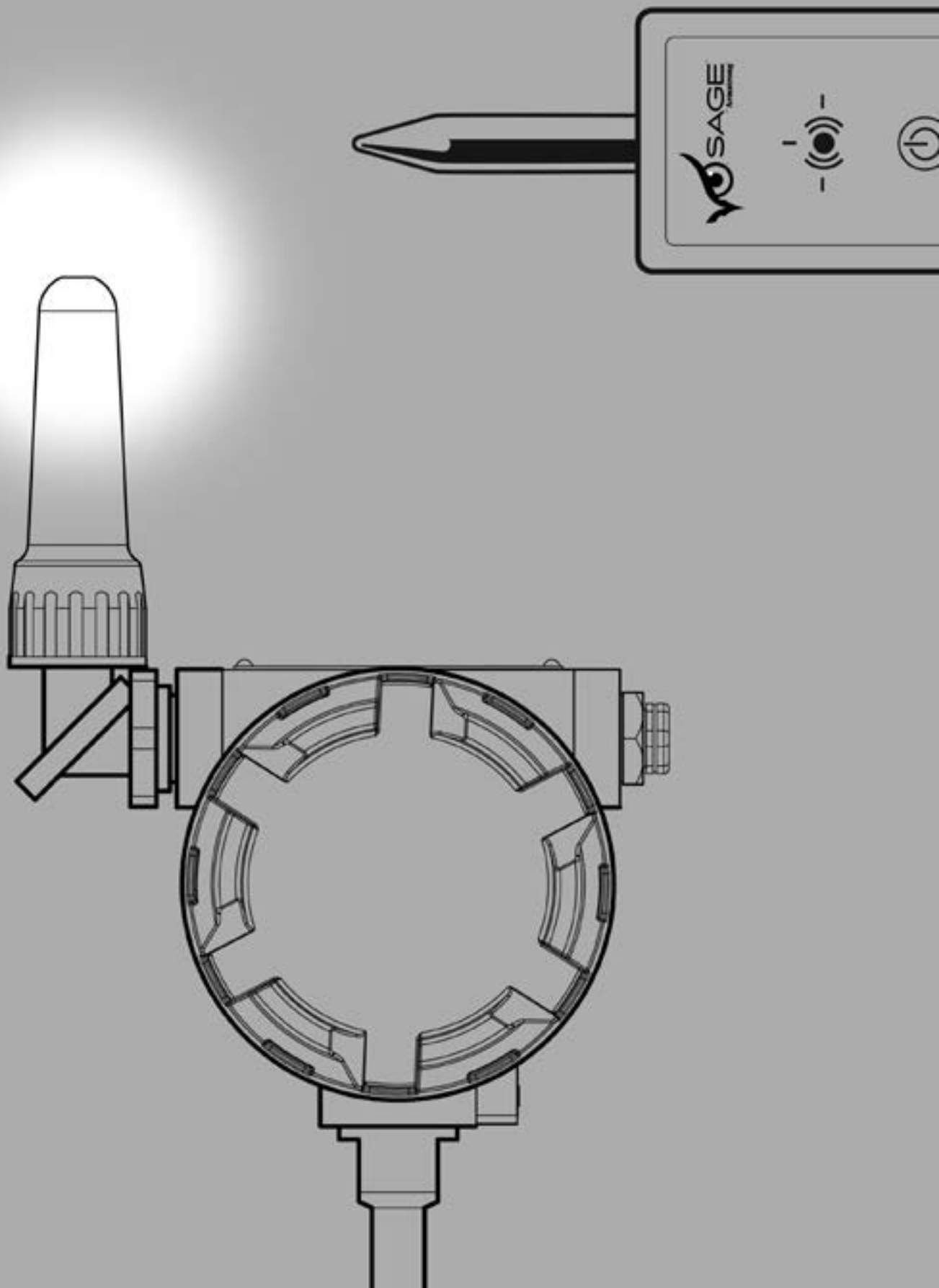
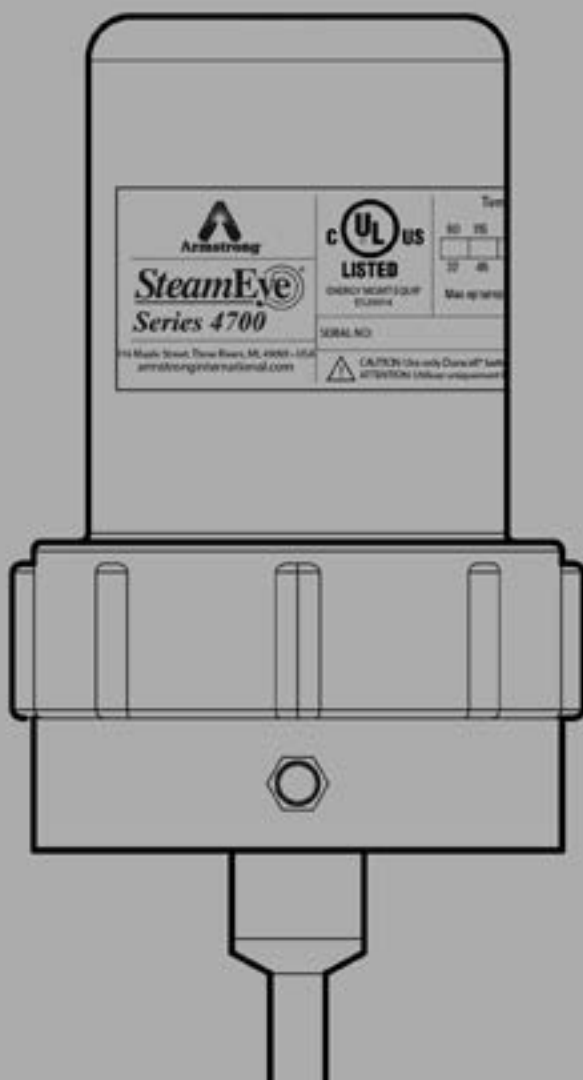
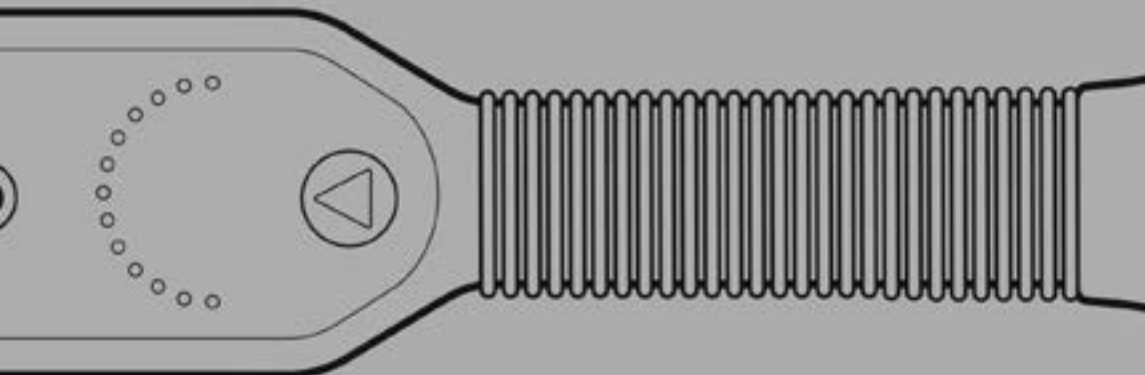




Smart Products



Armstrong



Only Armstrong Brings You Cutting-edge Innovation in Smart Utility Monitoring, Measuring and Reporting

By enabling you to maximize equipment reliability, efficiency and safety, SAGE® raises utility system management to a groundbreaking new level. This powerful software tool accurately calculates losses in steam, fuel, money and emissions based on

methodology approved by the United Nations Technical Committee. SAGE® analyzes your data to track behavior and performance, making it the most state-of-the-art steam and hot water system management available today.

A Fully Integrated Solution

SAGE® works seamlessly with all of our real-time monitoring products (SteamEye®, AIM®, The Brain®) ensuring that it always has access to the most current data on your critical steam trap and hot water systems.

Engineered to Make Your Life Easier

SAGE® is intuitive to use and offers unprecedented flexibility for a tailored user experience. Organize and manage your equipment population with ease, customize how data is filtered throughout the system, view only relevant equipment or oversee your entire organization—with SAGE® the options are yours.



You Own Your Data, We Keep It Secure

With SAGE®, you own your data and it is always safe and protected by high-level security. The enterprise-class cloud-managed IaaS is built on recognized technology platforms and operated from a Tier 3+ data center for 99.982% uptime. Our fully hosted solution is backed by guaranteed high-level security that includes automated backups, https encryption and SSAE 16 compliance.



SAGE® Mobile—Our Exclusive App

Perform steam trap surveys with efficiency and accuracy, and conduct resurveys much more quickly than with traditional methods, using SAGE® Mobile on your Apple or Android device—even when no Internet connection is available. Included with SAGE®, our native mobile application incorporates our Squares Condition Updates and an intuitive user interface for the swiftest way to manually update the condition of your traps. SAGE® Mobile quickly gathers your data and stores it locally, automatically pushing it to SAGE® when it has network access.

