

**Steam Trap
Management
Products and
Services**

Armstrong



Armstrong®

Intelligent System Solutions™

STEAM • AIR • HOT WATER

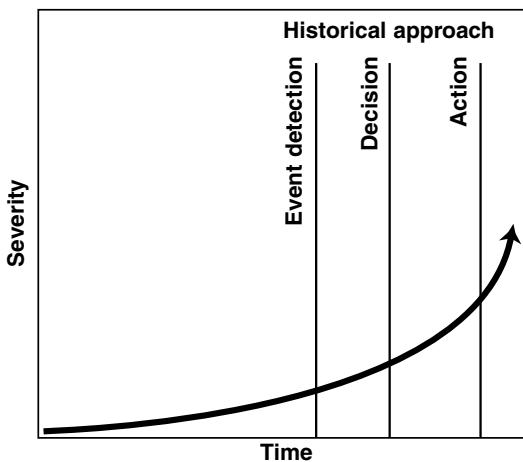


The New Standard for Steam Trap Management

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.

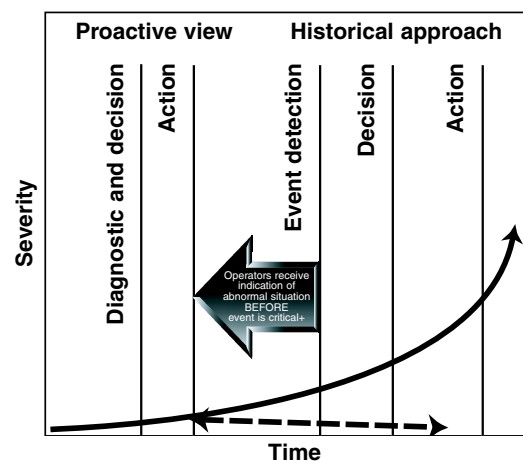
Historical Approach to Steam Trap Program*

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 important financial losses.



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.



SteamEye®
Best Practice Steam Trap Monitoring

Instant notification of steam trap failure and a sustained (24/7) monitoring process.

SteamStar
Best Practice Steam System Measurement

Company-wide awareness and measurement of steam trap performance for ROI decision making.

SteamStar™

Easy-to-use and Very Affordable Steam Trap Software



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

SteamStar Web-based software can... 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.

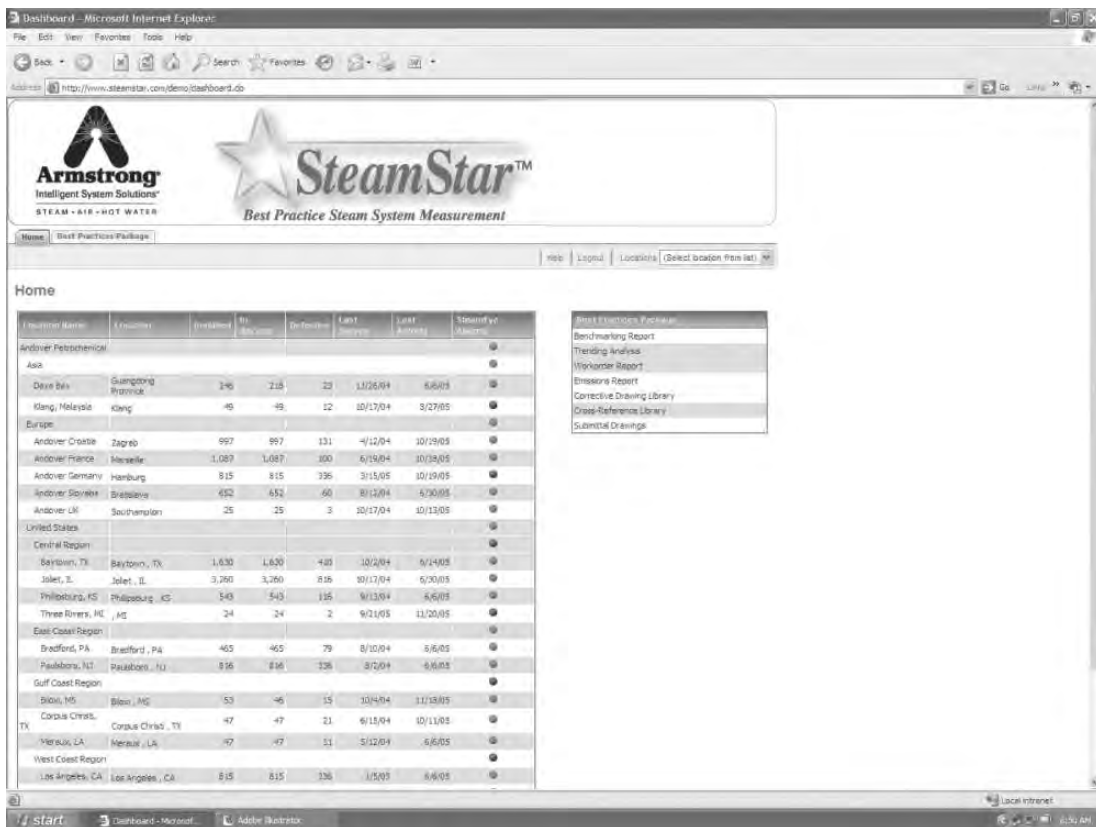
Eliminate costs associated with software.

