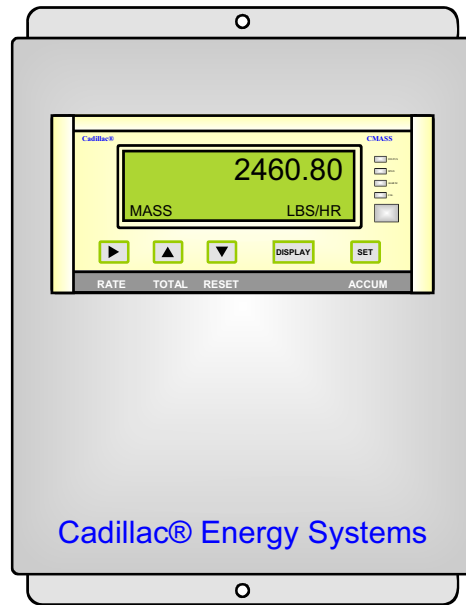


# Cadillac<sup>®</sup> CMASS

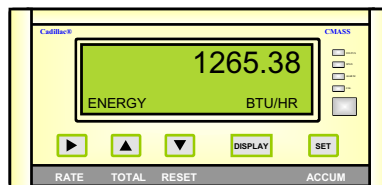
Central Station Steam Co.<sup>®</sup>

## GENERAL INFORMATION

### Wall Mount



### Panel Mount



**Central Station Steam Co.<sup>®</sup>**

**CADILLAC<sup>®</sup> METERS**

15615 SW 74th Ave., Ste #150 Phone: 888-556-3913  
Tigard, OR 97224 Fax: 503-624-6131

[www.cadillacmeter.com](http://www.cadillacmeter.com)

## THE ENERY SYSTEM OF CHOICE

The Cadillac® CMASS Mass Flow / Energy Meter is designed to measure the energy consumed in Super Heated Steam and Natural Gas applications. The meter is a rate and totalizing device, which is capable of calculating and displaying Volume, Volume Flowrate, Corrected Volume, Corrected Flowrate, (Heat & Heat Flowrate in Natural Gas), Mass, Mass Flowrate, (Energy in Steam) , Temperature, Pressure, (Compressibility Factor in Natural Gas), and (Specific Volume & Enthalpy in Steam). Combined with Cadillac®'s superior flow meter technologies the CMASS provides the most accurate, repeatable, and maintenance free Mass Flow / Energy system available in the industry.

The Cadillac® HEATX CMASS Mass flow / Energy meter measures the Volumetric flow via a Cadillac CV-P, CV-HS, or CV-U Vortex flow meter along with temperature and pressure inputs via separate loop powered transmitters and in turn calculates the Mass flow and Energy of the compressible media (Gas or Superheated Steam) being measured using internal calculations specific to either Steam (IAPWS industrial formulation) or Natural Gas (SGERG AGA-8 Gross equations).

## THE NEW INDUSTRY STANDARD

Combined with Cadillac®'s superior flow meter technologies the CMASS Mass Flow / Energy meter has quickly become acknowledged as the industry standard. Customers choose the Cadillac® CMASS Mass Flow / Energy Meter because of proven:

- ◆ **ACCURACY, DEPENDABILITY, CONSISTENCY, LOW MAINTENANCE, RANGEABILITY**

## APPLICATIONS

- Energy consumption data source for energy management system, DCS, district-wide systems.
- Energy-Customer Billing from accurately totalized Energy / Mass Flow measurements.
- Basis for internal cost distribution using campus-wide systems.
- Efficiency measuring and monitoring from central control rooms.
- Direct Energy / Mass Flow measurements at both Boiler and point of use locations.

## FEATURES

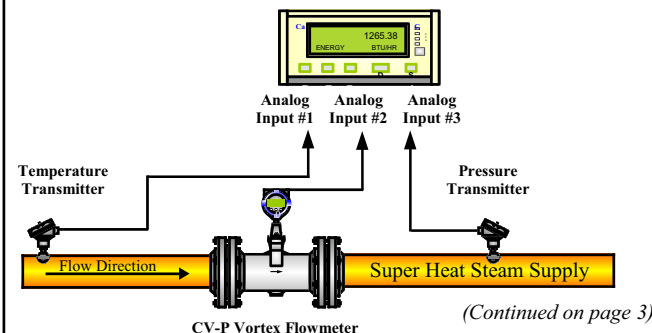
### MODES OF OPERATION

- **Natural Gas Flow:**  
Measures the volume, mass, and gross heat content of natural gas by using analog inputs; volume flow, temperature, and pressure.
- **Super Heated Steam Flow:**  
Measures the volume, mass, and energy content of Super heated steam by using analog inputs; volume flow, temperature, and pressure.

