configuration set so as to position the flow meter on the supply pipe, via RS485 protocol.

The pulse input can be simulated by jumpering pins 11 - 12 (figure 3). The maximum input frequency is 1 Hz.

Figure 3



The temperature sensors, directly connected to the heat meter, inseparable from the electronics circuit, may be placed in a thermostatic bath, observing the temperature range 50–195 °F and a ΔT between 5–145 °R.

The energy increases on the basis of the following equation:

$$E = K \cdot V(0.26417205) \cdot L \cdot \Delta T \text{ (BTU)}$$

E = energy (BTU)

K = factor from table [BTU/lb°F]

ΔT = temperature difference between sensors over short time increment [°F]

V = number of pulses input to the meter over short time increment

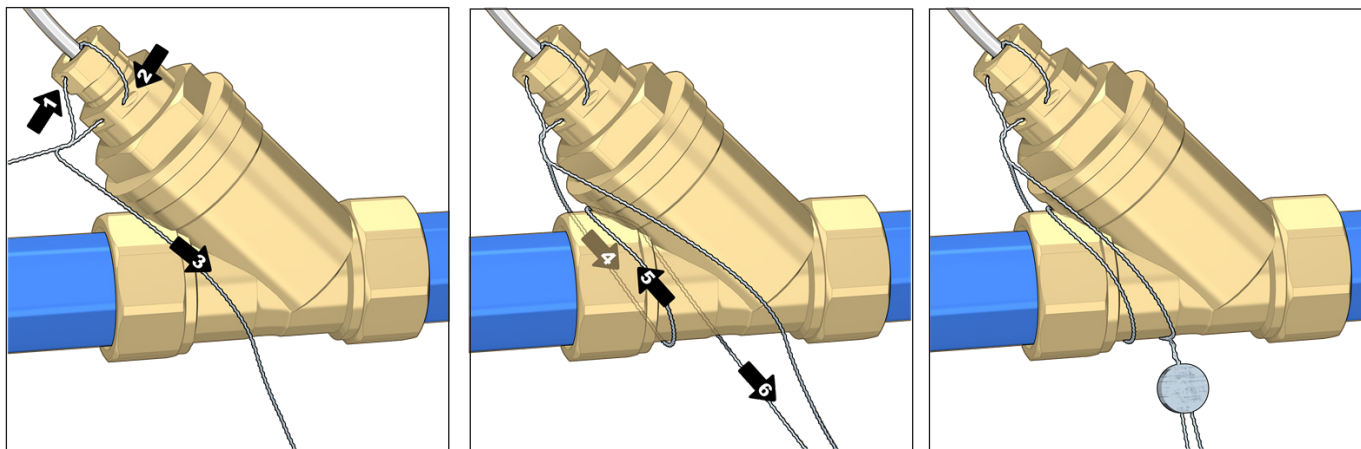
L = number of liters per pulse (see table on page 3 for specific flow meter)

Example: Over a period of 10 seconds you record 8 pulses from the meter, using the single jet flow meter having 1 liter per pulse, and the average temperature difference between sensors has been 12.5 °F. The fluid is water at a mean temperature of 60 °F (so K = 8.32908)