Built to operate on Apple versions supported iOS 9.0 or newer and Android devices supported for 6.0 or newer. This easy-to-use application eliminates dual data entry and provides significant time savings on resurveys, and even greater time savings on initial surveys. SAGE® Mobile also allows technicians to document; whether you have 10 traps or 10,000, one Brain® or 10, SAGE® enables you to manage your entire organization or company, regardless of size or location.

Sage® Dashboard

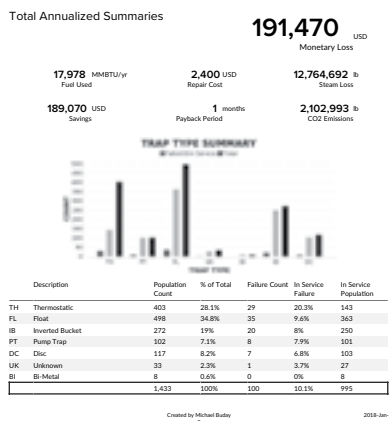
The dashboard gives you a powerful decision-making tool by providing convenient access to vital, real-time data from multiple areas.

- **Steam System**—Facility summary of steam trap system performance rate and daily losses.
- **Hot Water Updates**—Summary of critical temperatures for monitored Armstrong products.
- **Alerts**—System notifications allow for easy identification of problems and maintenance of equipment.
- **Annual Steam Loss**—A 12-month view of steam and monetary loss.
- **Real-time Technical Support**—Support for SAGE™ and Armstrong International products through face-to-face video communication, email and phone calls.



Smart Utility Reporting

SAGE® delivers the reports you need, based on the parameters you choose.



- **Steam Trap Executive Summary**—Provides a totalized summary of selected data in any of the following categories: monetary loss, fuel used, repair cost, payback period, and CO2 emissions. Chart options include: trap type, application and condition summaries.
- **Steam Trap Survey Summary**—Although similar to the Steam Trap Executive Summary, this report pulls data for selected survey technicians and time periods, allowing the user to run a report based on a performed survey.
- **Work Order/Defective Trap Report**—Provides a list of the defective traps within selected data parameters. Lists are organized according to selected groups, making it easier to find and repair traps.
- **Hot Water Report**—Provides a complete overview summary of digital recirculation valve and hot water system performance over the selected time period. Report includes an overall average of hot water inlet temperatures, recirculation return temperatures, actual outlet temperatures as well as a comprehensive list of all alarm/alert conditions monitored. Also provides a temperature trend of the hot water system throughout the selected time period.
- **Trap Detail Report**—Summarized or full-page report provides details for each trap within selected data parameters.

You Can Do It All With SAGE®

SAGE® helps you increase equipment reliability, efficiency and safety while allowing you to reduce environmental emissions. Whether you want to save time and money by keeping your facility's steam traps running at top efficiency, or you want to ensure happier customers or safer patients by operating, monitoring and reporting hot water system performance in compliance with global hot water safety guidelines—SAGE™ is the intelligent solution you need.

One Building or Your Global Corporation

Whether you have 10 traps or 10,000, one Brain® or 10, SAGE® enables you to manage your entire organization or company, regardless of size or location.

More Informed Means More Proactive

SAGE® gives you regular updates, precise documentation, and alerts you if an issue arises so you can take immediate action. Your decisions are swifter and smarter because you have deeper, more comprehensive insight into your utility system.



Complete Accessibility

SAGE® is easily accessible from virtually any device, wherever you are, at any time. It performs beautifully on tablets, laptops and desktop computers, and it is compatible with most common Internet browsers, including Google Chrome, Internet Explorer and Safari. Whether you're using a PC in your office or a mobile device out in the field, the responsive format will adapt to the size and resolution of your screen.

Choose Your Terms and Subscription

With SAGE® there are no hidden fees, no complicated license models and no long-term contracts. Choose from recurring monthly or annual subscriptions. All of our basic packages provide access to every feature SAGE® has to offer, including real-time monitoring. Prices are all-inclusive, so every package includes unlimited users, unlimited storage, unlimited devices for your organization, and the best customer service in the business. Unlike most business software, we do not charge per user/seat so you can use your account with as many people as you'd like without worrying about extra charges.

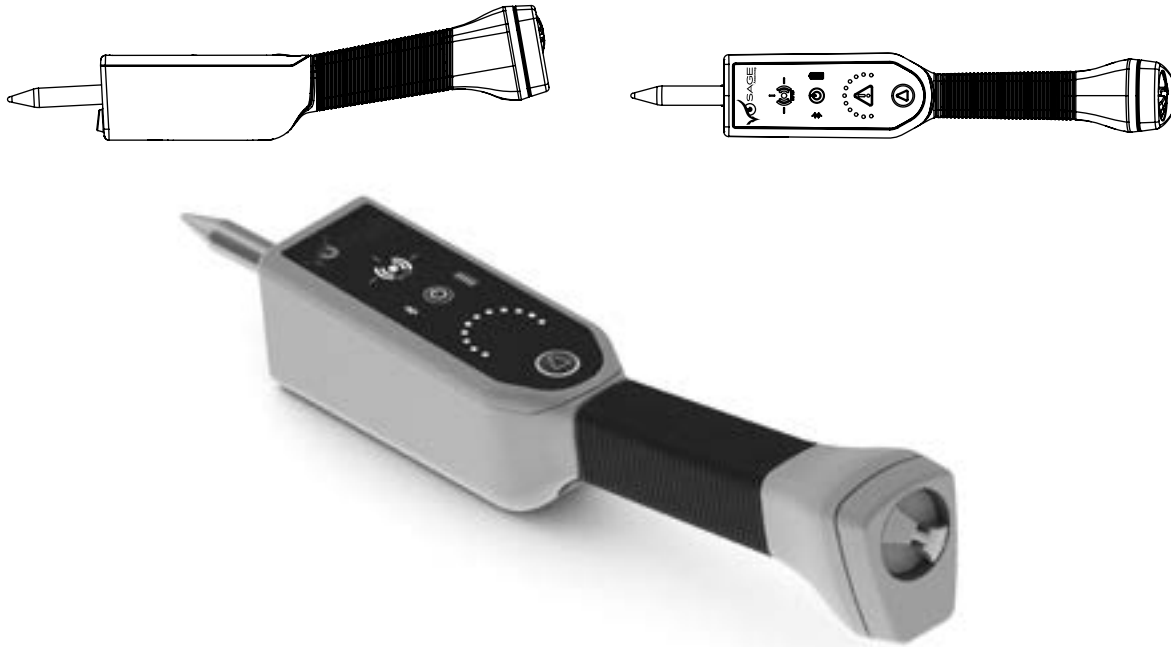
Armstrong accepts all major credit cards. Additional payment methods are available with the Enterprise package.

Get Started With SAGE™ In Less Than Five Minutes

Getting started with SAGE® takes less than 5 minutes. Our unique cloud solution needs no hardware or software setup and requires nothing from your IT department. It's quick and easy.

Email sage-support@armstronginternational.com or call (269) 965-4017 to subscribe now or to contact the SAGE® support team for more information.

SAGE UMT® Automatic Steam Trap Tester



DESCRIPTION

The SAGE UMT® is a wireless hand-held steam trap testing tool. The SAGE UMT® uses a state of the art piezo electric acoustic sensor developed and tuned specifically for the unique conditions found in steam traps. The acoustic sensor coupled with a non-contact infrared temperature sensor makes testing steam traps as simple as pressing a button.

The SAGE UMT® is wireless and connects to any smart phone or tablet running the SAGE® mobile app using Bluetooth technology. This means no more cords to get tangled, broke or melted and giving any steam trap technician the freedom to test traps quickly and easily.

The SAGE UMT® sends information gathered to the SAGE® mobile app where it is immediately processed and recorded. That means, no more crinkled and scribbled on log sheets, no more returning to the computer to re-enter all the recorded survey information and no more lost or illegible field records.

The SAGE UMT® is the final tool in the SAGE® steam trap management system to bring your program to the highest level

MAXIMUM OPERATING CONDITIONS

Minimum steam pressure: 2 psig (0.14 barg)
Maximum steam pressure: 3200 psig (221 barg)
Operating temperature: -4 °F to 140 °F (-20 °C to 60 °C)
Battery charging ambient temperature: 32 °F to 113 °F (0 °C to 45 °C)

MATERIALS

Body: Heat resistant ABS
Acoustic probe: 304 Stainless Steel
Acoustic Sensor: Ceramic Piezo Electric
Battery: 10+ hour Lithium Ion

FEATURES

Bluetooth communication
Built in RFID tag reader
Standard thread connection for installation on a "painter's pole"

SPECIFICATIONS

IP rating: IP 64
BLE Spec: 4.2
RFID Spec: 13.56 MHz
Infrared sensor:
- Optical grade, coated germanium lens
- -40 °F to 716 °F (-40 °C to 380 °C)
Weight: 1.25 lbs (0.57 kg)
Voltage: 7.2 VDC
Charging Voltage: is 12 VDC (6.5 W max.)

