+ Energy management – measurement of steam, hot and chilled water, and fuel

How It Works

Sensia flow computers and flowmeters work together to sense, compute, indicate, record, report, and, if required, control the movement of energy to support efficient operations.

Computing the value of steam

Sensia is skilled in computing the precise quantities of energy, mass, and volume equivalents of steam in industrial and commercial installations and in enhanced oil recovery operations. The steam condition can be superheated, saturated, or wet. When it is wet, a steam quality factor can be entered. Not only does this adjust the quantities directly, but if an orifice or cone meter is sensing the flow, then the imbedded correlation technique derived from Chisholm and Steven in 2008 can be applied to adjust for the overreading relative to the true flow quantity and thereby improve measurement accuracy. This correction is applicable to cone meters of 0.75 beta ratio and to orifice meters 0.2 < beta < 0.7.

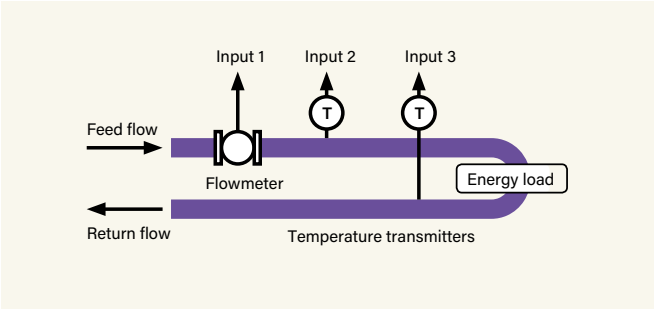
Computing the value of natural gas

Sensia has built and sold thousands of flow computers for measuring natural gas. Around the world, they are relied upon to precisely account for this valuable commodity with select models offering third-party custody transfer metrological approvals.

The quantity of energy that would be released from the combustion of the gas is automatically computed based on the molecular composition of the gas or is acquired from analytical devices measuring the energy content per unit volume or mass. Scanner* 3000 flow computers offer the ability to directly interface with a gas chromatograph or combustion analyzer or to manually receive compositional data. Scanner 2000 flow computers manually receive compositional or analytical data or from an interconnected Scanner 3000 flow computer.

Computing the value of water

Water is often used as a thermal transfer fluid. The Scanner 3100 flow computer determines the differential energy across a thermal load. The fluids can be chilled or hot water or steam. The source of the measurement can originate from within the Scanner 3100 computer itself or from a Scanner 2000 flow computer connected to it.



Totalizing water and other utilities

An additional feature of Scanner flow computers is the ability to use a pulse input with a pulse-producing flowmeter, such as a Sensia turbine meter, to centrally totalize gross water flow. The Scanner 3000 series computer offers three pulse inputs, and the Scanner 2000 series computers offer one with an option for another.

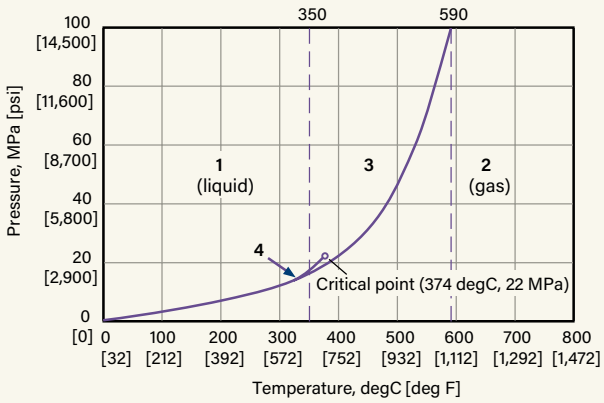
Computing the value of fuel oil

When fuel oil is used as a primary or a backup energy source, Scanner flow computers determine the net volume or mass per the latest API computations.

Efficiency calculation

The Scanner 3100 flow computer is capable of multistream measurement of the same or different fluid types. The calculation feature enables the live calculation of efficiency by metering both the energy input and output. The resulting efficiency measurement is a primary tool in detecting and controlling cost savings.