licensing agreements. Licensing agreements can cost tens of thousands of euro 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



Screen shot of SteamStar home page.



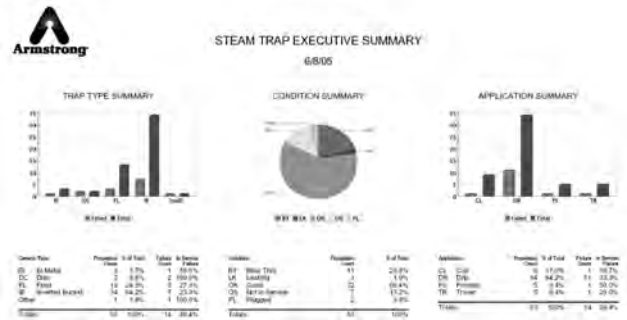
SteamStar™

Easy-to-use and Very Affordable Steam Trap Software

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



Screen shot of executive summary.

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

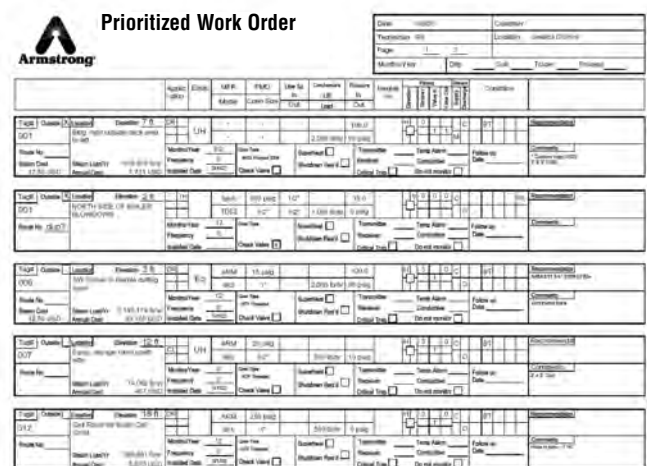
The work order report is a premium report that was designed for optimum facility payback on labor and material while keeping energy losses to a minimum. This report is available at the site or unit level and will create a work order for steam trap repairs based on payback.

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 prioritized work order.

Upload your current steam trap information easily, regardless of current format!

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



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

"It's like having a man 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 radio frequency (RF) steam trap monitoring anyway?

Radio frequency 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 Application Engineering Department.

