



STEAM SYSTEM MONITORING



SteamEye®



WHY STEAM TRAP MONITORING?

If the steam trap **fails open** (Leaking or Blow-Through):

- Increased back pressure.
 - Reduced flow for surrounding steam traps.
- Steam losses (monetary losses).
- Safety issue.
- Environmental issue...

If the steam trap **fails closed** (Cold):

- Wet steam.
 - Water hammering.
 - Damaged turbine.
 - Piping corrosion.
 - Erosion on valves, reducers etc.
- “Stalling” or flooded heat exchanger.
 - Decrease in production.
 - Reduced heat transfer.
 - Batch process losses.
 - Thermal stress.
 - Safety issues.

| STEAM LOSS THRU AN ORIFICE • DRIP APPLICATION | | | | | | |
|---|----------|----------|----------|----------|----------|----------|
| | 10barg | 150psig | 17barg | 250psig | 28barg | 400psig |
| Orifice | [kg/day] | [lb/day] | [kg/day] | [lb/day] | [kg/day] | [lb/day] |
| #38 | 495 | 1,091 | 796 | 1,754 | 1,246 | 2,747 |
| 7/64" | 575 | 1,267 | 924 | 2,036 | 1,447 | 3,190 |
| 1/8" | 751 | 1,655 | 1,207 | 2,660 | 1,890 | 4,167 |
| 5/32" | 1,173 | 2,586 | 1,885 | 4,156 | 2,953 | 6,511 |
| 11/64" | 1,419 | 3,129 | 2,281 | 5,029 | 3,573 | 7,878 |
| 3/16" | 1,689 | 3,724 | 2,714 | 5,984 | 4,253 | 9,376 |
| 7/32" | 2,299 | 5,068 | 3,695 | 8,145 | 5,788 | 12,761 |
| 1/4" | 3,003 | 6,620 | 4,826 | 10,639 | 7,560 | 16,668 |
| 5/16" | 4,692 | 10,343 | 7,540 | 16,623 | 11,813 | 26,043 |
| 3/8" | 6,756 | 14,894 | 10,858 | 23,937 | 17,011 | 37,502 |
| 1/2" | 12,011 | 26,479 | 19,303 | 42,556 | 30,241 | 66,671 |
| 9/16" | 15,201 | 33,512 | 24,430 | 53,859 | 38,274 | 84,380 |
| 11/16" | 22,707 | 50,061 | 36,495 | 80,457 | 57,175 | 126,050 |
| 3/4" | 27,024 | 59,577 | 43,432 | 95,750 | 68,043 | 150,009 |

Blow-Thru steam trap, Outlet Pressure < (Inlet Pressure/2)

Source: AM0017 by UNFCCC

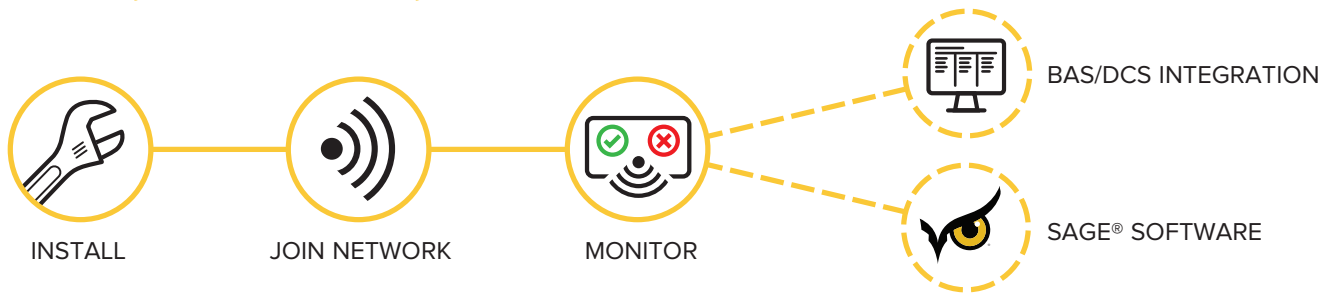
There are **3 challenges** for effective steam trap monitoring:

- Identifying a failure – What, when, and where?
- Evaluating the scope – How big of an impact?
- Measuring the impact – Value the tangible and intangible losses.