**SAGE UMT® HOLSTER**

The SAGE UMT® holster securely holds the UMT and can be configured in either a right and or a left-hand configuration.

**SAGE UMT® CHARGER**

The SAGE UMT® charger will charge the UMT® to 90% charge in 2.5 hours. A full charge can be completed in 5 hours.

**SAGE UMT® CASE**

The SAGE UMT® Case is specially designed to hold the SAGE UMT®, the charger, holster, IOM, a tablet (not included) and several stacks of 20 RFID tags (not included).



**WATCH A VIDEO TO LEARN MORE
ABOUT THE SAGE UMT® AUTOMATIC
STEAM TRAP TESTER**

SAGE UMT[®] RFID Hanging Tags

Standard RFID Tags - Basic Dimensions



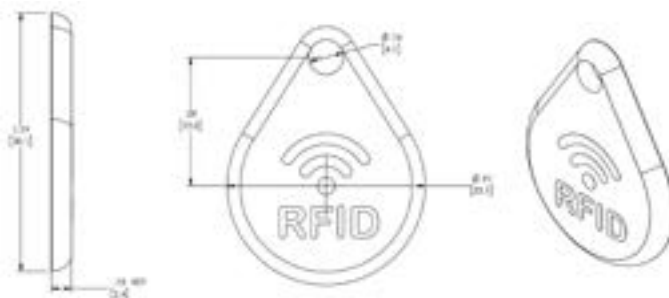
Standard RFID Tags

Physical Parameters	
Products Size	1" H x 2.7" W (25mm H x 68mm W), 0.16" (4mm) hole
Materials	Polycarbonate
Operating condition	-30 °F to 180 °F (-34 °C to 82 °C)
Storage condition	14 °F to 122 °F (-10 °C to 50 °C), 5-95% RH, no condensation
Single Weight	0.07 oz (2g)
Performance Parameters	
Direct Sunlight Exposure	10 Years
Water Resistance	Resistant to Dripping, Splashing and Prolonged Submersion
Operating Frequency	13.56MHz
Read Distance	1-1/2" (38mm)
Data Retention	50 years
Chemical Resistance	*Isopropyl Alcohol, Hydrochloric Acid, Sodium Hydroxide, Ethyl Acetate, Common Lacquer Thinner, Common Paint Stripper
Mounting Method	Engineered Hole

*Note that some chemicals may alter or damage the tag to which the RFID tag is adhered, even if the RFID Tag may not be affected



Tear Drop Add On RFID Tags - Basic Dimension



RFID Tear Drop Tags

Physical Parameters	
Products Size	1.25" H x 0.92"W (32mm H x 23mm W), 0.16"(4mm) hole
Materials	PET Epoxy over foil with VHB™ Adhesive Backing
Operating condition	-4F to 150F (-20C to 65C)
Storage condition	*14F to 122F (-10C to 50C), 5-95% RH, no condensation
Single Weight	0.06 oz (1.7g)
Performance Parameters	
Direct Sunlight Exposure	10 Years
Water Resistance	Resistant to Dripping, Splashing and Brief Submersion
Operating Frequency	13.56MHZ
Read Distance	1/2" (12mm)
Data Retention	10 years
Chemical Resistance	* Isopropyl Alcohol, Sodium Hydroxide, Ethyl Acetate, Muriatic Acid, Common Lacquer Thinner, Common Paint Stripper
Mounting Method	VHB™ Adhesive Backing and Engineered Hole



*Note that some chemicals may alter or damage the tag to which the RFID tag is adhered, even if the RFID Tag may not be affected

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.

There are **3 challenges** for an 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.

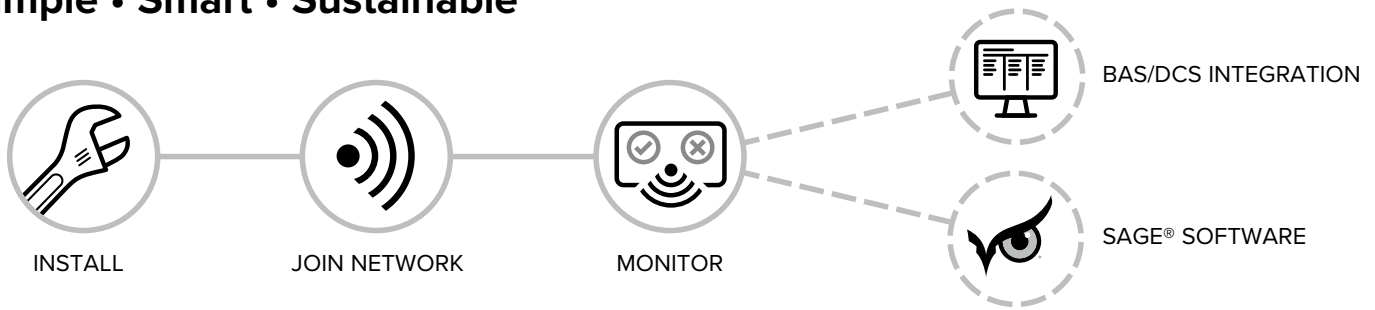
SteamEye® enables you to tackle all three challenges with one system solution that combines a mix of methods including conductivity, steam trap specific acoustic, and temperature monitoring with integrated smart wireless solutions.

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-Through steam trap, Outlet Pressure < (Inlet Pressure/2) Source: AM0017 by UNFCCC

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 (0barg) 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).

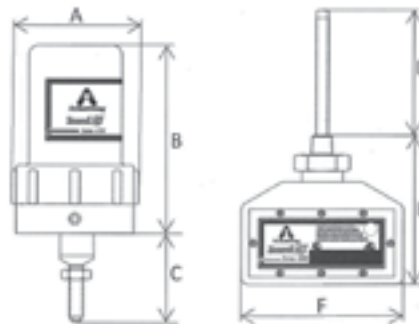


SPECIFICATIONS	GATEWAY	REPEATER	WIRELESS MONITOR
Communications	Proprietary spread spectrum format		
Operating Frequency	902-928 MHz		
Transmission Bandwidth	200 kHz		
Power Requirement	120 VAC	14 VAC*	Duracell #DL123A 3 VDC; 2/3 A size; LiMN02
Power Consumption	400 mA	250 mA	N/A
Ambient Temperature	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

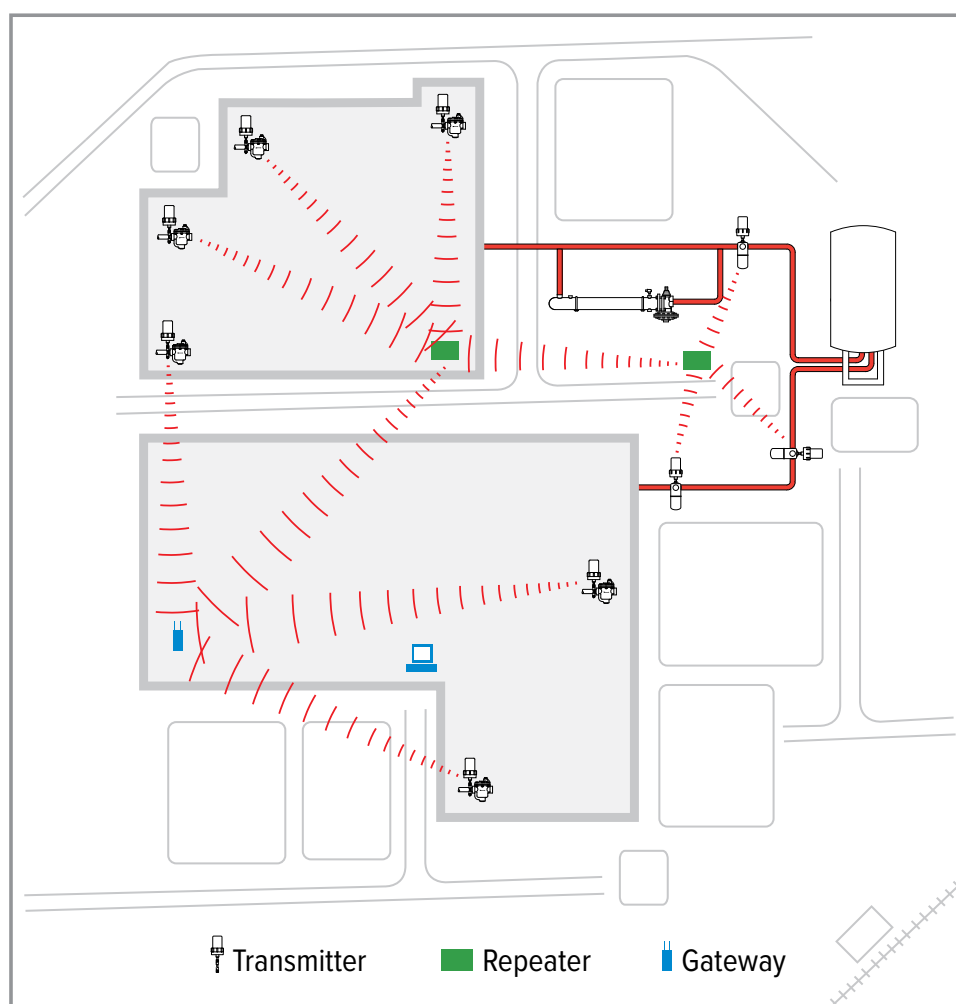


Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit armstronginternational.com for up-to-date information.