$$E = 8.32908 \cdot 8(0.26417205) \cdot 1 \cdot 12.5 = 220.031 \text{ BTU}$$

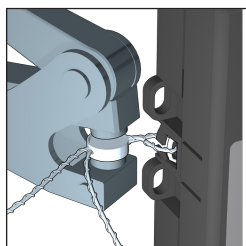
## Lead sealing procedure

### Temperature sensors

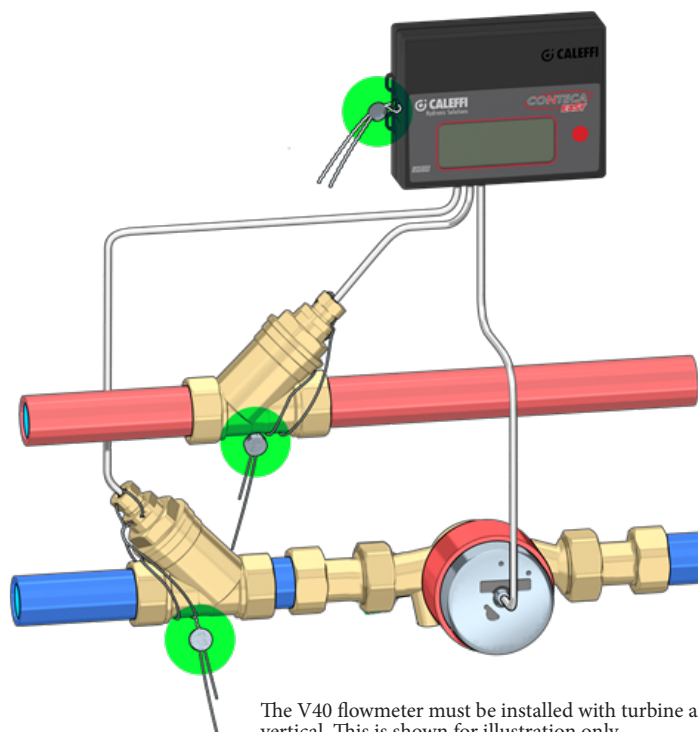


- A) Feed the steel wire through the holes in the temperature sensor fitting (1) and through the sensor fitting pocket (2) and twist it;
- B) Wind the wire tightly as shown in the picture so that, once the seal will be in place, it will be impossible to remove the sensor without either breaking the seal or cutting the wire;
- C) Twist the wire and insert the lead seal;
- D) Repeat steps D, E, F for the other temperature probe.

### Heat meter



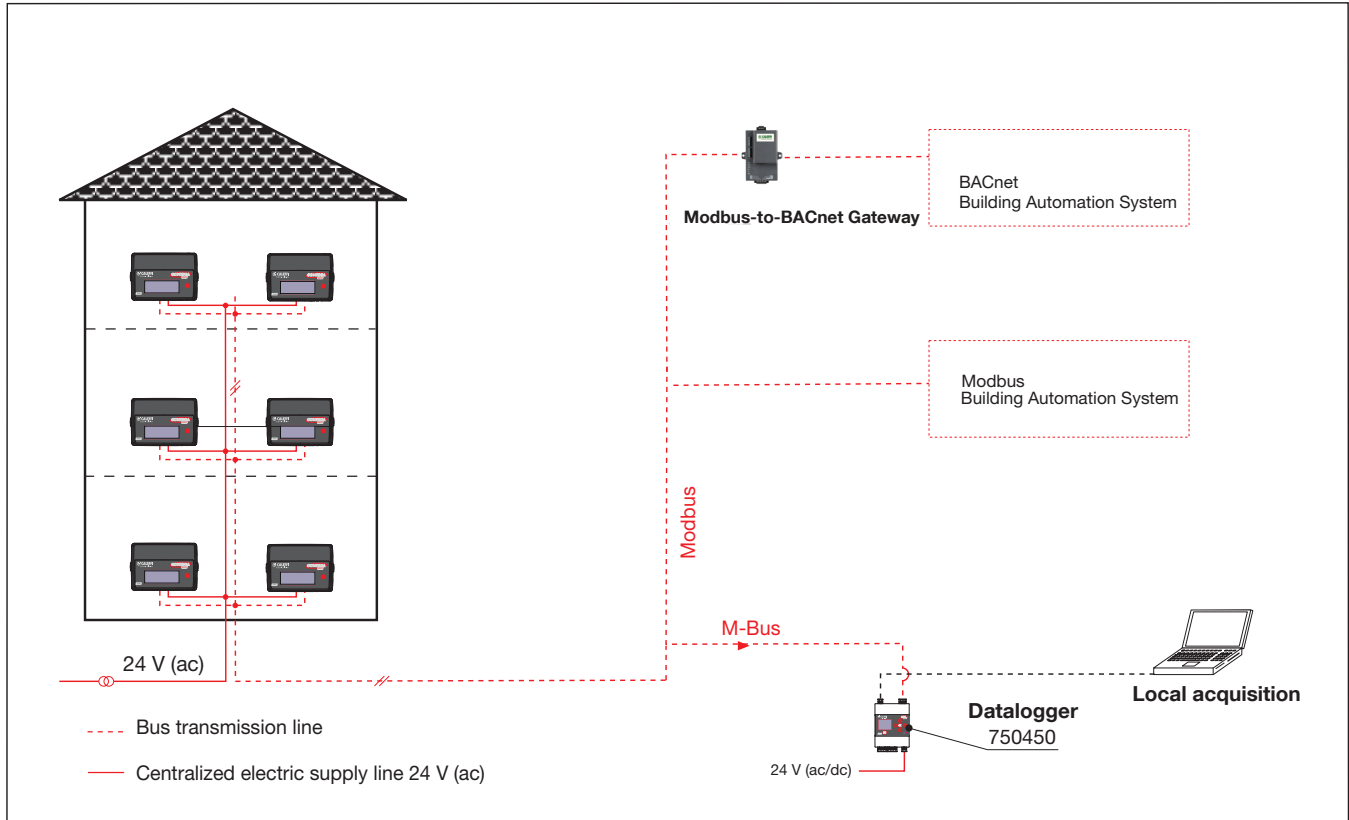
- E) Feed the steel wire through the dedicated holes on one side of the heat meter unit, twist it and insert the lead seal.
- F) Crimp the lead seals highlighted with the green circles in the picture on the right.