SteamEye® enables you to tackle all three challenges with one system solution that combines a mix of methods including conductivity, steam trap specific acoustic, and temperature monitoring with integrated smart wireless solutions.”



SIMPLE, SMART, SUSTAINABLE.



No integration to external software necessary.

Transmitted Information to gateway:

- Low battery alert
- Status of equipment
 - Steam Trap: OK, CD (cold), BT (Blow-through), LOS (Loss of Signal)
 - Safety Relief Valve: OK, RA (Relief Alarm), LOS
 - Coil, Liquid Level: OK, FL (Flooded), LOS
 - Pump: OK, FL, CC (Cycle count), LOS
 - Repeater: OK, LOS

24/7 monitoring.

Gateway integration connections: Modbus RTU; RS485; BACnet™.

Up to 2,000 wireless monitors per gateway

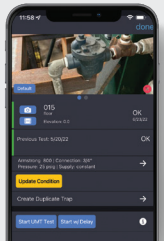
Steam pressure from Opsig (Obarg) to 1,500psig (104barg)

Maximum process temperature: 600°F (315°C)

No annual subscription for the monitoring

SAGE® keeps you fully informed, 24 hours a day by providing regular updates, precise documentation, custom-filtered reports, and real-time alerts to notify you immediately of any problems that arise.

SAGE® calculates steam loss data and reports it using our proprietary steam system efficiency methodology approved by the United Nations Framework Convention on Climate Change (UNFCCC).

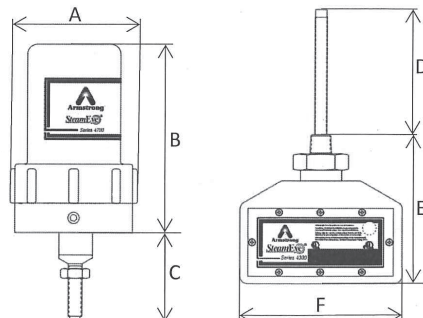


| SPECIFICATIONS | GATEWAY | REPEATER | WIRELESS MONITOR |
|--------------------------|------------------------------------|-----------------------------|--|
| Communications | Proprietary spread spectrum format | | |
| Operating Frequency | 902-928 MHz | | |
| Transmission Bandwidth | 200 kHz | | |
| Power Requirement | 120 VAC | 14 VAC* | Duracell #DL123A 3 VDC; 2/3 A size; LiMN02 |
| Power Consumption | 400 mA | 250 mA | N/A |
| Ambient Temperature | 32°F to 140°F (0°C to 60°C) | 32°F to 140°F (0°C to 60°C) | -40°F to 140°F (-40°C to 60°C)** |
| Ethernet | 10/100 Mbps | N/A | N/A |
| Output Power | N/A | 250 mW | 60 mW |
| Dimensions – Inches (mm) | 4.5x6.54x3.25 (114x166x83) | 6.5x3.5x1 (165x90x25) | See below |

* 120 VAC to 14 VAC adapter provided

** At extreme temperatures, Armstrong recommends optional insulation jacket or heat sink. Consult factory for details.

| WIRELESS TRANSMITTERS DIMENSIONS | | |
|----------------------------------|------------------------------|------|
| | [in] | [mm] |
| A | 3.25 | 82 |
| B | 4.81 | 20 |
| C | 2.00 | 51 |
| D | Cut to length per trap model | |
| E | 4.57 | 116 |
| F | 5.25 | 113 |



