

Steam Trap
Management
Products and
Services

Armstrong





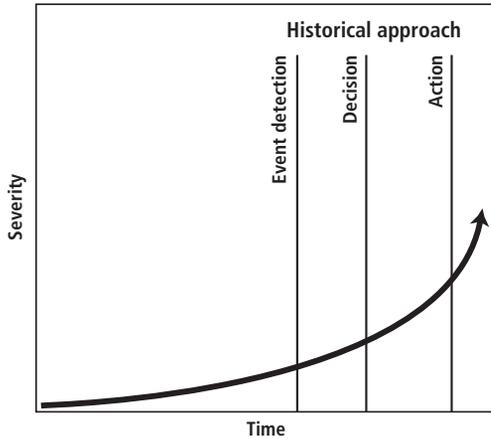
Armstrong® The New Standard for Steam Trap Management

According to the Alliance to Save Energy, facilities have saved as much as 17% of fuel use when implementing energy-saving processes. Establishing a consistent, long-term steam trap management process is one way to achieve savings.

Steam Trap Management Products and Services

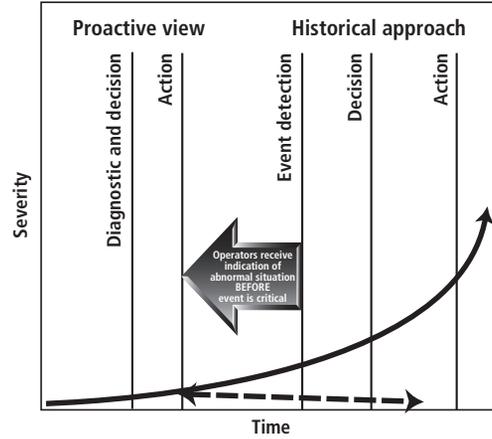
Historical Approach to Steam Trap Program*

Trap inspections are typically performed one time per year. The problem with this approach is that steam traps fail every day. These undetected failures lead to system irregularities, which, when left undetected long enough, can result in severe problems and equate to many dollars lost.



Proactive Approach to Best Practice Steam Trap Management*

Early detection means being able to act on a trap failure before the associated problem becomes severe. Therefore, immediate evaluation of the situation and measurement of the results are critical for continued best practice process improvement, yearly steam loss reductions and sustained monetary savings.



*Schavey, L. and Stout, J., "Achieving Operational Excellence in Gas Plants," Hydrocarbon Processing, January 2005.

Wireless, Labor-free, Instant Notification of Steam Trap Failure!

If you were to describe your vision for steam trap best practice, what would it look like?

Awareness

- The ability to constantly monitor the steam trap population without labor allocation
- Instant notification of steam trap failure

Action

- Quick diagnosis and action on best trap replacement based on return on investment (ROI)

Accountability

- A reporting system that provides tracking, measurement, ROI analysis and easy company-wide communication

SteamEye® and SteamStar® bring steam savings through instant notification of steam trap failure.

SteamEye® is the tool to reduce labor and energy costs by constantly monitoring the steam trap population. SteamStar® is the measurement software that will create company-wide awareness for a whole new level of steam savings. When working together, SteamEye® will feed the moment-to-moment steam trap data into SteamStar®. SteamStar® will instantly report this information through Web-based software that allows easy access for company personnel to make timely, money-saving decisions.



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SteamStar®

Easy-to-use and Very Affordable Steam Trap Database



SteamStar® is the first Web-based software for recording, monitoring and managing steam trap information.

Improve steam system efficiency.

Steam system efficiency can be directly linked to how well the system is managed. SteamStar® provides diagnostic reporting at various levels of organizational responsibility. The reports permit the evaluation of current conditions and provide the knowledge necessary to make money-saving decisions.

Achieve best practice energy management goals.

History has shown that companies maximize sustainable cost savings when energy goals are measured, monitored, and managed on a consistent basis. SteamStar® is the Web-based tool that will bring data together by site, by region and by company to help achieve best practice energy management goals.

Save valuable time.

Typically steam trap data are presented from multiple sites in different software formats and with different qualifying terminology. These variables make managing steam system information difficult and time-consuming. SteamStar® offers a platform for company-wide steam data to be viewed and analyzed without wasted time.