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 amounts 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

Table ST-167-1. Cost of Various Sized Steam Leaks (assuming steam costs of €20/t)

Pressure (barg)	Orifice	Steam Loss	Euro Loss per Year	500 Traps 20% Failure Rate
1	3/16"	110 000	2 200€	220 000€
3,5	5/32"	166 000	3 320€	332 000€
8,5	1/8"	226 000	4 520€	452 000€
17	#38	277 000	5 540€	554 000€
31	1/8"	751 000	15 020€	1 502 000€
41	7/64"	760 000	15 200€	1 520 000€

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

Steam Trap Management



SteamEye® Proven Technology

The SteamEye System

Radio frequency 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 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, the transmitter have the ability to sense when a trap is cold. To eliminate false readings on modulating steam applications, the Ultrasonic modulating transmitter will check to see if pressure exists before sending a cold alarm.

Steam Trap Management

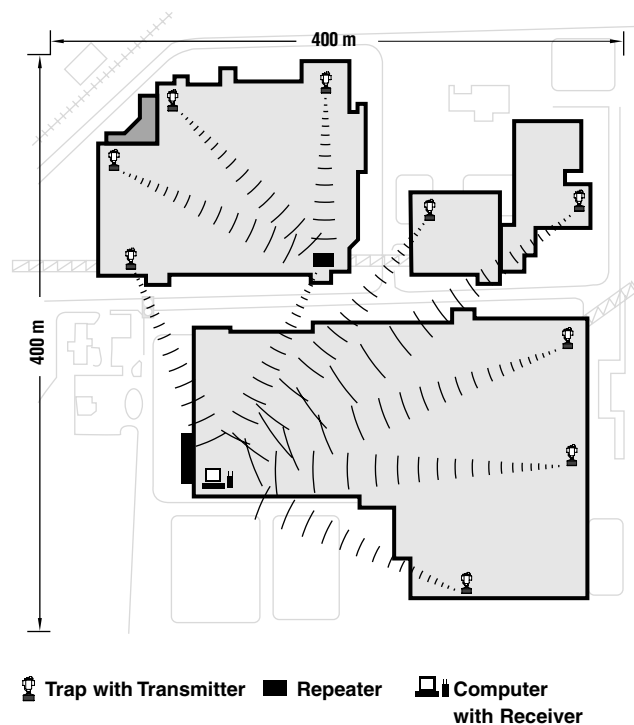
SteamEye® How It Works

The transmitter sends a radio frequency signal indicating the status of the steam trap back to a Web-enabled receiver. The Web-enabled receiver is connected to your company network running the SteamStar™ Web-based software. Information regarding a steam trap's operating condition (OK, blow-thru or cold) can be viewed with this software. Because SteamEye and SteamStar are linked through the network, users from various areas in the facility can see the real-time trap status.

What is the typical range of the RF signal? In applications where the transmitter is located within the line of sight of the receiver, the range is approximately 400 meters. In facilities where the signal must travel through walls or floors, the range varies. The typical range of the signal is approximately 100 meters. 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 transmitter signal can pass through up to seven repeaters. Since it is difficult to know the range of a transmitter in a facility, a radio-frequency-signal-strength survey will determine if repeaters should be used and how many will be required.

Let's face it: At any given time a percentage of your traps have failed, and you just don't have the manpower to check them frequently. Besides, the trap you check on Tuesday afternoon may fail Wednesday morning – and not be scheduled for a recheck for months, even years. You just have to put up with a certain percentage of failure, right? Wrong. Not any more. That's precisely the point of SteamEye.

Typical Plant Layout



SteamEye will...

- Monitor traps 24 hours a day, 365 days a year using a radio frequency signal
- Alert immediately when a steam trap has failed, mitigating steam loss
- Protect critical process from steam trap failure
- Eliminate 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)