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



DESCRIPTION

The SteamEye® Gateway 4000M 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 IP. 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 4000M series has a LAN connection for direct monitor status updates and gateway configurations. Automatic email notifications and alerts for critical applications are also available.

Model: 4000M

Specifications	
Operating System	Linux based Cherokee SSL web server
Processor	AMD low power LX800 500MHz, Fanless
Memory	128MB RAM 4GB Internal Flash
Input Power	120v AC Power Supply
Power Consumption	400mA
Ethernet Interface	1 x 10/100 Mbps
Supported Communication Protocols	IPv4, SMTP, FTP, Telnet, SSH, HTTP, HTTPS, ModBus RTU
Inbound TC/IP ports: - Embedded web server with Remote configuration	80 standard (redirected to 443) 23 Telnet 21 FTP 443 HTTPS configurable 22 SSH configurable
Outbound TC/IP ports: - For e-mail/text message notification - For SAGE® updates	25 (Mail to SMTP server) 80 HTTP 443 HTTPS configurable
RF Receiver	1 Internal RF Receiver 1 External Receiver Port
Operating Frequency	902-928 MHz
Dimensions (H x W x D)	2-3/4" x 6-1/2" x 4-1/2" (70mm x 166mm x 114mm)
Weight	3.5 lb (1.6 kg)
Operation Temperature Range	32-140°F (0-60°C)
Operating Humidity	10% - 70% Relative humidity, non-condensing
ModBus Connection	RS-485 or RS-232
BACnet IP	Ethernet



DESCRIPTION

SteamEye® technology sends information wirelessly from transmitters in the field to the main receiver (gateway). If transmitters have a line of site to the gateway, the range is roughly 1,300 feet. In facilities where the signals must travel through various obstructions, the distance can vary from 300 to 500 feet. If the gateway is out of range, the transmitter will utilize a pathway back using repeaters. Repeaters can be placed in strategic locations and will help set up a wireless backbone throughout the facility. This network allows equipment to be monitored efficiently and effectively every minute of the day.

Model: RP4000

Specifications	
Power Requirement	120 VAC. Adapter to 14 VAC provided
Power Consumption	300 mA
Receiver Type	Narrow-Band Spread Spectrum
Frequency	902-928 MHz (North America)
Band Width	200 KHz
Ambient Temperature	32°F To 140°F (0°C To 60°C)
Humidity	Up to 90%, non-condensing
Repeat Signals	Limit of 10 Repeaters in Series
Battery Backup	1800 mAh @3.7 typical
Typical Battery Backup Life	24 Hours
Battery Charger Operating Environment	32°F To 104°F (0°C To 40°C)



Model: URFC4700

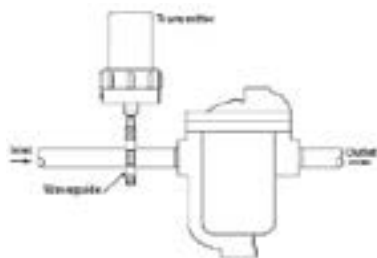
DESCRIPTION

The 4700 Series is designed to detect the condition of the steam trap (cold, ok, and blow through) for any make or model. The 4700 Series utilizes acoustic and temperature readings coupled with Armstrong patented logic to determine the state of the steam trap. The easy-to-install design provides non-intrusive installation that can be completed in minutes without any special tools. The unit utilizes battery power and can be changed easily and quickly without removing the transmitter from the mounting hardware.

Models: URFC4700, URFM4700

Transmitter	
Physical Dimensions	dia - 3" (76 mm) h - 6.75" (171 mm)
Monitoring type	Ultrasonic and Temp
Material	Glass Filled Nylon
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	1500 psi (104 bar)

*Operating at the upper or lower end of the temperature range may decrease battery life



Model: URFC4700

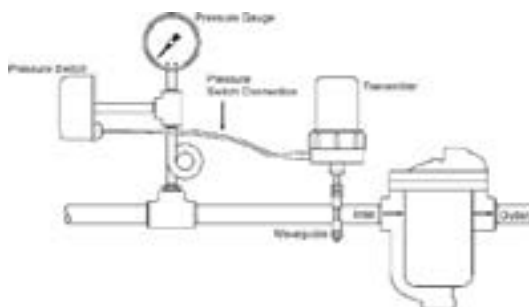
The URFC4700 steam trap transmitter can be installed on any style trap operating under constant pressure.

Monitors: Steam Trap
Constant Pressure Applications

Operating Conditions:

Non-submersible

Note: Heat sync is required on installations above 200 psig (14 Bar)



Model: URFM4700

The URFM4700 steam trap transmitter can be installed on any style trap operating on modulating pressure.

Monitors: Steam Trap Modulating Pressure (On/Off)

Operating Conditions:

Non-submersible

Note: Heat sync is required on installations above 200 psig (14 Bar)

Note: Pressure switch not included.



Model: URFC4700R

The URFC4700R steam trap transmitter can be installed on any style trap operating on constant pressure. The remote transmitter can be installed away from the trap making it ideal for use in situations where communication is difficult.

Monitors: Steam Trap
Constant Pressure Applications

Operating Conditions:

Non-submersible

Note: Heat sync is required on installations above 200 psig (14 Bar)



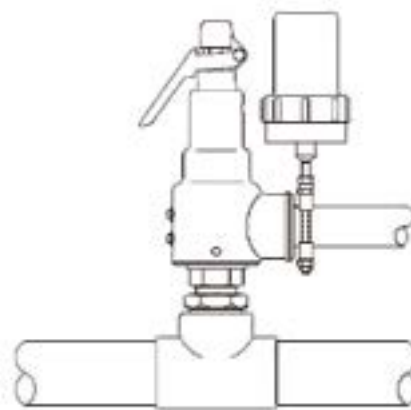
DESCRIPTION

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

Model: URFC4700-SRV

Transmitter	
Physical Dimensions	dia - 3" (76 mm) h - 6.75" (171 mm)
Monitoring type	Ultrasonic and Temp
Material	Glass Filled Nylon
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	600°F (316°C)

*Operating at the upper or lower end of the temperature range may decrease battery life



Model: URFC4700-SRV

The URFC4700-SRV Safety Relief Valve (SRV) transmitter can be installed on a SRV for notification of a leaking or discharging SRV.

Monitors: Safety Relief Valves

Operating Conditions: Non-submersible

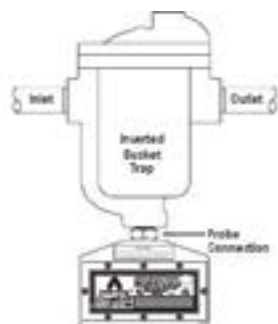
Note: A heat sync is required on installations with pipe temperatures greater than 385°F.



Model: RFC4300

DESCRIPTION

The 4300 Series is designed to detect the condition of the steam trap (cold, ok, and blow through). The 4300 Series utilizes conductivity and temperature readings coupled with Armstrong patented logic to determine the state of the steam trap.



Model: RFC4300

The RFC4300 steam trap transmitter can be installed on any probe ready Armstrong inverted bucket steam trap.

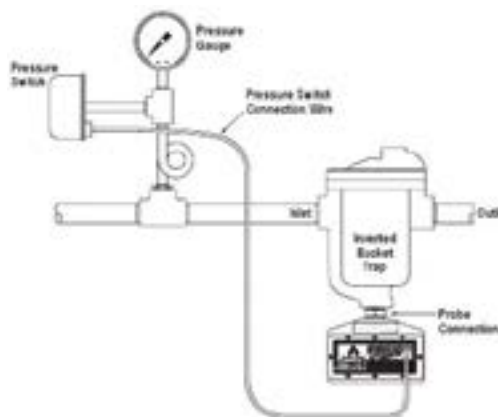
Monitors: Steam Trap Constant Pressure Applications

Operating Conditions: Non-submersible

Model: RFC4300, RFM4300

Transmitter	
Physical Dimensions	W - 5.25" (134 mm) H - 4.5" (115 mm) D - 2.75" (70 mm)
Monitoring type	Conductivity & Temperature
Material	Thermoset Resin; EL Cast Black
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	600 psi (42 bar)

*Operating at the upper or lower end of the temperature range may decrease battery life



Model: RFM4300

The RFM4300 steam trap transmitter can be installed in any probe ready Armstrong inverted bucket trap.

Monitors: Steam Trap Modulating (On/Off Applications)

Operating Conditions: Non-submersible

Note: Pressure switch not included.