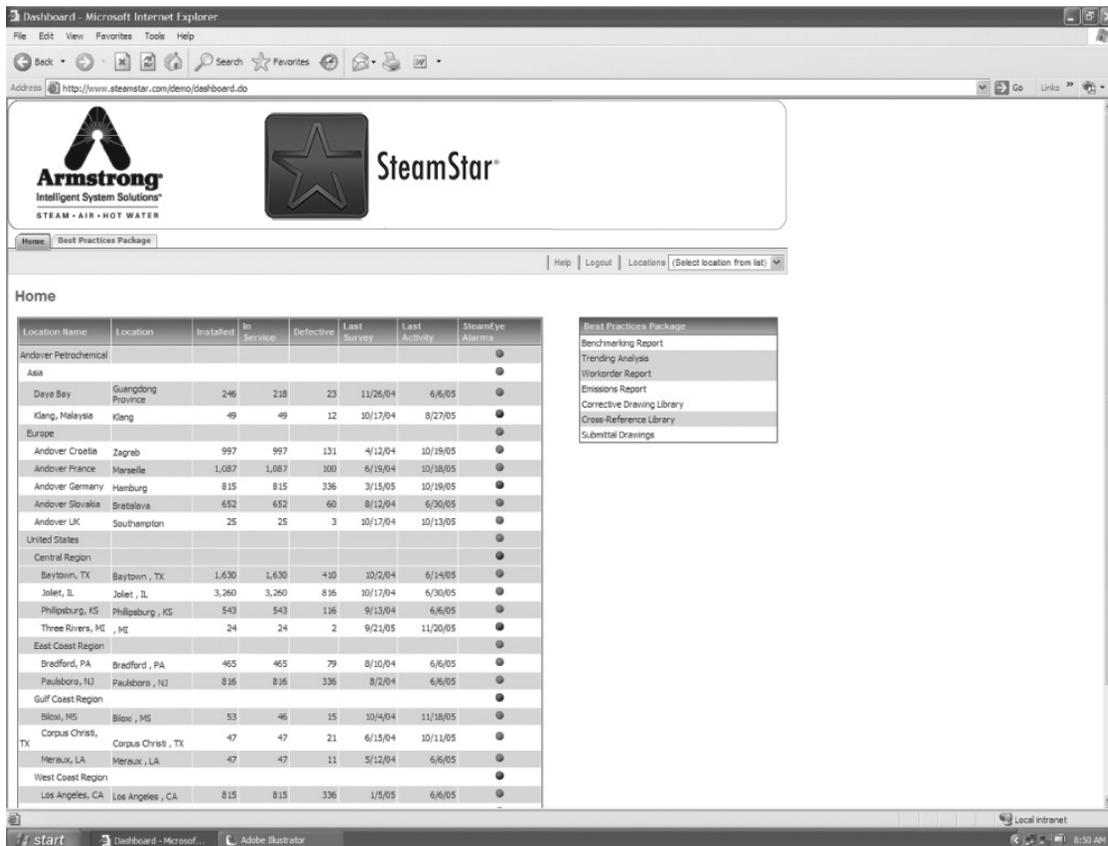
Eliminate costs associated with software

licensing agreements. Licensing agreements can cost tens of thousands of dollars for initial software purchase. For the software to facilitate multiple users, additional capital outlay is required. The Web-based platform of SteamStar® eliminates licensing fees and dramatically reduces the required investment. A one month return on investment!

Improve company-wide communication.

Users at the plant level can perform evaluations to determine root causes of steam system issues. Using the same platform, the global energy manager has the ability to analyze data for sites around the world. This level of communication promotes understanding of steam system efficiency.

Steam Trap Management Products and Services



Screen shot of SteamStar® home page.



SteamStar®

Easy-to-use and Very Affordable Steam Trap Database

SteamStar® Web-based software will evaluate steam system data.

Continuous Steam Trap Monitoring captures real time steam trap operation from SteamEye®. SteamEye® is the automated steam trap monitoring tool that provides accurate and constant information from each steam trap. This information is translated by SteamStar® into actionable reports. All of the reports available in SteamStar® are designed for best practice measurement.

- Executive Summary
- Steam and Monetary Loss
- Defective Trap Report
- Manufacturer Summary
- Trap Evaluation by Application

Company Benchmarking

This premium report establishes a comparison to sister sites and industry peer best practices. The user has a choice of which sites to benchmark and which factors to compare. Steam losses and monetary losses can be compared by site, by type of application, by type of trap, and more. This report will offer management a wide analysis of which sites are working to reduce steam losses and which lag behind. It will also highlight any areas of concern in terms of high steam trap failure rate compared to total monetary losses. This report is a valuable tool for facility managers and global energy managers alike.