## PRINCIPLE OF OPERATION

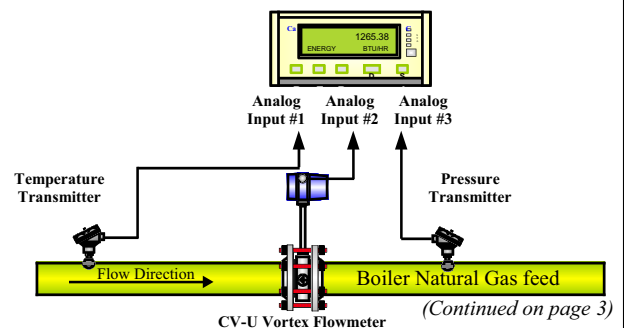
The **CMASS Super Heat Steam** flow measurement requires three analog inputs:

- 1) Volumetric flow using a **CV-P** Vortex meter.
- 2) Temperature using a Temperature Transmitter.
- 3) Pressure using a Pressure Transmitter.



The **CMASS Natural Gas** flow measurement system requires three inputs:

- 1) Volumetric flow using a **CV-P** Vortex meter.
- 2) Temperature using a Temperature Transmitter.
- 3) Pressure using a Pressure Transmitter.



# Energy and Mass Flow Measurement for Campus Steam Mains and Central Utility Boiler Gas Flows

(continued from Page 2 - *CMASS Super Heat Steam*)

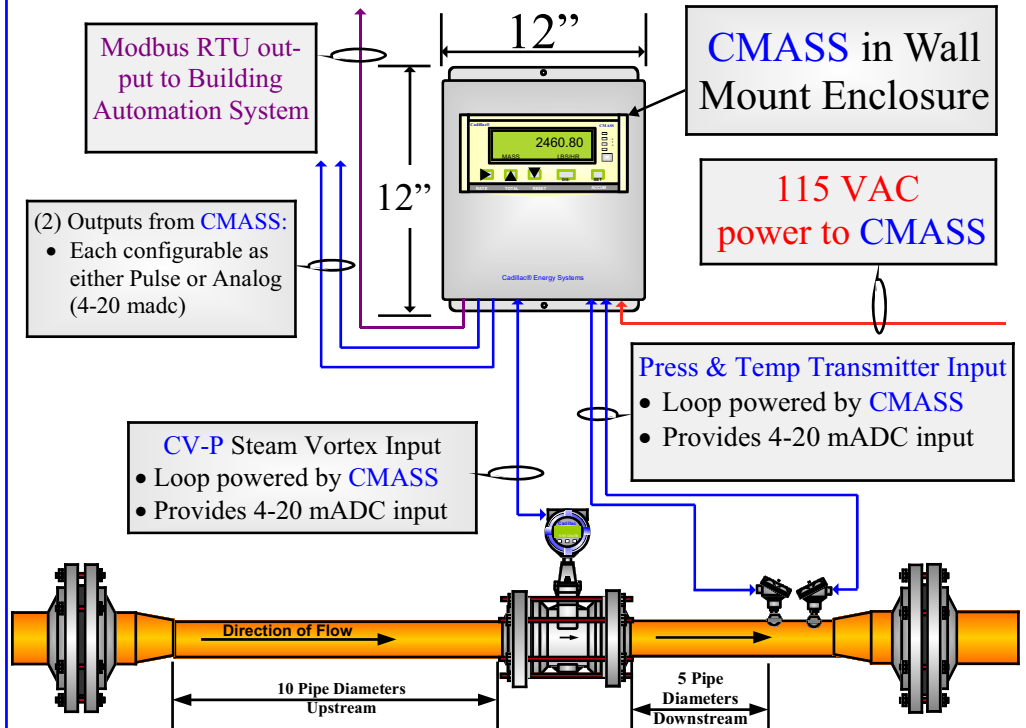
for calculating Mass flow or Energy according to the IAPWS industrial formulation (1997) for the thermodynamic properties of steam. The equations use the pressure and temperature values to determine the specific volume and the specific enthalpy.