Scanner Flow Computer Application Summary		
Model	**2000 Series**	**3000 Series**
Flow streams	1	1 to 22
Computed and recorded values		
Energy	▪	▪
Mass	▪	▪
Volume	▪	▪
Fluids		
Chilled or hot water	–	▪
Wet low-quality steam	▪	▪
100% saturated steam	▪	▪
Superheated steam	–	▪
Net (in – out)	▪	▪
Liquid or gas hydrocarbon fuel	▪	▪
Ancillary capabilities		
Proportional-integral-derivative (PID) throttling control	▪	▪
Remote terminal unit (RTU) data and signal exchange	▪	▪
Programmable logic control (PLC)	–	▪
Record keeping and data logging	▪	▪
Primary devices		
Cone meters	▪	▪
Pitot	▪	–
Orifice	▪	▪
Venturi (excluding steam)	–	▪
Vortex and other pulse meters	▪	▪
Coriolis mass	–	▪

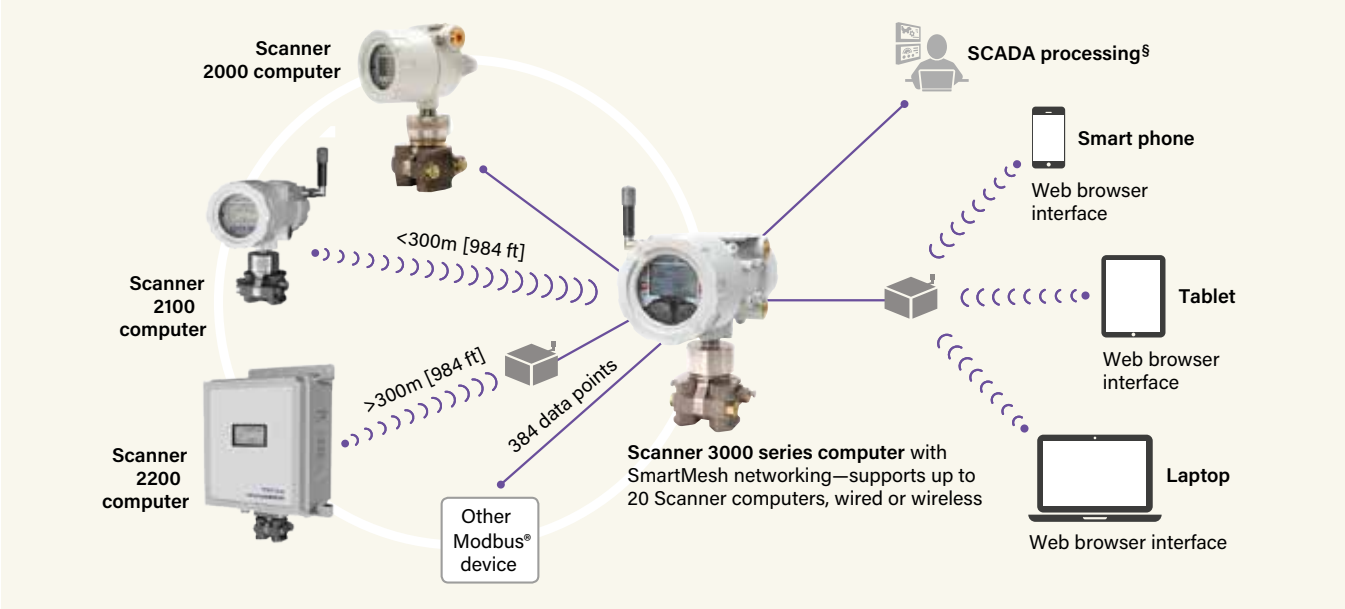


Where there is a quantity of measurements to be made in a local area, the Scanner flow computer can deploy as a wired network, self-creating wireless mesh network, or both. This rapidly deployable system semiautomatically integrates and replicates the data records that exist in both the Scanner 2000 flow computers and the Scanner 3000 flow computer.

Using this high-data-integrity design, Sensia customers avoid most of the engineering design and implementation costs associated with complex wired systems and can reduce installation costs by more than 50% without compromising measurement monitoring and control capabilities.