Prioritized Work Orders

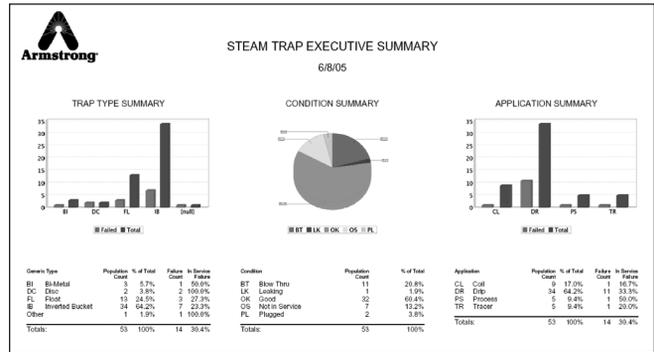
The work order report is a premium report that was designed for optimum facility payback on labor and material while keeping energy losses to a minimum. This report is available at the site or unit level and will create a work order for steam trap repairs based on payback.

Trend History

The premium trend analysis report will assist a manager with the comparison of multiple years of data. The data available for comparison are steam loss, monetary loss, fuel consumed, and emissions created. Like the other premium reports, the trend analysis report can be compared by site and/or region. It will also track emissions—CO₂, SO_x, NO_x—and highlight the progress made toward steam system efficiency and dollars saved.

Emissions Summary

The premium emissions report is valuable for its ability to focus on the quantifiable emissions of CO₂, SO_x, and NO_x in one summarized view. Steam system efficiency is not only viewed as important in terms of energy losses but also in terms of environmental impact. The emissions report is especially beneficial to users that are penalized by world governments for high emission factors.



Screen shot of executive summary.



Screen shot of prioritized work order.

SteamEye® — The Only 24/7, Wireless, Labor-free Steam Trap Monitoring System!



Steam Trap Management Products and Services

SteamEye® can monitor any manufacturer's trap and any trap type.

"It's like having someone sitting there watching traps all day." That's how a maintenance supervisor at an installation summed up the benefits of SteamEye®.

But exactly how does SteamEye® do what it does? And how does it use radio waves to signal a real beginning in steam system optimization? What is wireless steam trap monitoring anyway?

Wireless monitoring of steam traps gives you an instantaneous insight into trap performance that is the most accurate measure of steam trap status available. The system consists of a transmitter, a repeater (if necessary), and a receiver. Building automation system integration is also an option. Consult your Armstrong Representative or Armstrong's Smart Services Group.

SteamEye® saves energy and money

Whoever first observed "Little things mean a lot" perhaps had failed steam traps in mind. Show us a steam trap blowing through (losing steam), and we'll show you potential for huge savings in the dollars you spend for energy to generate steam in the first place. Besides, less energy consumed means

less waste, fewer emissions and a healthier environment. As you see from the table below, a little steam leak can truly be the start of something big. A single trap with an 1/8-inch orifice can squander more than \$4,000 per year. Multiply that by the number of traps represented in a typical 20% failure rate, and you begin to get the idea. Failed steam traps waste energy and cost you money. Big money. But that was then. Now there's SteamEye®.

What does an undetected failed steam trap cost?

At today's energy prices, steam trap blow-thru can no longer be tolerated. Energy lost means dollars lost. In addition to energy losses, do not forget the other costs associated with undetected steam trap failure.

- Critical processes, possible loss of product
- Pressurized return lines
- Failure to other equipment such as electric condensate pumps, PRVs and control valves
- Unexpected downtime
- Emergency labor requirements

Cost of Various Sized Steam Leaks (assuming steam costs of \$10.00/1,000 lb)				
Pressure (psig)	Orifice	Steam Loss	Dollar Loss per Year	500 Traps 20% Failure Rate
15	3/16"	241,741	\$2,417	\$241,700
50	5/32"	365,991	\$3,660	\$366,000
125	1/8"	497,563	\$4,976	\$497,600
250	#38	610,027	\$6,100	\$610,000
450	1/8"	1,655,099	\$16,551	\$1,655,100
600	7/64"	1,674,206	\$16,742	\$1,674,200

NOTE: Steam loss based on bi-phase flow through an orifice using Armstrong's steam loss formula, approved by the United Nations Technical Committee.

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Armstrong® SteamEye® Proven Technology

The SteamEye® System

Wireless technology has been around for decades. Armstrong International has taken this technology, combined it with our 100 years of steam trap experience and developed a product to accurately determine the operational condition of any type, make and model of steam trap without a labor requirement.