Vault Transmitter



Model: RFC4320

Transmitter	
Physical Dimensions	W – 7.80" (198 mm)
	H – 7.09" (180 mm)
	D – 2.88" (73 mm)
Encl. Environmental Rating	NEMA 4X
Power Supply	Duracell 123A
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Temperature Range	-40°F to 194°F (-40°C to 90°C)

*Operating at the upper or lower end of the temperature range may decrease battery life

DESCRIPTION

The 4300 Series is designed to detect the condition of the steam trap (cold, ok, and blow through). The 4300 Series utilizes conductivity and temperature readings coupled with Armstrong patented logic to determine the state of the steam trap.

Probe	
Physical Dimensions	Diameter – 1.875" (48 mm)
	H – 5" (127 mm)
Max Temperature	250°F (121°C)
Max Pressure	600 psi (41 bar)
Monitoring Type	Conductivity and Temp
Material	304 Stainless Steel

Cable and Connector	
Length	50 ft (15.24 m)
Size	4-Pole, 22 AWG
Temperature Range	-40°F to 221°F (-40°C to 105°C)
Insulation Material	Thermoplastic Elastomer
O-ring Material	Nitrile Rubber
Connector Contact Material	Brass, Gold plated over Nickel
Connector Material	Polyurethane and Stainless Steel

Model: RFC4320

The RFC4320 steam trap transmitter is typically installed in areas where there is a potential for flooding and/or high heat and humidity are present (steam vaults/pits). The RFC4320 can be installed in any probe ready Armstrong trap.

Monitors: Steam Trap, Constant Pressure Applications



Liquid Level Transmitter

Model: RFC4300-PTX



DESCRIPTION

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

*Operating at the upper or lower end of the temperature range may decrease battery life

Transmitter	
Physical Dimensions	W - 5.25" (134 mm) H - 4.5" (115 mm) D - 2.75" (70 mm)
Monitoring type	Conductivity & Temperature
Material	Thermoset Resin; EL Cast Black
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	600 psi (42 bar)

Pressure Operated Pump Transmitter



DESCRIPTION

The pressure operated pump transmitter is designed to detect if a pump is in a plugged or blow through condition. The transmitter also has a cycle counter option to help with preventative maintenance. Information collected allows for condensate return calculations and trending of capacities of the pump trap. The pressure operated pump transmitter works with any mechanical pump.

*Operating at the upper or lower end of the temperature range may decrease battery life

Model: RFM4300-PTX

Transmitter	
Physical Dimensions	W - 5.25" (134 mm) H - 4.5" (115 mm) D - 2.75" (70 mm)
Monitoring type	Conductivity & Temperature
Material	Thermoset Resin; EL Cast Black
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	600 psi (42 bar)

Coil Transmitter



Model: RFC4300-CLX

Transmitter	
Physical Dimensions	W - 5.25" (134 mm) H - 4.5" (115 mm) D - 2.75" (70 mm)
Monitoring type	Conductivity & Temperature
Material	Thermoset Resin; EL Cast Black
Power supply	Duracell 123A 3 Volt Lithium Battery
Typical Battery Life	3-5 years*
Transmission	902 to 928 MHz
Power	60 mW
Transmission Bandwidth	200 KHz
Communications	Proprietary spread spectrum format
Temperature Range	-40°F to 115°F (-40°C to 46°C)
Max Operating Pressure	600 psi (42 bar)

DESCRIPTION

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

*Operating at the upper or lower end of the temperature range may decrease battery life

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 LP saturated steam stage
 - Piping corrosion
 - Erosion on valves, reducers
- | “Stalling” or flooded heat exchanger
 - Decrease in production
 - Reduced heat transfer
 - Batch process losses
 - Thermal stress

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 & intangible losses.

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

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-Through steam trap, Outlet Pressure < (Inlet Pressure/2) Source: AM0017 by UNFCCC

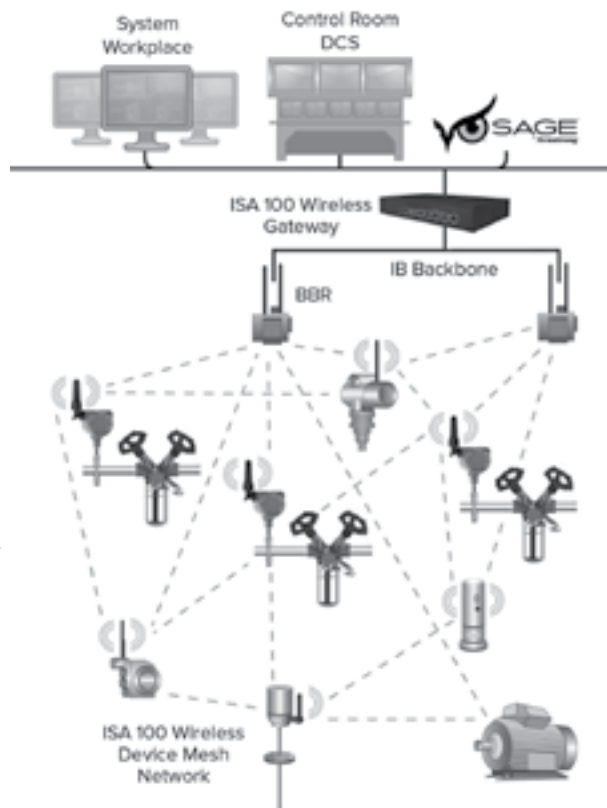
ISA100 Wireless™ Protocol

ISA100 Wireless™ is the only industrial wireless protocol standard to incorporate IPv6 directly as part of its network layer and transport layer. ISA100 Wireless™ supports multiple subnets which enables sensors to be grouped for traffic and network management, while breaking the network into zones for security reasons. ISA100 enables backbone-level routing which is also supported in ISA100 Wireless™.



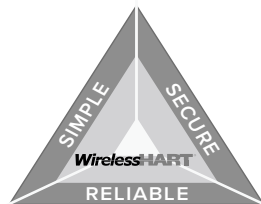
ISA100 Provides:

- | Best in class transmitter for application.
- | Robust encryption technology.
- | Globally accepted standard.
- | Downtime free communication.
- | Control of latency and low error rates.



WirelessHART® Protocol

WirelessHART® is a highly reliable, easy to deploy wireless communications protocol for process automation applications. It adds wireless capabilities to HART technology while maintaining compatibility with existing HART devices, commands, and tools. **WirelessHART** uses mesh networking technology. Each device in a mesh network can serve as a router for messages from other devices. In other words, a device doesn't have to communicate directly to a gateway, but just forward its message to the next closest device. This extends the range of the network and provides redundant communication routes to increase reliability, particularly in the difficult radio environment found in process facilities. The Armstrong Intelligent Monitoring (AIM®) ST5700 series is the only steam traps monitoring device **WirelessHART®** registered by FieldComm Group.™



SIMPLE

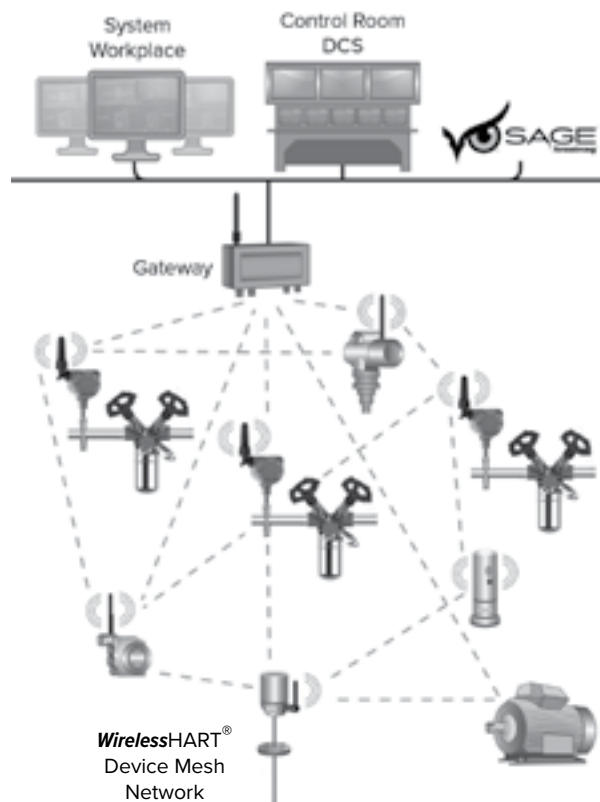
- | Easy set-up of network and HART devices
- | Self-organizing, adaptive mesh network
- | Seamless integration to existing hosts

RELIABLE

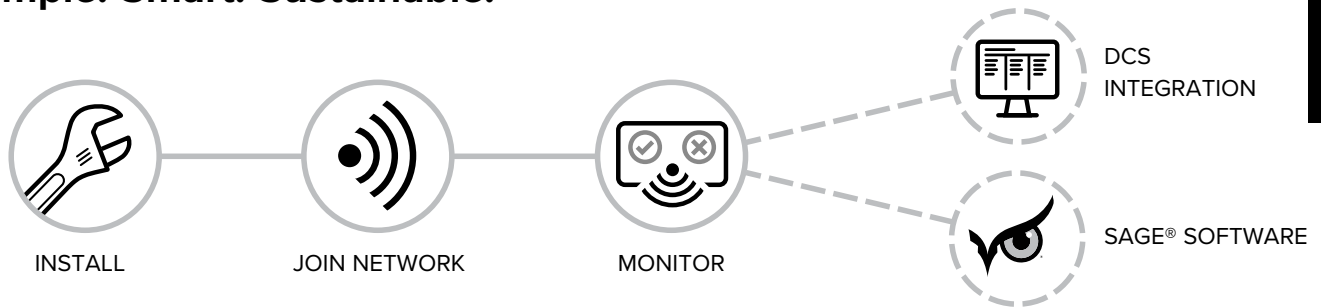
- | Robust, multi-tiered, always-on security
- | Device authentication and passwords
- | Industry standard data encryptions

SECURE

- | Channel hopping to avoid interference
- | Time-synchronized communication
- | Redundant self-healing network



Simple. Smart. Sustainable.



| No steam trap set-up (operating pressure, trap details, rate).

| No integration to external software necessary.