The V40 flowmeter must be installed with turbine axis vertical. This is shown for illustration only.

## NETWORK CONFIGURATION

Building transmission network layout



## 750450 CONTECA™ Datalogger

The CONTECA datalogger allows acquisition and logging of the consumption data from CONTECA heat meters via Modbus communication. The integrated browser provides logged and instantaneous data, and report generation. The CONTECA® datalogger can be set up locally via web interface by connecting a PC to one ethernet port with switch functionality.

The SMART function allows the automatic detection of the heat meters connected to the network. Data can be obtained with the automatic report generation, making the system user-friendly and reduces the number of operations to run.

Maximum number of heat meters: 250.



Main specifications of the datalogger:

- Power supply: 24 V (dc)  $\pm 10\%$ , 24 V (ac) - 3 W.
- 2 Ethernet ports: ETH1 (PoE), ETH2.
- Ambient temperature range: 32 - 122 °F.
- Mounting: on a 35 mm DIN rail (EN 60715).
- Daily data logging: 10 years.
- Reports: In XLS or CSV format.



## 755052 Modbus-to-BACnet gateway

Converts CONTECA controller Modbus (RS-485 serial) output communication to BACnet IP or MSTP communication.



## NA10759 Wall mount transformer



Input voltage: 120 V AC.  
Output voltage: 24 V AC.  
Power output: 20 VA.  
Agency approval: cULus.

## V40 Replacement flow meter

Replacement flow meter (body only).

Single jet and Multiple jet rotary pulse flow meter measures liquid flow for energy heat metering production or consumption. Accurate to International Standards OIML, R75, EN1434 and MID. Brass body. Sweat connections included.

Working temperature range: -40 to 210 °F.

Maximum fluid temperature: 265 °F.

Maximum working pressure: 235 psi.

Maximum glycol: 50%.

Code	Description	Weight (lb/kg)
R79701	Single jet, ½" - 1", 0.25 to 10 GPM	3.0/1.4
R79702	Multi-jet, 1" only, 0.3 to 15 GPM	5.0/2.3
R79703	Multi-jet, 1¼" only, 0.5 to 25 GPM	8.0/3.6
R79704	Multi-jet, 1½" only, 1.0 to 45 GPM	14.0/6.4



LEAVE THIS MANUAL WITH THE USER.

Laissez ce manuel à la disposition de l'utilisateur.