Each transmitter is equipped with an electronic board. This board houses the engineered “thought process” that gives SteamEye® its reliability and accuracy. The conductivity transmitter uses a conductive probe to detect a blow-

thru steam trap. The Ultrasonic transmitter uses a unique Armstrong designed Waveguide that concentrates the operational sound of any steam trap to the electronic board of the transmitter. The “thought process” of the electronic board “listens” to the trap operation and determines precisely whether a trap is operating normally or is in a blow-thru state. In addition to the blow-thru condition, both transmitters have the ability to sense when a trap is cold. To eliminate false readings on modulating steam applications, the Ultrasonic and Conductivity transmitters will check to see if pressure exists before sending a cold alarm.

Steam Trap Management
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SteamEye® How It Works

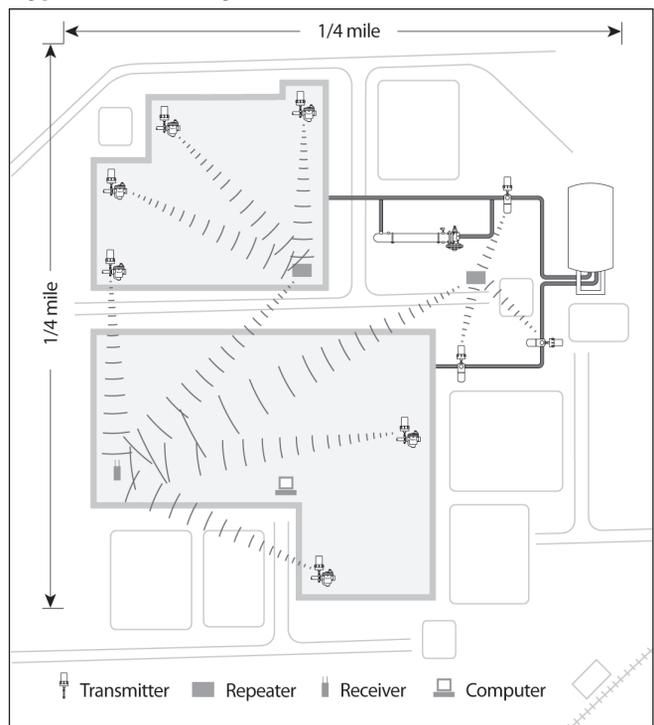
Using wireless technology, the transmitters (SteamEye® monitors) send information about the operating condition of the steam trap, or other monitored device, to the receiver (Gateway). The Gateway is connected to your company’s network where the information can be viewed through a web browser as though you are surfing the intranet (see screenshot of SteamEye® on page 193).

SteamEye® can be integrated into your existing Building Automation System (BAS) or Digital Control System (DCS) using MODBUS RS-232 or RS-485 communication platform. This allows you to view and alarm your SteamEye® monitored devices seamlessly throughout your existing control systems.

Furthermore, SteamEye® can be linked to SteamStar® through the Internet for real time steam loss information using the *Energy Tracker* feature. This will calculate and quantify accumulated steam and dollar losses until action is taken. All this is important information to help prioritize busy work schedules in today’s “do more with less” workplace.

In applications where the transmitter has line of sight to the receiver, the range is approximately 1,500 feet. In facilities where the signal must travel through walls, floors and other obstructions the range is 300 to 500 feet. If the receiver is out of the range of a transmitter, devices called repeaters can be placed between the transmitter and the receiver to “repeat” the signal from one device to the next. A radio frequency signal strength survey is required to determine if repeaters are needed, where they will be located and how many will be required.

Typical Plant Layout



SteamEye® will...

- Monitor traps 24 hours a day, 365 days a year using wireless technology
- Alert immediately when a steam trap has failed, mitigating steam loss
- Protect critical process from steam trap failure
- Mitigate frozen coils caused by plugged traps
- Hasten problem solving in areas where incorrect size or type of trap is used in specific applications
- Eliminate labor associated with testing traps
- Work in conjunction with a building automation system (BAS)