Transmitted information to gateway:

ST5700 (WirelessHART)

- Primary Variable (PV) → Steam Trap Condition: 1=OK, 2=COLD, 3=BLOW-THROUGH
- Secondary Variable (SV) → Current Temperature (°C or °F)
- Tertiary Variable (TV) → Temperature Set Point (°C or °F)
- Quaternary Variable (QV) → Estimated Battery Life (Days)

Transmitted information to gateway:

ST6700 (ISA100)

- Channel 9 → Steam Trap Condition: 1=OK, 2=COLD, 3=BLOW-THROUGH
- Channel 10 → Current Temperature (°C or °F)
- Channel 11 → Temperature Set Point (°C or °F)
- 100+ NAMUR NE107 diagnostics available including estimated Battery Life (Days)

| Acoustic range specifically calibrated for steam traps.

| Patented waveguide for proper acoustic filtration and vibration resistance.

| Non-intrusive installation, clamped directly on the pipe ahead of the steam trap.

| Waveguide hardware allows multiple transmitter installation orientations.

| 24/7 monitoring of the steam trap population.

| AIM[®] devices scattered on the steam system will strengthen the wireless network.

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).



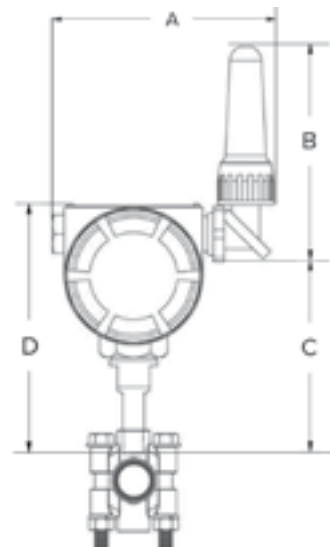
DIMENSIONS

	[in]	[mm]
A	6.4	162
B	5.0	128
C	5.2	131
D	6.5	164

SPECIFICATIONS

Housing Material	Epoxy coated aluminum
Waveguide Material	CF8M casting
Protection Rating	IP66
Hazardous Location	Class I, Division 1, ATEX Zone 0
Ambient Temperature	-40°F to 158°F (-40°C to 70°C)
Min. Operating Pressure	15psig (1barg)
Max. Process Temperature	824°F (440°C) *
Battery Type	Epoxy Lithium-metal battery pack
Pipe Diameter	½" to 12" (DN15 to DN300)
Weight (without waveguide)	4.1lbs (1.9kg)

* See IOM, not derated on ambient temperature using specific installation kit.



Why Monitoring Valves?

Fugitive emissions are unintended or irregular releases of gases or vapors from pressurized system, either due to faulty equipment, leakage, or other unforeseen mishaps. Leak detection is an essential component of risk management as it allows the operator to respond to the leaks to prevent further escalation of incidents.

Pressure/Safety Relief Valves are necessary to the protection of many processes but most of these are known to be continuous sources for leakage. Regardless of whether these gases, hazardous area pollutants or more benign fluids such as steam, are released to an enclosed recovery system or to the environment, it is important to identify the source, time, and magnitude of the release.

There are **four benefits** of valve monitoring:

Safety

- It reduces exposure of employees to potentially harmful emissions and fluids as well as exposure of property to potentially highly corrosive fluids.

Environmentally

- It reduces global warming and greenhouse gases getting to the atmosphere.

Economically

- It makes sure the process is efficient by limiting downtime and reducing losses of pressurized gases.

Legally

- It helps avoid fines from local and states regulated by complying with legislation.

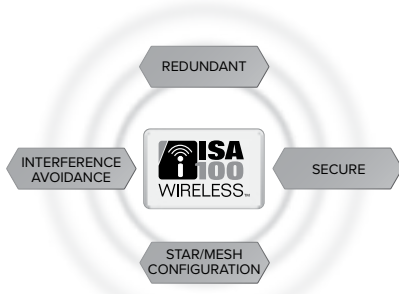
There are **three challenges** for effective valve monitoring:

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

AIM® enables you to tackle all three challenges with one system solution that combines a mix of methods including valve specific acoustic and temperature monitoring with integrated smart wireless solutions.

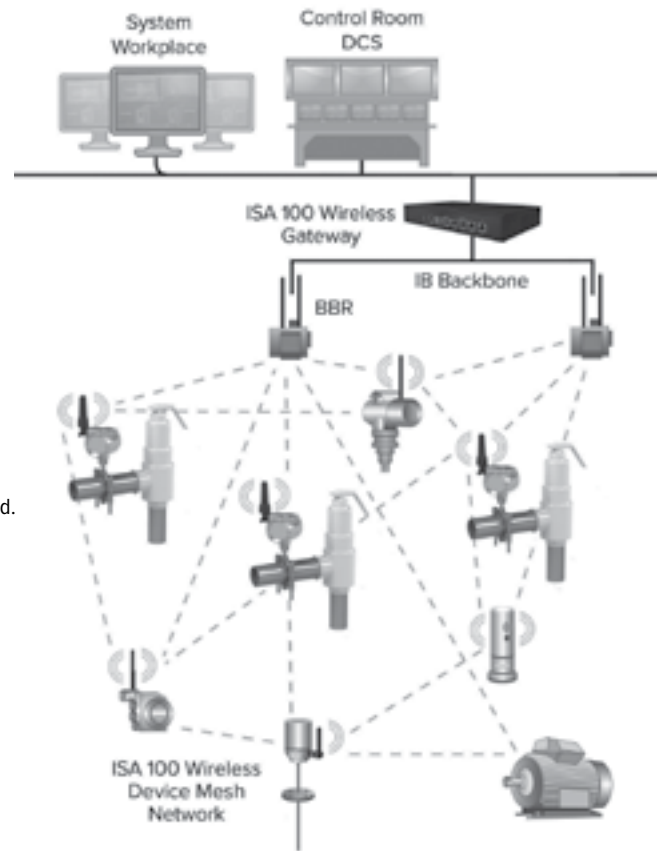
ISA100 Wireless™ Protocol

ISA100 Wireless™ is the only industrial wireless protocol standard to incorporate IPv6 directly as part of its network layer and transport layer. ISA100 Wireless™ supports multiple subnets which enables sensors to be grouped for traffic and network management, while breaking the network into zones for security reasons. ISA100 enables backbone-level routing which is also supported in ISA100 Wireless™.



ISA100 Provides:

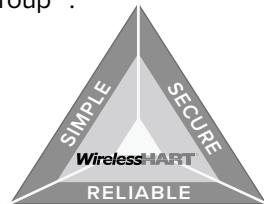
- | Best in class transmitter for application.
- | Robust encryption technology.
- | Globally accepted standard.
- | Downtime free communication.
- | Control of latency and low error rates.



WirelessHART® Protocol

WirelessHART® is a highly reliable, easy to deploy wireless communications protocol for process automation applications. It adds wireless capabilities to HART technology while maintaining compatibility with existing HART devices, commands, and tools.

WirelessHART uses mesh networking technology. Each device in a mesh network can serve as a router for messages from other devices. In other words, a device doesn't have to communicate directly to a gateway, but just forward its message to the next closest device. This extends the range of the network and provides redundant communication routes to increase reliability, particularly in the difficult radio environment found in process facilities. The Armstrong Intelligent Monitoring (AIM®) AD5000 series is the only valve monitoring device **WirelessHART®** registered by FieldComm Group™.