Armstrong International

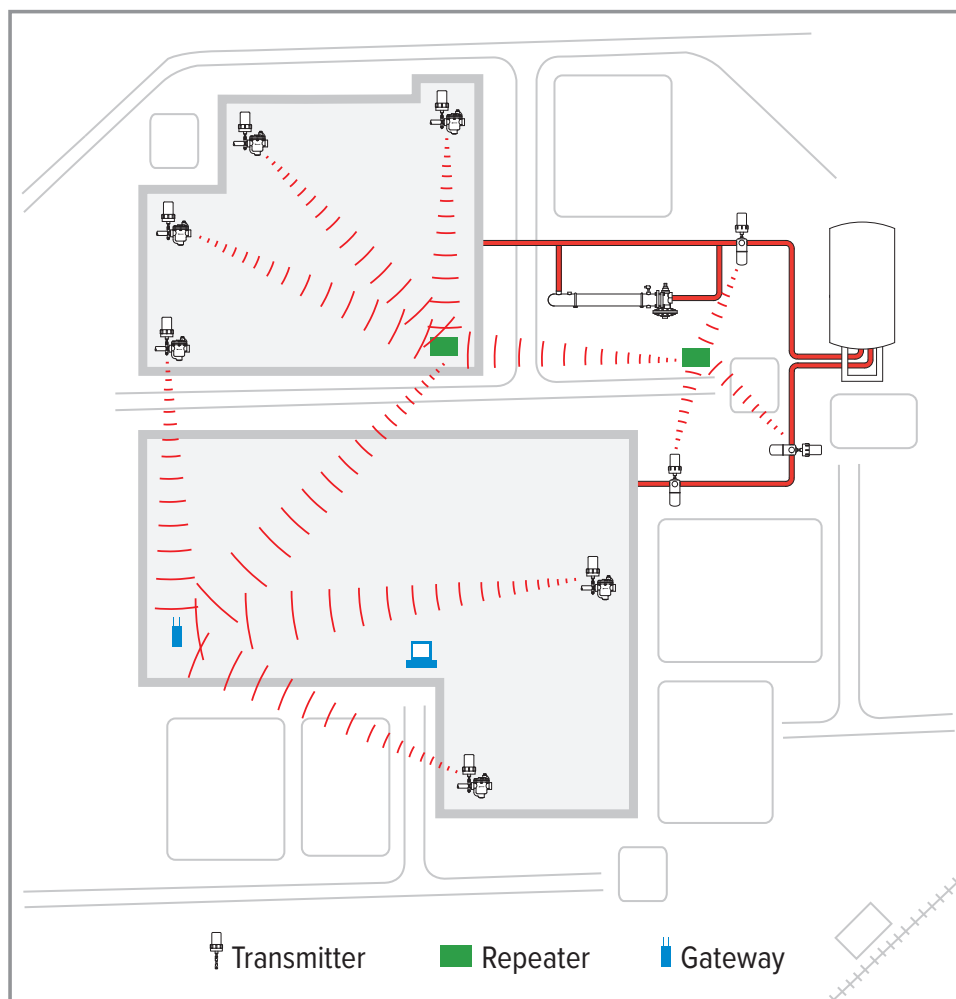
North America • Latin America • India • Europe / Middle East / Africa • China • Pacific Rim



HOW IT WORKS

The SteamEye® system is designed to monitor and detect instant failure of steam traps and other steam equipment in real-time. Using a patented Armstrong International technology, SteamEye® transmitters continuously monitor the steam equipment. Once a failure is detected, the transmitter wirelessly sends the current operating condition of the steam trap, or other steam equipment, to a gateway (receiver). SteamEye® can be integrated into your existing Building Automation System (BAS) or Digital Control System (DCS) using Modbus or BACnet™ communication protocols.

In applications where the transmitter has line of sight to the gateway, the range is approximately 1500 feet. In facilities where the signal must travel through walls, floors and other obstructions the range can vary (typically 300 - 500 feet). If the receiver is out of the range of a transmitter, repeaters can be placed to “repeat” the signal back to the gateway. The gateway can also be connected to your company’s network where the information can be viewed through any computer on campus.