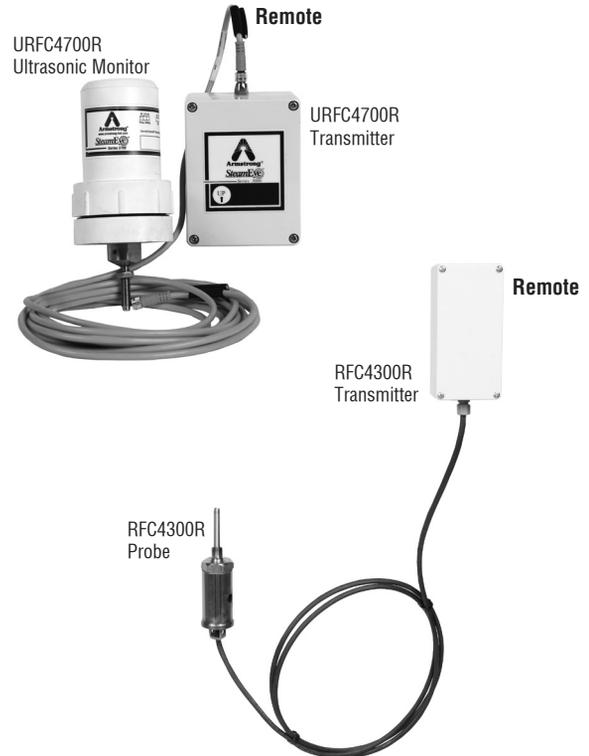
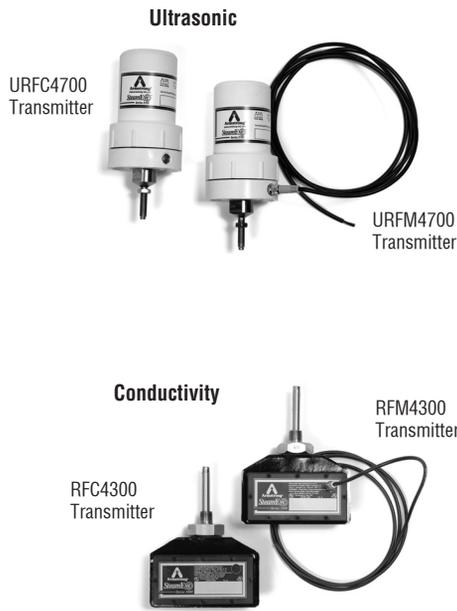
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SteamEye® Transmitter Choices

The Ultrasonic 4700 Series transmitter is used for applications 15 psig and above. The Conductivity 4300 Series transmitter is designed for steam pressures below 15 psig. In addition, each series transmitter has two operating designs, constant pressure and on/off. The constant pressure transmitter is used on steam traps where steam is "on" at all times. The on/off transmitter should be used in applications where steam pressure is not constant. An example of an on/off application would be a batch process: steam pressure is required when the process is running, and steam is valved off when there is no batch being run. The purpose of the on/off transmitter is to eliminate a false cold signal due to no steam pressure. The on/off transmitter provides a connection allowing the unit to be tied to a pressure or position switch that indicates whether the system is pressurized.

Got Tunnels or Confined Spaces?

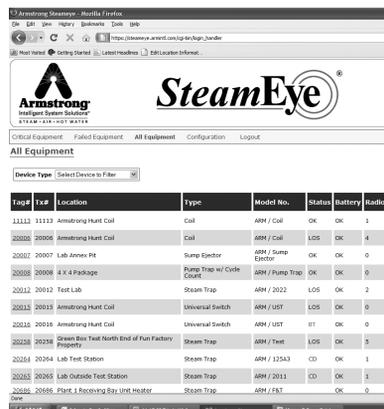
Testing steam traps in hard-to-reach locations such as tunnels, confined spaces or ceilings is labor intensive, costly and unsafe! SteamEye® allows traps to be monitored remotely, eliminating unnecessary access to these areas. A remote probe is available for areas like steam vaults, which can be challenging for an RF signal. A radio frequency survey would be performed to determine the most cost effective manner of providing labor-free monitoring of steam traps in areas where worker safety is a concern.