## Formulas:

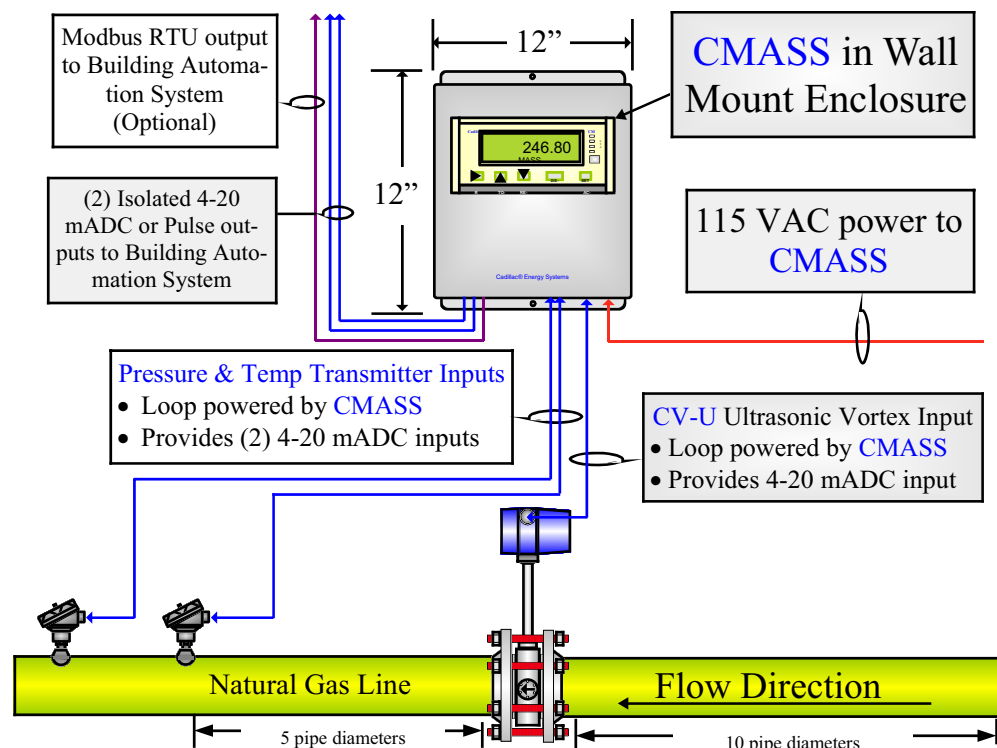
1) **Mass Flow = Volume flow / Specific volume**

2) **Energy flow = Mass flow x Specific enthalpy**

## MASS Flow Measurement for Superheat Steam



## MASS Flow Measurement for Natural Gas



(continued from Page 2 - *CMASS Natural Gas*)

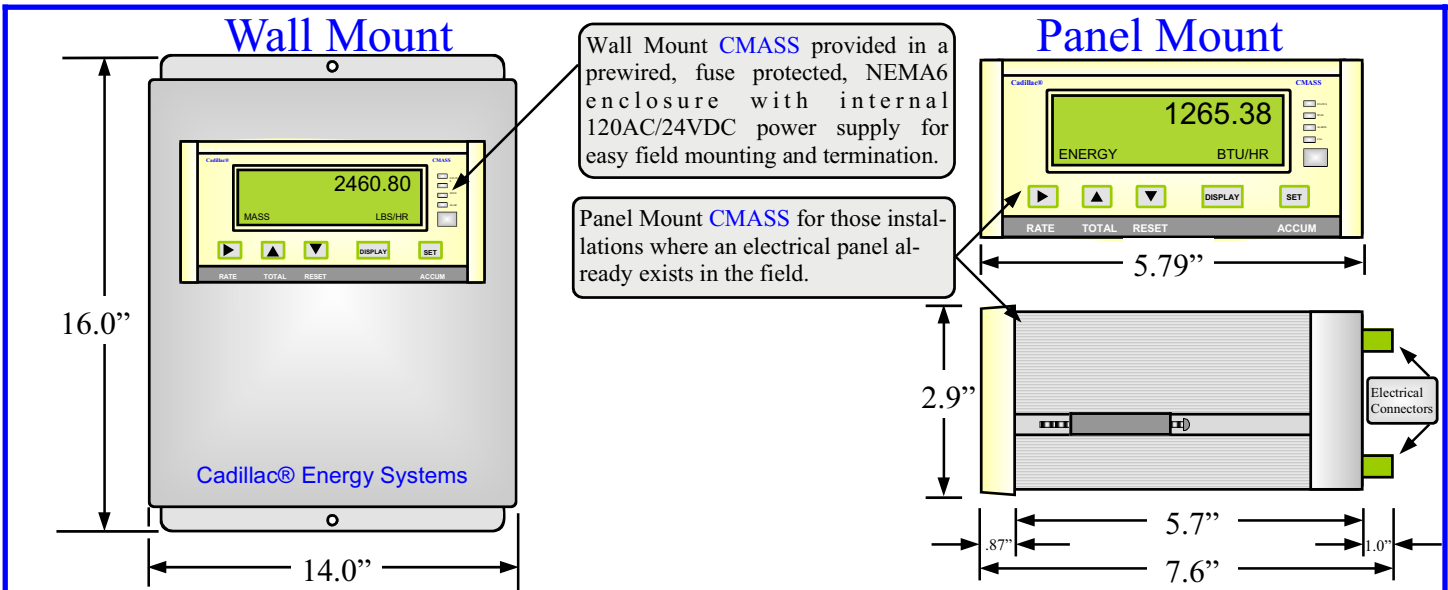
for calculating the gas density and compressibility factor based on the SGERG (AGA-8 Gross) equations. The equation uses the pressure and temperature values to determine the Mass flow, Corrected flow, and Heat flow.