Typical Plant Layout



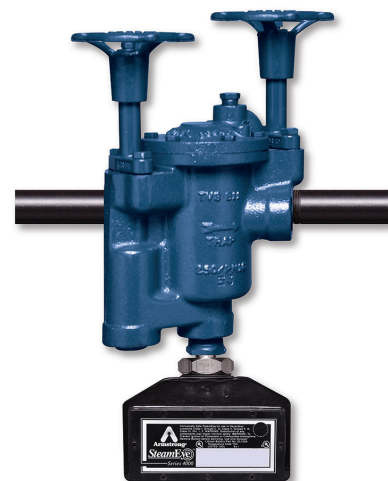
Steam Trap Monitor

The 4700 Series is designed to detect the condition of the steam trap (cold, ok, and blow thru) for any make or model of steam trap. The 4700 Series utilizes acoustic and temperature readings coupled with Armstrong patented logic to determine the condition of the steam trap. The easy-to-install design provides non-intrusive installation that can be completed in minutes without any special tools. The monitor is battery powered that can be changed easily and quickly without removing the monitor from the mounting hardware. The 4700 series includes a pressure switch option for modulating applications.



The 4700R Series is designed to detect the condition of the steam trap (cold, ok, and blow thru) for any make or model of steam trap. The 4700R Series utilizes acoustic and temperature readings coupled with Armstrong patented logic to determine the state of the trap. This unit includes a simple battery change out design, which can be completed in minutes without shutting down the steam system. The 4700R Series is a remote transmitter that helps monitor steam traps that are difficult to access which are installed in areas such as pits or elevated pipe racks.

The 4300 Series is designed to detect the condition of the steam trap (cold, ok, and blow thru). The 4300 Series utilizes conductivity and temperature readings coupled with Armstrong patented logic to determine the state of the steam trap. The 4300 series also has a pressure switch option for modulating applications. This monitor is typically used for low pressure steam trap applications.



Vault Monitor

The Vault Monitor is the most robust of all SteamEye® products. It utilizes a robust aluminum epoxy coated housing with potted electrical components to protect the monitor from high temperature and water. The vault monitor utilizes conductivity and temperature readings to determine trap condition (cold, ok, and blow thru). This monitor excels in applications like vaults and tunnels. The transmitter is designed to be installed outside of the vault to help avoid stringent confined space entry regulations and reduce safety concerns of employees. The monitor probe is made of annealed stainless steel and is designed to be installed directly in harsh environments that would destroy a less robust monitor.

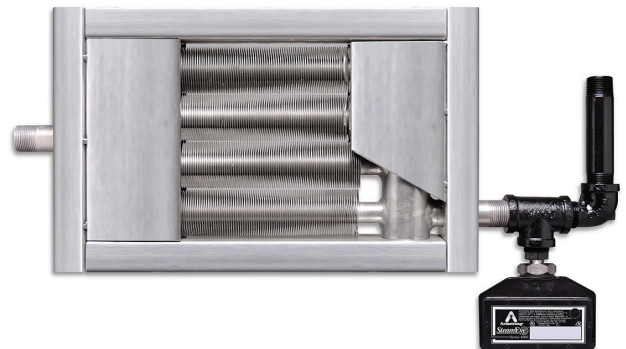


Safety Relief Valve Monitor

This monitor utilizes acoustic signatures to detect a leaking safety relief valve. The monitor notifies the leaking status and provides the location to quickly solve the issue and avoid process disruption.

Coil Monitor

This monitor utilizes conductivity technology to immediately notify when condensate is backing up in the coil thus protecting it from corrosion or freezing conditions. The monitor can be installed on any manufacture's coil.



Liquid Level Monitor

The liquid level monitor can be installed on any piece of equipment to notify flooded conditions. By using conductivity the liquid level transmitter instantly detects and notifies when the liquid's level is too high.



Condensate Pump Monitor

The condensate pump monitor is designed to detect if a pump has stopped discharging condensate. If used with a pressure operated pump the condensate pump monitor can be used with the available cycle counter. Information collected allows for condensate return calculations and trending of capacities of the pressure operated pump. The condensate pump monitor works with any pump.

SteamEye® Gateway

The SteamEye® Gateway 4000 Series can be seamlessly integrated into SAGE®, Armstrong's web hosted steam trap management platform, as well as existing host systems and data application through Modbus or BACnet. This gateway series can collect data from up to 2,000 monitors and is expandable to large areas with the use of repeaters. It also features secure access to data using a stand web browser and uses a Linux based operating system to collect, store and relay SteamEye® device information. The 4000 series has a LAN connection for direct monitor status updates and gateway configurations. Automatic email notifications and alerts for critical applications are also available.





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