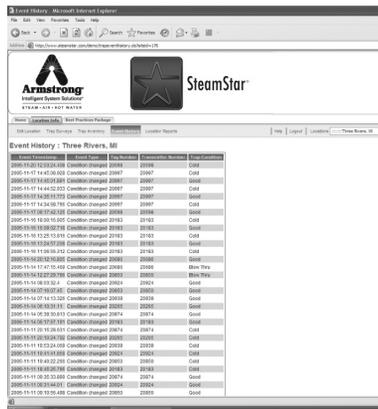
Steam Trap Management Products and Services

With SteamEye® and SteamStar®, Energy Management Is Right at Your Desk

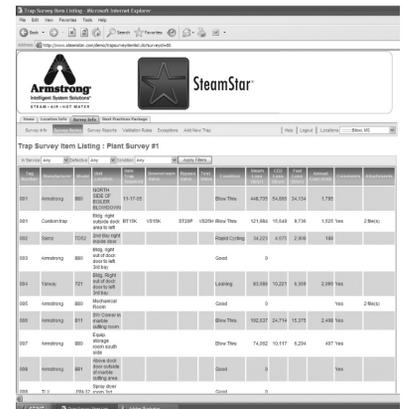
As we have seen, the SteamEye® system is your window into the inner workings of your steam trap population. You can also use the SteamStar® platform for data management. As a result, you can build a remarkably versatile database of trap operating history.



Screen shot of SteamEye®.



Screen shot of SteamStar® event history.



Screen shot of SteamStar® survey page.

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SteamEye® Series 4000

Physical Data and Material Specification

Steam Trap Management Products and Services

Illustration	Transmitter	Application	Battery	Operating Frequency	Trans. Bandwidth	Trans. Power	Operating Temperature Range (Ambient)	Cable	Approximate Dimensions	Hazardous Locations Certifications
	URFC 4700	Constant	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	7" x 3" dia. (17.8 x 7.6 cm) dia.	Class I, Groups C, D Class II, Groups F, G Class III, Div. 1, 2
	URFM 4700	Modulating	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	6.5 ft. (2 m)	7" x 3" dia. (17.8 x 7.6 cm) dia.	Class I, Groups C, D Class II, Groups F, G Class III, Div. 1, 2
	URFC 4700R Remote	Constant	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	Transmitter -40°F to 140°F (-40°C to 60°C) Probe 180°F (82°C)	16.4 ft. (5 m)	Transmitter 3.5" x 4.5" x 2.25" (6.4 x 13.7 x 5.7 cm) Probe 7" x 3" dia. (17.8 x 7.6 cm) dia.	—
	RFC 4300	Constant	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C - 60°C)	—	5.5" x 4.5" x 2.6" (14 x 11.4 x 6.6 cm)	—
	RFM 4300	Modulating	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C - 60°C)	6.5 ft. (2 m)	5.5" x 4.5" x 2.6" (14 x 11.4 x 6.6 cm)	—
	RFC 4300R Remote	Constant	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C - 60°C) Probe 250°F (121°C)	50 ft. (15.24 m)	Transmitter 6.3" x 3.2" x 2.2" (16 x 8 x 5.5 cm) Probe 5" x 1.9" dia. (12.7 x 4.8 cm) dia.	—
	RFM 4300R Remote	Modulating	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C - 60°C) Probe 250°F (121°C)	Probe 50 ft (15.24 m) Switch 6.5 ft. (2 m)	Transmitter 6.3" x 3.2" x 2.2" (16 x 8 x 5.5 cm) Probe 5" x 1.9" dia. (12.7 x 4.8 cm) dia.	—

SteamEye Device

U	→	Ultrasonic, Blank = Conductivity
R	}	Radio Frequency
F		
C		
C	→	C = Constant, M = Modulating, S = Switch
4	→	4000 Series
3	→	7 = Ultrasonic, 3 = Conductivity, 0 = Switch
0	}	Place Holders
0		
R	→	R = Remote, - (Dash) = Place holder for expanded apps
H	}	Expanded Applications
L		
X		

Mounting Hardware

S	}	SteamEye WaveGuides
W		
G		
3	}	Pipe Size: 3 = 1/2" or 3/4" (15 - 20 mm) 4 = 1" (25 mm) 5 = 1-1/4" (32 mm) 6 = 1-1/2" (40 mm) 8 = 2" (50 mm) 10 = 2-1/2" (65 mm) 12 = 3" (80 mm)
X		