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

SteamEye® Transmitter Choices



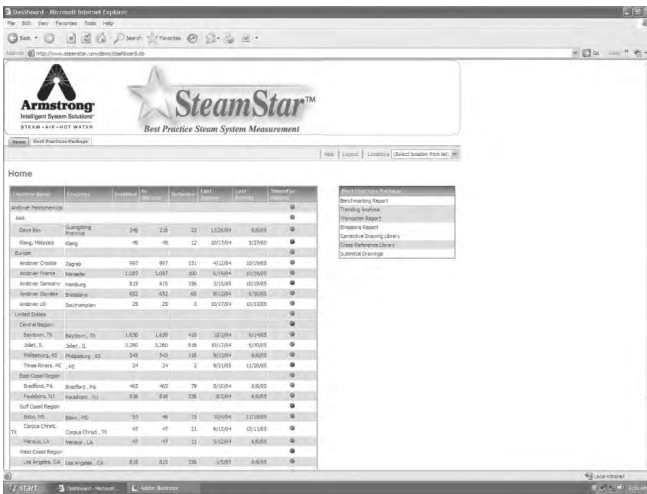
The Ultrasonic 3700 Series transmitter is used for applications at 2 bar or above. In addition, each series transmitter has two operating designs, constant pressure and on/off. The constant pressure transmitter is used on steam traps where steam is "on" at all times. The on/off transmitter should be 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.



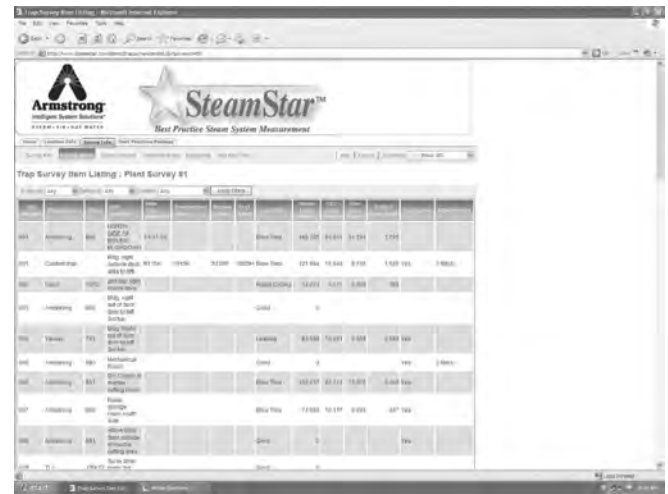
Steam Trap Management

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 SteamStar home page.



Screen shot of SteamStar survey page.

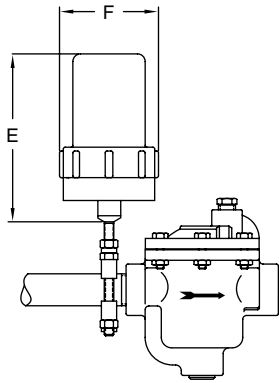


Screen shot of SteamStar event history page.

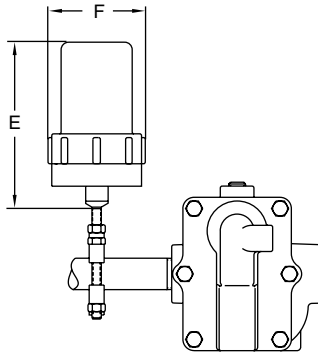


SteamEye® Dimensional Drawings

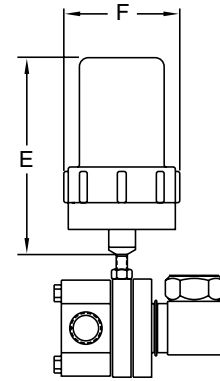
Steam Trap Management



Series 800PC Trap with SteamEye® Ultrasonic Transmitter



F&T Trap with SteamEye Ultrasonic Transmitter with Waveguide

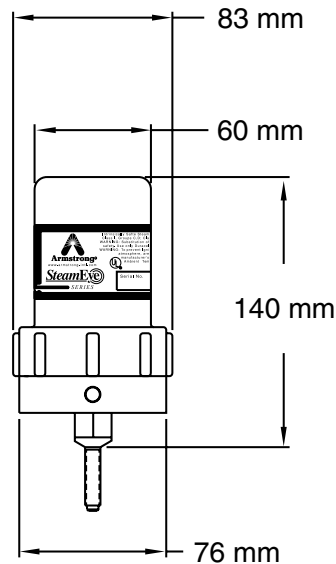


Series CD-3300 with SteamEye Ultrasonic Transmitter and Retrofit Doughnut

Table ST-170-1. SteamEye – Physical Data

Model	Series 800PC	F&T	Series CD-3300
	mm	mm	mm
"E" (Probe Height)	140	140	140
"F" (Probe Width)	83	83	83
Maximum Allowable Pressure of Transmitter	41 bar @ 254°C		

Reference the Steam Trap Section for steam trap dimensions.