IF-97 thermodynamic properties

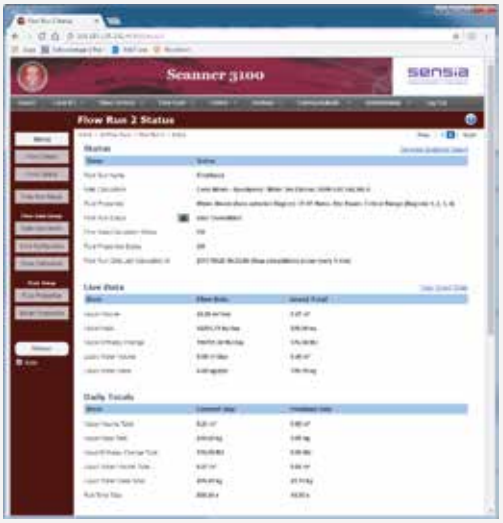
Scanner flow computers apply the 1997 industrial formulation for the thermodynamic properties of water and steam (IF-97) issued by the International Association for the Properties of Water and Steam (IAPWS). IF-97 is the basis of similar standards from American Society of Mechanical Engineers (ASME) and others.



†Compatible with eFCAS, a Sensia solution offered in association with CPU, LLC, and other SCADA products.
The capex-saving distributed measurement system of Scanner flow computers features wired or wireless capabilities.

Communications
Each Scanner flow computer can transmit data over tremendous distances using Modbus® serial communications. Wired data transmission capabilities include serial, 4–20 mA, or quantity pulses. The 3000 series includes two Ethernet ports for access to browser-based user-interface pages or for connection to other automation devices. Scanner flow computers can incorporate multivariable differential pressure, absolute pressure, and temperature sensors.

Scanner 3100 flow computer browser-based interface
Connecting to a flow computer to view current data, download historical data, or perform system maintenance is more convenient because Scanner 3100 flow computers serve pages to any user-authorized device with a browser. The connection can be local, through a Wi-Fi connection, or remote via the internet.



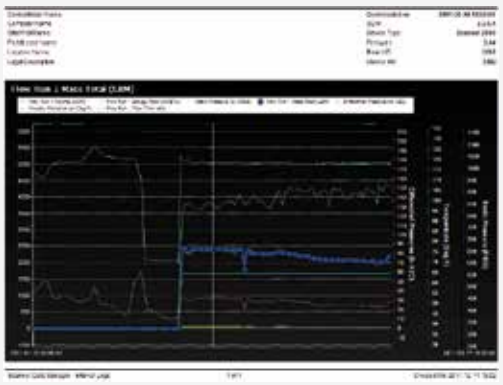
Users can view current data, download historical data, and perform system maintenance by connecting to any authorized device with a browser.

Data reporting
All Scanner flow computers are long-term data recording devices, with the Scanner 3100 computer offering the highest capacity and flexibility. Using one scenario for the Scanner 3100 flow computer, the user lists the item they wish to record and the frequency of the recording. Assuming there were 13 items selected, the value of each of the items would be logged every 5 minutes for 85 days for each of the flow runs. In addition, these entries are used to create daily values and are stored for 5.6 years. Where appropriate, the period values are user defined as instantaneous, minimum, maximum, time-based average, or flowbased average.

A third log called a triggered archive is provided to capture up to one million records divided by up to 19 items. It is called a triggered archive because it can be started and stopped by many items, including alarms, time, or events. Nearly 100,000 records comprising user changes, system alarms, or process alarms are recorded.

To utilize the information acquired using Scanner flow computers, Sensia provides a Windows® software tool that enables users to evaluate and report the measurement information that is key to their operations. This tool provides graphical visualization, data presentation, and output in an Excel® format. User-defined reports can be printed or e-mailed. Scanner Data Manager* analysis and reporting software is available for free download from the Sensia website.

Companion meters
Sensia offers a variety of flow sensors, including cone meters in the NUFLO* measurement technology portfolio, that are well suited to energy measurement applications. Our differential-based cone meters excel in wet and dry steam, water, and compressed gas flow measurement applications. They are available in sizes from ½ to 48 in [15 to 1,200 mm] with threaded end or flanged connections up to ANSI 2500.



NUFLO technology cone meter.