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SteamEye® Series 4000

Physical Data and Material Specification



Steam Trap Management
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Illustration	Transmitter	Application	Battery	Operating Frequency	Trans. Bandwidth	Trans. Power	Operating Temperature Range (Ambient)	Cable	Approximate Dimensions	Hazardous Locations Certifications
	URFC4700-SRV	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	7" x 3" dia. (17.8 x 7.6 cm) dia.	Class I, Groups C, D Class II, Groups F, G Class III, Div. 1, 2
	RFC4300-PTX	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	5.5" x 4.5" x 2.6" (14 x 11.4 x 6.6 cm)	—
	RFM4300-PTX	Cycle Counter	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	5.5" x 4.5" x 2.6" (14 x 11.4 x 6.6 cm)	—
	RFC4300-CLX	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	5.5" x 4.5" x 2.6" (14 x 11.4 x 6.6 cm)	—
	RFC4300RHLX	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	Transmitter -40°F to 140°F (-40°C to 60°C) Probe 180°F (82°C)	50 ft (15.24m)	Transmitter 6.3" x 3.2" x 2.2" (16 x 8 x 5.5 cm) Probe 5" x 1.9" dia. (12.7 x 4.8 cm) dia.	—
	RFS4000-TMP	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	—	—
	RFS4000-UNV	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	3.5" x 1.75" x 1" (8.9 x 4.4 x 2.5 cm)	—
	SK4000	N/A	123 Duracell Li-ion	902-928 MHz	200 kHz	60 mW	-40°F to 140°F (-40°C to 60°C)	—	Transmitter 7" x 3" dia. (17.8 x 7.6 cm) dia.	(Transmitters) Class I, Groups C, D Class II, Groups F, G Class III, Div. 1, 2
	RP4000	N/A	120 VAC	902-928 MHz	200 kHz	250 mW	32°F to 140°F (-0°C to 60°C)	—	6.5" x 3.5" x 1" (16.5 x 8.9 x 2.5 cm)	—

- SRV = Safety Relief Valve
- PTX = Pump Trap
- CLX = Coil
- HLX = High Level
- TMP = Temperature Switch
- UNV = Universal Switch

Example Part Numbers:
 SteamEye: URFC4700, RFM4300R
 Mounting Hardware: SWG5, SWG3

Other System Components

- | | | |
|---|---|---|
| H | } | HS = Heat Sink |
| S | | IJ = Insulation Jacket |
| 2 | } | 200 = Heat Sink (>200 psi saturated steam)* |
| 0 | | 600 = Heat Sink (>600 psi saturated steam)* |
| 0 | | 300 = Insulation Jacket (Conductivity) |
| 0 | | 700 = Insulation Jacket (Ultrasonic) |
- * Heat sinks are available for Ultrasonic style transmitters only.

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Figure 1
Armstrong SteamEye Gateway M



Product Overview

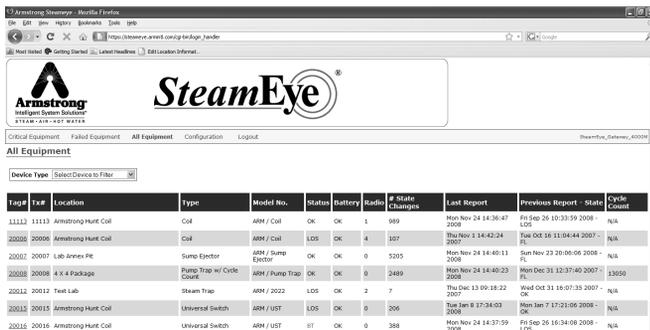
The Armstrong Gateway M runs on a Linux based Lighttpd web server which collects data from up to 2000 wireless SteamEye transmitters. The data is stored using a flash memory drive. The unit requires 120v AC power supply, is self contained, has no moving parts and is designed to operate in industrial environments. Data is accessed using a standard web browser with password authorization to the device.

The SteamEye Gateway can be integrated with Armstrong's SteamStar™, a web based steam trap measurement platform, as part of a comprehensive Best Practices Steam Trap Management Solution.

Integration and Security

The Gateway M can be configured on a LAN and will use the data interface shown in Figure 2. The unit has a built in security certificate signed by Armstrong but can accept a user customized certificate. HTTP, Telenet and FTP ports can be turned off for added device security; however, if SteamStar communication is desired either the HTTP, or HTTPS outbound ports must be open. The unit can also be integrated with BAS or DCS systems using a built-in ModBus RTU table.

Figure 2



Steam Trap Failure Alarms

The Gateway M has several alarm options. The device can communicate with an email server to page or email up to three (3) people when critically monitored equipment fails in either the open or closed position. The other alarm option is provided by external alarm relay contacts. This options allows for connection to a visual or audio alarm.

Allowing Armstrong remote access to the web server is recommended but not mandatory. Remote access is used for administration purposes only and Armstrong is willing to sign a confidentiality agreement when necessary. If remote access is allowed, an internet accessible TCP/IP address or a VPN assigned to the SteamEye device is required.