SteamEye Ultrasonic Transmitter

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.

SteamEye® Dimensional Drawings



Table ST-171-1. SteamEye – Physical Data	
Transmitter	
Battery	Duracell® #DL123A 3 VDC; 2/3 A size; LiMnO
Battery Life	5 years (typical)
Operating Frequency	868-869 MHz
Transmission Band Width	200 KHz
Communications	Proprietary spread spectrum format
Ambient Temperature*	-46°C to 52°C at or above 2 bar
Intrinsically Safe	ATEX 20 ne II, CE Marked-CE II 3G EEx ni II CT6 P54
Outout Power	25 mW (milliwatts)
Standard Receiver & Programming Module	
Power Requirement	12 VDC-20 VDC (120 VAC adapter provided)
Power Consumption	100 mA
Receiver Type	Narrow-band spread spectrum
Frequency	868-869 MHz
Band Width	100 KHz
Ambient Temperature	0°C to 52°C, (indoor use)
Computer Cable	Two 6-foot, 9 Pin DIN female cables
Web-enabled Receiver - Series 4000	
Power Requirement	120V
Power Consumption	12VDC
Receiver Type	Narrow-band spread spectrum
Frequency	868-869 MHz
Band Width	100 KHz
Ambient Temperature	0°C to 52°C, (indoor use)
Computer Connection	Ethernet
Repeater - Series 4000	
Power Requirement	12 VDC-20 VDC (120 VAC adapter provided)
Power Consumption	70 mA (typical)
Receiver Type	Narrow-band spread spectrum
Frequency	868-869 MHz
Band Width	100 KHz
Ambient Temperature	0°C to 52°C, (indoor/outdoor)
Repeat Signals	Limit of 10 repeaters in serie
Computer Requirements (Customer-supplied)	
SteamEye Web-enabled Receiver for use with SteamStar™	Static TCP/IP address, Internet routable address, and Mail server name

*At lower ambient temperatures Armstrong recommends optional insulation sleeve. Consult factory for details.

Table ST-171-1. SteamEye – Physical Data		
Transmitter	4700	
Probe Core	Stainless steel threaded	
Probe Sleeve	N/A	
Probe Hex Bushing	N/A	
Screws	N/A	
O-Ring	Nitrile	
Battery	Duracell® #DL123A (lithium)	
Potting	N/A	
Partition	Plastic enclosure	
Receiver	Web-enabled	
Enclosure	Powder coated steel	
Mounting Hardware		
	Body	Bolts
Waveguides	Stainless steel	Gr. 5 Zinc Plated CS
Cap Blocks	Stainless steel	Gr. 5 Zinc Plated CS
Flange Rings	Stainless steel	Stainless steel
Retrofit Doughnut	Stainless steel	Stainless steel
Additional Components		
Heat Sink	Aluminium	
Insulation Jacket	Silicone fiberglass	
Repeater		
Enclosure	Plastic	
Programming Module		
Enclosure	Plastic	

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.



All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.



SteamEye® Selection and Ordering

1. **Determine type of transmitter required**
RFC4700 (ultrasonic – constant pressure)
RFM4700 (ultrasonic) – on/off
2. **Specify mounting hardware.**
 - Waveguide
 - Cap Blocks
 - Flange Rings
 - Retrofit Doughnut
3. **Specify trap type, make and model.**
Also specify connection size of trap.
4. **Specify maximum operating pressure.**
5. **Determine number of repeaters required.**
REP4000 (RF survey to determine: contact Armstrong Representative)
6. **Determine type of receiver desired.**
 - Web-enabled receiver REC4000
NOTE: Device configuration worksheet must be completed for the Web-enabled receiver.
7. **BASIS use:**
Contact your Armstrong Representative or Armstrong's Application Engineering Department.