SIMPLE

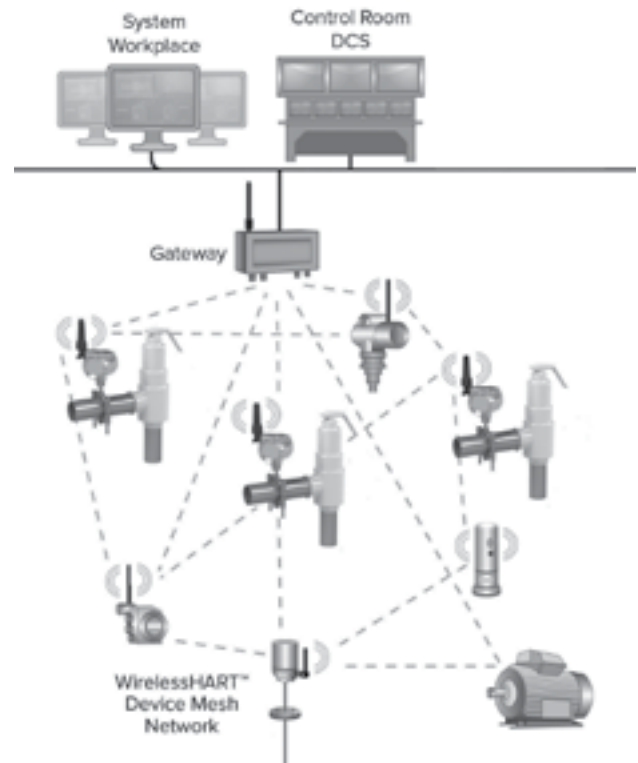
- | Easy set-up of network and Hart devices
- | Self-organizing, adaptive mesh network
- | Seamless integration to existing hosts

RELIABLE

- | Robust, multi-tiered, always-on security
- | Device authentication and passwords
- | Industry standard data encryptions

SECURE

- | Channel hopping to avoid interference
- | Time-synchronized communication
- | Redundant self-healing network



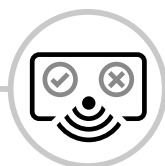
Simple • Smart • Sustainable



INSTALL



JOIN NETWORK



MONITOR



DCS INTEGRATION

Transmitted Information to gateway: AD5000 (WirelessHART)

- **Device variable 0:** Value of the level of sound detected by the monitor
- **Device variable 1:** The temperature detected at the tip of the stem of the monitor (skin temperature)
- **Device variable 2:** Number of occurrences where the acoustic level exceeds a defined threshold (with reset).
- **Device variable 3:** Calculate the total time that a lift is detected between resets (in seconds).
- **Device variable 4:** Battery Life
- **Device variable 5:** Acoustic Level Threshold
- **Device variable 6:** Sample rate

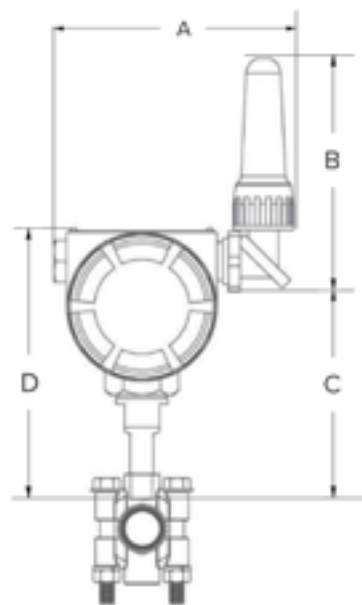
These are all the available variables that can be mapped, only four can be displayed to PV, SV, TV, and QV.

- No integration to external software necessary.
- Acoustic range specifically calibrated for valves
- Patented waveguide for proper acoustic filtration and vibration resistance.
- Non-intrusive installation, clamped directly on the pipe downstream of the valve.
- Waveguide hardware allows multiple transmitter installation orientations.
- 24/7 monitoring of the valve population.
- AIM® devices scattered in the plant will strengthen the wireless network.

Transmitted Information to gateway: AD6000 (ISA100)

- **Channel 9:** 0–255 value of the level of sound detected by the monitor
- **Channel 10:** The temperature detected at the tip of the stem of the monitor (skin temperature)
- **Channel 11:** Number of occurrences where the acoustic level exceeds a defined threshold (with reset).
- **Channel 12:** Calculate the total time that a lift is detected between resets (in seconds).
- 100+ NAMUR NE107 diagnostics available including estimated Battery Life (Days)

SPECIFICATIONS	
Housing Material	Epoxy coated aluminum
Waveguide Material	CF8M casting
Protection Rating	IP66
Hazardous Location	Class I, Division 1, ATEX Zone 0
Ambient Temperature	-40°F to 158°F (-40°C to 70°C)
Min. Operating Pressure	15psig (1barg)
Max. Process Temperature	824°F (440°C) *
Battery Type	Epoxy Lithium-metal battery pack
Pipe Diameter	½" to 12" (DN15 to DN300)
Weight (without waveguide)	4.1lbs (1.9kg)



DIMENSIONS		
	[in]	[mm]
A	6.4	162
B	5.0	128
C	5.2	131
D	6.5	164



* See IOM, not derated on ambient temperature using specific installation kit.

Steam QM®-1 – Steam Quality Monitor

Wet steam is a costly problem across many industries causing damages and product quality issues:

- | Batch rejection, wet packs and wet loads in sterilizers.
- | Food grade quality of steam not achievable.
- | Carbon dioxide with water creates carbonic acid that damages pipes.
- | Slug of water causes water hammering which is destructive.
- | Flow meters are inaccurate.
- | Water abrades like sand and will erode pipes, elbows, valves
- | Lower latent heat available reduces heat transfer.
- | Blade erosion on saturated steam turbines.
- | Thermal stress as condensate cools down.



In fact, steam quality typically refers to the amount of water in the steam which is also known as “dryness fraction”. Saturated steam is a biphasic mixture of steam and water where the water is in the form of un-vaporized micro-droplets.

The dryness fraction (X) quantifies the ratio of the mass of steam to the mass of the biphasic mixture:

$$X = \frac{\text{Mass of Steam}}{\text{Mass of Steam} + \text{Mass of Water}}$$

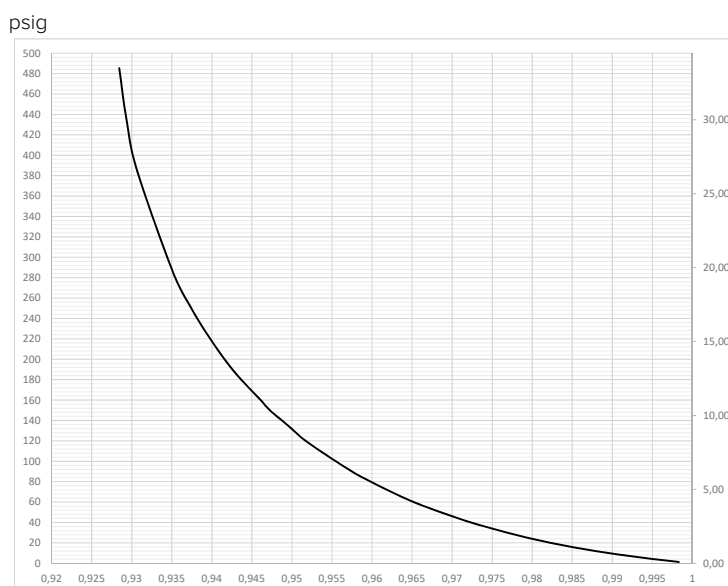
Part of the difficulty in monitoring the steam dryness fraction is that steam systems are dynamic. The steam is moving through the components and conditions change, second by second. Within this complex system, there are many things that contribute to water in the steam.

Monitoring the dryness fraction of steam has long been a manual process – time consuming, inconsistent, unreliable, and presents inherent safety and accuracy risks.

The Steam QM®-1 is an automatic steam quality monitor that safely and reliably determines and communicates the dryness fraction of plant and culinary steam; allowing you to continuously and efficiently monitor your steam system.

The Steam QM®-1 makes it easy, safe and precise to monitor steam quality when the highest quality steam is needed.

Minimum Dryness Fraction Measurable



Steam QM -1 Specifications

Steam Operating Pressure Range	43 - 465 psig (3 - 32 barg)
Voltage	12 VAC or 15 - 24 VDC



Steam QM[®]-1 – Steam Quality Monitor

Smart
Products

Manual Versus Automatic

Until now steam dryness fraction measurement has been a time-intensive, unreliable and potentially unsafe process. Steam QM[®]-1 is more reliable. It is also safer than manual testing methods. When you compare Steam QM[®]-1 to manual testing methods the choice is clear:

Manual Method	Automatic Method
Description	
↓ A sample of the steam is condensed during a limited time frame. Temperature and mass measurements allow calculation of the steam dryness.	↓ Reducing steam pressure to atmosphere allows measurement of steam dryness.
Disadvantages	Advantages
↓ Time Consuming: Typically manual steam quality measurement requires two people, and can take up to one hour per measurement point. This does not include additional time required to complete necessary reports. ↓ Trending: Unable to trend steam dryness over a period of time. ↓ Unsafe: There are inherent safety risks involved in sampling live steam and condensate in a water receiver. ↓ Unreliable: Measurement results depend on the skill of the technician conducting the test.	↓ Quick and Easy: Steam QM [®] -1 is simple to install. ↓ Trending: Continuous measurements provide trending data over time. ↓ Safe: Once QM [®] -1 is installed it is much safer than manual measurement methods. ↓ Reliable: Steam QM [®] -1 is both reliable and accurate.