Product Specifications

Model	Armstrong SteamEye Gateway M
Operating System	Linux, AMD low power LX800 500MHz fanless processor, 128MB RAM, 4GB flash memory
Ethernet Interface	1 X 10/100mbps
Network Protocols Supported	IPv4, IPv6, SMTP, FTP, Telnet, SSH, HTTP, HTTPS
Inbound TCP/IP ports: Embedded web server Remote configuration Remote software upgrades	80 standard (redirected to 443) 23 (Telnet) 21 (FTP) 443 (HTTPS configurable) 22 (SSH configurable)
Outbound TCP/IP ports: For e-mail/pager/text message notification For SteamStar updates	25 (send mail to SMTP server) 443 or 80 (HTTP)
RF Receiver	1 X Internal RF Receiver 1 X RS-232C External Receiver Port
Dimensions (H x W x D)	2-3/4" x 6-17/32" x 4-15/32" (70 mm x 166 mm x 114 mm)
Weight	3.5 lb (1.6 kg)
Operating Temperature Range	32°-140°F (0°-60°C)
Operating Humidity	10% - 70% Relative humidity, non-condensing
BAS/DCS Connection	RS-232 or RS-485 (configurable) ModBus RTU slave
External Alarm Contacts	Input voltage to relay 12-50 VDC Normal Switch Capacity 1.5A @ 30 VDC

SteamEye® Monitoring Capabilities

4700 Ultrasonic type steam trap monitors

- Steam trap monitor for constant pressure
- Steam trap monitor for on/off steam systems*
- Steam trap remote monitoring

4300 Conductivity monitors

- Steam trap monitor for constant pressure
- Steam trap monitor for on/off steam systems*
- Steam trap remote monitoring

Safety Relief Valve Monitor

Coil Monitor

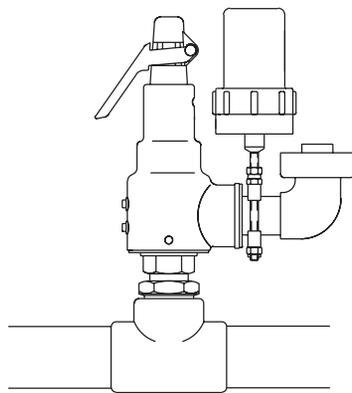
Liquid Level Monitor

Pump Trap Monitor

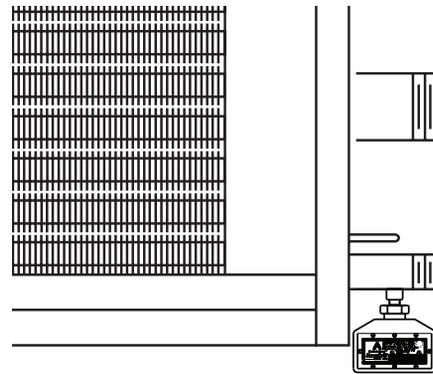
Universal Switch

Pressure Switch

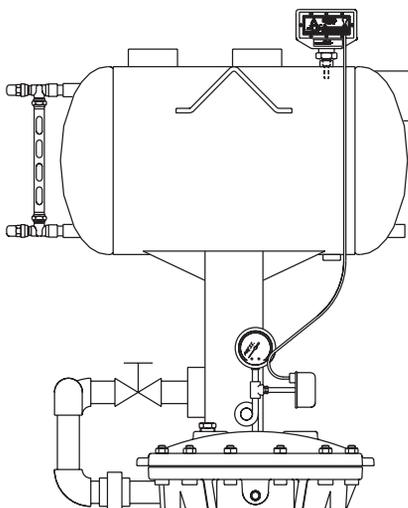
*Pressure switch to be used on systems where steam may be shut off. This will prevent false "Cold" alarms.



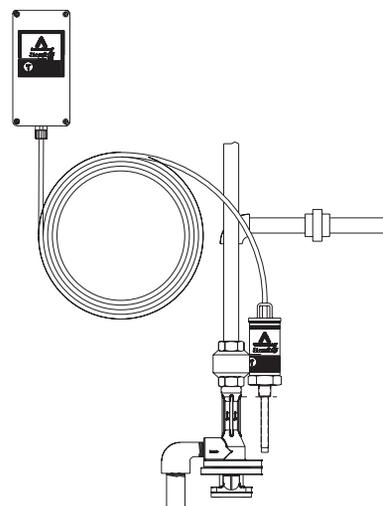
SRV Monitor



Coil Monitor



Condensate Pump Monitor



High Level Alarm