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History

Industries use approximately 42% of the total energy consumed annually in Europe. Of this, about half (or 21% of total European energy consumption) is used to generate steam in more than 54,000 large industrial-sized boilers.

Unfortunately, much of that steam is lost through leaks in the distribution system, including piping, valves and steam traps. Lost steam must be replaced, which can only be done in a boiler that consumes fuel.

The cost of replacing wasted steam can be enormous in terms of system efficiency, lost production, fuel consumption, makeup water treatment cost, and maintenance. These additional costs must be factored into the bottom line of every organization.

Environmental Considerations

Inadequate trapping on steam mains not only results in economic losses, it also creates environmental concerns as additional fuel is burned to replace lost steam. For example, assume the steam-main pressure is 10 barg and the leak size is 5/64" – about the thickness of a coin. In this instance, approximately 12 kg of steam will be wasted per hour – escaping from the system or blowing through a trap and into the return line.

Twelve kilograms per hour may not sound significant, but over one year (8,400 hours), that small leak will waste the following equivalent amounts for fuel:

- 1.9 tons of bituminous coal at a value of €679 (coal cost €57/ton)
- 9 000 l of residual oil at a value of €978 (oil cost 0,11€/l)
- 89 m³ of natural gas at a value of €1,272 (gas cost €14,30/m³)

Pulverized bituminous coal in a dry bottom-firing boiler will generate the following pollutants per year:

- 330 kg of particulate matter
- 211 kg of sulfur oxides
- 114 kg of nitrogen oxides
- 3,3 kg of carbon monoxide
- 4 400 kg of total carbon

These figures represent a case in which just one trap has blown through – typical failure mode of many steam traps. Compound the figures by the number of potential failed traps and you can begin to understand the value of trap maintenance, both in terms of energy and the extra load placed on your environmental cleanup systems.

Evaluation = Efficiency = Dividend

Reliable evaluation of steam trap operation is necessary for traps to work at peak efficiency. Trap testing is a key element in a complete energy management program, and an essential skill for protecting your investment.

Accurately evaluating steam trap operation can pay dividends in energy conservation, save countless maintenance hours, and reduce unscheduled downtime caused by trap failure.

Steam-Trap Survey

To ensure that your steam traps are maximizing the return on your product investment, your first steps should be to conduct a steam-trap audit or trap survey, then implement a comprehensive trap-maintenance program. Proper trap maintenance requires someone who knows how each type of trap functions and can determine if each trap is operating as required.

Armstrong has the ability and trained personnel to conduct steam system energy audits for any facilities in the world. Our factory-trained technicians have decades of experience and have tested tens of millions of steam traps worldwide.

Test and Replace Just the Failed Traps

The sooner a trap is identified as an energy waster, the sooner it can be replaced. Since newer testing methods require minimal labor, traps can be tested more frequently and failed traps can quickly be identified. In addition, perfectly good traps that may be misdiagnosed as failed by less reliable testing techniques will no longer be routinely replaced, thus saving the expense of a new trap and related labor costs.

Armstrong continues to lead the industry with innovative testing and tracking tools such as SteamStar™, SteamEye® and TrapAlert™.

By using SteamEye technology, you can better spend your maintenance time repairing only defective traps and not evaluating traps that have been misdiagnosed as failed. In conjunction with SteamStar, the system becomes the premier steam trap management package for maintaining a healthy steam system.

Maintaining the Boiler Plant

Boiler plant reliability and efficiency depend on the stability and success of each component of the steam generation, distribution and condensate return system. Maintaining a boiler plant means paying close attention to components including flanges, elbows, valves, unions and steam traps, since each component has the potential to waste steam.

We can help with proper system evaluations, as well as piping recommendations, replacement-trap sizing and troubleshooting.