## Formulas:

Mass Flow = Volume flow x  $\rho_{flow}$   
 Corrected flow = Mass flow x  $\rho_{ref}$   
 Heat Flow = Mass flow x  $H_m$

## Where:

$\rho_{flow}$  = Density at flow conditions  
 $\rho_{ref}$  = Density at reference conditions  
 $H_m$  = Mass gross heating value



**CADILLAC® ENERGY AND FLOW MEASUREMENT SYSTEM GENERAL SPECIFICATIONS**

**ENERGY SYSTEM SPECIFICATION:**

- ◆ The entire Energy Measurement System shall be supplied, calibrated, and commissioned (if necessary) by a single manufacture, Central Station Steam Co, and shall consist of a CMASS Mass Flow / Energy meter, a non-mechanical flow meter, a precision matched temperature sensors/transmitter, and a high accuracy gauge pressure transmitter. A certificate of NIST traceable calibration shall be provided with each system.

**ENERGY / BTU METER:**

- ◆ Provide a Cadillac® CMASS Mass flow / Energy Meter. The Mass Flow meter shall provide the following measurements at the local display and as outputs\* to an Building Control System. Volume, Volume Flowrate, Corrected Volume, Corrected Flowrate, (Heat & Heat Flowrate in Natural Gas), Mass, Mass Flowrate, (Energy in Steam) , Temperature, Pressure, (Compressibility Factor in Natural Gas), and (Specific Volume & Enthalpy in Steam). Output signals shall be either Serial RS-485 (Modbus RTU), and/or via analog (4-20 mADC) and or pulse (Open Collector). Each meter shall be factory configured for its specific application, and shall be reprogrammable using the front panel keypad (no special tools or computer required). \*Output options vary by model code and digital communications.

**TEMPERATURE SENSOR/TRANSMITTER:**

- ◆ Temperature sensor/transmitter shall have a accuracy of +/- 0.1% of temperature span, be 24VDC loop powered, provide a scalable 4-20 mADC output, and field adjustable through a local interface or via digital communications (HART).

**PRESSURE SENSOR/TRANSMITTER:**

- ◆ Pressure sensor/transmitter shall have a accuracy of +/- 0.1% of pressure span, be 24VDC loop powered, provide a scalable 4-20 mADC output, and field adjustable through a local interface or via digital communications (HART).

**FLOW METER:**

- ◆ Provide a Cadillac® CV Vortex flow meter. The meter will have no moving parts, shall operate per the “Karman” principle. For Superheated steam (CV-P) Piezoelectric crystals mounted external to flow body will be employed to measures torsional effects of vortices on shedder bar. For Natural Gas (CV-U) ultrasonic sensors mounted in sidewall of meter body downstream of shedder bar will be employed to measure vortices. Both meters will have an operational accuracy of +/- 1.0% of rate. A fully developed flow profile must be maintained through piping straight run up and downstream of meter. Meter will have minimum 25:1 turndown at stated accuracy in a “Best Fit” installation. Meter will be provided with integral or remote electronics including a local backlit LCD for parameter viewing and easy interface / configuration. Meter will be preconfigured for application, but may be field adjusted through local display (no special tool or computer required).

**CADILLAC® HEATX MODEL NUMBER STRUCTURE**

CMASS		Cadillac Mass Flow / Energy Meter
	P	Panel Mount
	W	Wall Mount
	0	Outputs:(2) Relays, (1) Isolated 4-20 or pulse & (4) Logic inputs
	1	Outputs: Above plus; RS485, (2) extra relays, (1) Additional isolated output
	DC	Power Supply: 12-28 VDC
	AC	Power Supply: 110/120 VAC
	S	Steam Tables and formulas
	G	Gas Tables and Formulas

Cadillac® also offers the HEATX Energy / BTU meter for Hot/Chilled water and the CDIS remote display flow station for Saturated Steam Mass flow measurements. Please contact Central Station Steam Co. for more information on these products.