Steam QM[®]-1 Dimensions & Weight

	in	mm
A – Assembly Width	20	500
B – Assembly Height	15	375
C – Cabinet Width	10	250
D – Cabinet Height	6.5	160
E – Cabinet Depth	2.5	60
Assembly Weight	20 lb	9 kg
Cabinet Weight	2 lb	0.9 kg

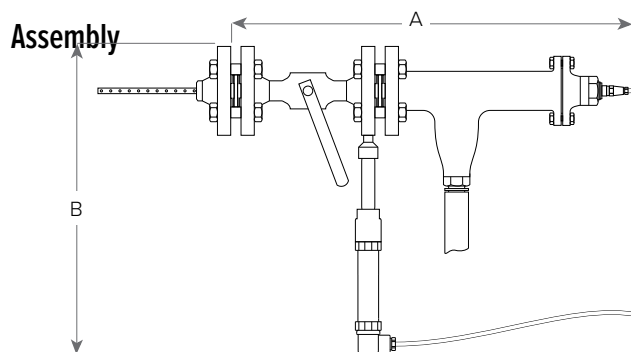
Steam QM[®]-1 Package Includes:

- ↓ Insulation Covers
- ↓ All Necessary Accessories

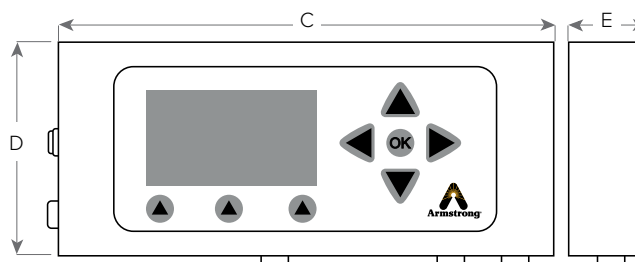
Optional Feature:

- ↓ Data Logger

More Information:



Cabinet



Steam QM®-3 – Steam Quality Monitor

The sterilization process, the quality of the sterile product and the serviceability and longevity of the sterilizer and its associated equipment are greatly influenced by the quality of steam supplied to a sterilizer. Sterilization is a process whose efficacy cannot be verified retrospectively by inspection or testing of the product before use. For this reason, sterilization processes must be validated, the performance of the process routinely monitored, and the equipment maintained.

EN 285

This European standard specifies requirements and the relevant tests for large steam sterilizers, primarily used for the sterilization of medical devices and their accessories but has been adopted by most pharmaceutical industries.

- The sterilizer shall be designed to operate with saturated steam containing up to 3.5 ml non-condensable gases collected from 100 ml condensate.
- The sterilizer shall be designed to operate with saturated steam with a dryness value not less than 0.95, where the dryness value denotes the mass of the gas fraction in the mass of saturated steam.
- When the supplied steam is expanded to atmospheric pressure the superheat shall not exceed 25K.

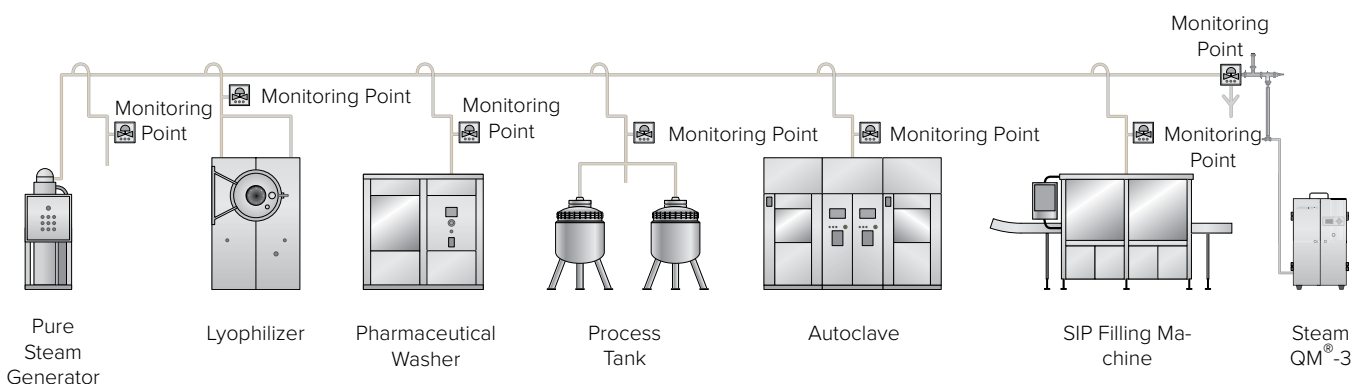
The patented Steam Quality Monitor QM®-3 is an alternative procedure to the one described in EN285 that has been shown to give equivalent results to the method specified in this European Standard in order to demonstrate that the level of non-condensable gases contained in the steam will not prevent the attainment of sterilization conditions in any part of the sterilizer load and to avoid excess moisture carried in suspension that can cause damp loads, while too little cannot prevent the steam from becoming superheated during expansion into the sterilizer chamber.



Sensing Range	
Dryness Fraction	85 - 100%
Amount of Superheat Present	0 - 50° C 0 - 90° F
NCG Content	0 - 15%

Product Features

- Simple “Plug and Play” installation,
- Simultaneous steam dryness, superheat and non-condensables (NCGs) monitoring,
- Safe alternative to the traditional manual method of sampling steam,
- RS485 connection for data logging using regulation compliant device; results may be remotely monitored via MODBUS.



Manual Versus Automatic

Until now steam quality measurement has been a time-intensive, unreliable and potentially unsafe process. Steam QM®-3 is not only more reliable and safer than manual testing, the unit is also portable, so it can be easily transported to multiple points on your steam line.

When you compare Steam QM®-3 to manual testing methods the choice is clear:

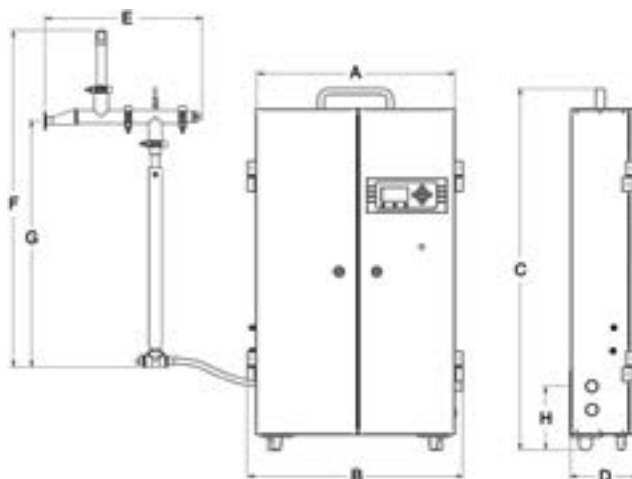
Manual Method	Automatic Method
Description	
- A sample of clean steam is condensed, and the enthalpy allows measurement of steam dryness, and NCG content. - Temperature measurement before condensation identifies an excess of superheat temperature.	- Reducing steam pressure to atmosphere allows measurement of steam dryness. - Steam temperature and pressure measurements detect superheat. - Volume of non-condensable gases are compared to condensate.
Disadvantages	Advantages
- Time Consuming: Typically manual steam quality measurement requires two people, and can take up to three hours per measurement point. This does not include additional time required to complete necessary reports. - Trending: It is impossible to monitor a trend over a period of time. - Unsafe: There are inherent safety risks involved in sampling live steam and condensate in a water receiver. - Unreliable: Measurement results depend on the skill of the technician conducting the test.	- Quick and Easy: Steam QM®-3 is simple to install. - Trending: Continuous measurements provide trending data over time. - Safe: Because Steam QM®-3 is installed while the steam valve is closed, it is much safer than manual measurement methods. - Reliable: Steam QM®-3 is both reliable and accurate within +/- 1% of steam dryness.

Installation Qualification/Operational Qualification

Installation Qualification/Operational Qualification (IQ/OQ) procedures available to comply with government and international standards that recommend documented verification that your equipment is installed and functioning according to the manufacturer's specifications.

Dimensions & Weight		
	in	mm
A – Cabinet Width	22	550
B – Width	24	600
C – Cabinet Height	40	1000
D – Depth	7.5	190
E – Width	17	430
F – Height	37	945
G - Height from inlet tee to bottom	26	660
H - Height from cabinet steam inlet to bottom	7.5	190
Cabinet Weight	42 lb	19 kg
Total Weight	55 lb	25 kg

Specifications	
Steam Operating Pressure Range	0.5-55 barg 7-80 psig
Voltage	110/230 VAC
Cooling Water	15 l/h @ 10 °C (4 gph @ 50 °F)



Steam QM®-3 Package Includes:

Insulation Covers • Wall Mount • All Necessary Accessories

Optional Feature:

Data Logger