SN Integrity

ionix
ADVANCED TECHNOLOGIES

hotsensell®

Powered by ionix

Experts in Corrosion and Erosion, Non Intrusive Monitoring

The Ionix HotSense™ ultrasonic testing (UT) sensors and monitoring platform are for applications in extreme environments through a temperature range of -55 to +550 °C. HotSense™ complements routine inspection by providing frequent, high precision trending data, which is unaffected by operator variability. Trending data is used to maximise plant availability and productivity by enabling predictive maintenance and process optimisation.

ABOUT

HotSense™ was formed from the needs of operators and inspectors to measure and monitor their assets in increasingly challenging conditions, including at high and low temperatures, in explosive and hazardous environments or in the presence of ionising radiation.

Before HotSense™, ultrasonic testing (UT) sensors required the use of cooling or using large stand-offs and shields to protect them from the local environment, limiting their application. With the Ionix HPZ piezoceramic crystal at their core, HotSense™ can be deployed direct to the asset, within the extreme environment, including under insulation.

Combined with our measurement and data collection option, Ionix provides the most versatile and cost effective, non-invasive, ultrasonic monitoring solution on the market today. We enable asset integrity digitalisation and the realisation of Industrial IOT solutions with data, such as corrosion and erosion trending, delivered direct to plant control rooms or the cloud.

Introduction to HotSense™ sensors

hotsense® SN Integrity

LEADERS IN NON INTRUSIVE, WIRELESS, ON-STREAM WALL THICKNESS MONITORING.

HotSense™ sensors are the key enablers to acquire ultrasonic measurements, such as wall thickness data, from locations which are dangerous, hard to access or where other OEMs can't install. Our solution consists of a range of intrinsically safe ultrasonic transducers, deployment and coupling methods, data collection and storage systems and data viewing and managing software.

With built-in measurement validation and solution modularity that allows for automated, wireless and manual implementation, Ionix sensors can be installed anywhere at any industrial location regardless of its temperature or hazard location requirements. HotSense™ sensors can also be installed while equipment is operating and without shutdown. They can be installed on coated or painted surfaces with a range of rugged deployment options.

BROCHURE CONTENTS

Contact us:

0430 041 643

info@snintegrity.com.au

snintegrity.com.au

sn-integrity

VISIT US

HotSense™ Dual Element (DE) Ultrasonic Monitoring Sensors

Reduce the cost and complexity of on-stream ultrasonic monitoring

Keywords: corrosion, erosion, in-service monitoring, hazardous environments, ultrasonics, corrosion in painted pipes

HOTSENSE™ DE

- **Low-cost dual element** ultrasonic monitoring sensors for widespread distribution.
- **Through coating** measurements without removal of protective coatings.
- **Installation on all sizes** of pipes and vessels.
- **Built on the award winning HotSense™ ultrasonic platform** next generation sensors powered by the proprietary Ionix HPZ piezoceramic.
- **-55 to +150 °C** [-67 to +302 °F] continuous measurement temperature range.
- **Permanent or semi-permanent installation** in extreme or hazardous environments.
- **Intrinsically safe certified** to Zone 0.
- **Manual or automated** data collection.

DEPLOYMENT

- Deploy on to live assets without shutdown or isolation.
- Options for vessels and pipes NPS 52" and above.
- Integrated magnetic fixing for ease of installation on ferrous assets.
- Epoxy fixings for large pipes and vessels.
- Universal strap fixing for small pipe diameters and semi-permanent installation.
- Deploy around the circumference, spine or survey grid of piping.

SOLUTIONS

- Fixed UT sensors provide increased measurement precision and collection frequency for reliable and real-time corrosion trending.
- Optimise Asset Integrity and Performance Management (AIM/APM) programmes with accurate and reliable wall loss data.
- Reduce operational costs and maximise production margins.
- Data collection using standard UT flaw detectors with Measurement Hub™.
- Autonomous data collection and data direct to control centre with WirelessHART Caliperay.

STANDARD TRANSDUCER SPECIFICATION

PARAMETER	VALUE	UNIT
Operating Temperature	-55 to +150 / [-67 to +302]	°C / [°F]
Delay Line Material	Engineering Polymer	
Tip Diameter	11 / [0.434]	mm / [in]
Connector Type	Dual UNF 10/32 Microdot	
Cable Length(s)	2 [6.5] standard, 15 [49] by request	m / [ft]
Ruggedisation	Certified to IP 66/68 Stainless steel construction	
Acoustic characteristics certificate of conformity to EN 12668:2 supplied with each unit		
Transducer Centre Frequency	5	MHz
Active Element Diameter	8 /2	mm
Wear Allowance	1.5	mm
For use with Measurement Hub™ manual and Caliperay automated monitoring solutions. Also compatible with UT flaw detectors and thickness gauges		

*Other variations available via special request For other specification requirements please contact our sales team

STANDARD DEPLOYMENT SPECIFICATION

PARAMETER	VALUE	UNIT
Strap Free Deployment		
Applications	Vessels, larger pipe diameters, grids	
Fixing	Magnetic & epoxy adhesive	Optional retention lanyard
Coupling	Epoxy	
Cure Time	Minimum of 1 hour at 150 °C	Cure in-service
Diameters	>NPS 2"	Ideal for vessels
Installation on Coatings	Yes	
Semi-Permanent Deployment		
Applications		
Fixing	Magnet & universal steel strap	Optional retention lanyard
Coupling	Solid coupling pad	
Diameters	NPS 2" to 36"	
Installation on Coatings	Yes	

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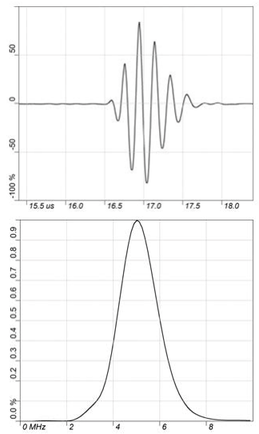
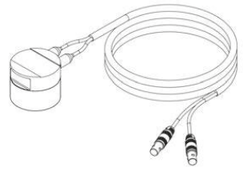
CERTIFICATION

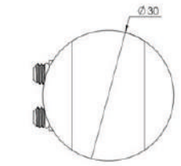
II 1 GD Ex ia IIC T* Ga / Ex ia IIIC T* Da

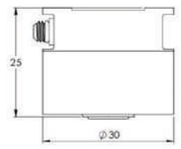
IP 68

TYPICAL ULTRASONIC RESPONSE









Dimensions shown in mm

HotSense™ 380 High Temperature Ultrasonic Sensors

High performance ultrasonic sensors for high and low temperatures. Low profile, robust and rugged.

Keywords: in-service monitoring, hazardous environments, high-temperature, radiation, corrosion in painted pipes

HOTSENSE™

- **The original, truly high temperature transducer** powered by the Ionix HPZ piezoceramic.
- **Permanent or temporary installation** in the most extreme environments.
- **-200 to +550 °C** [-328 to 1,022 °F] wide operating temperature range available for in-service, on-stream, monitoring applications.
- **On-stream installation and calibration** with integrated reference block for reliable data.
- **Highest sensitivity in class** for highest accuracy and precision in the most challenging installations.
- **Intrinsically safe certified to Zone 0** for use in the most hazardous locations.

DEPLOYMENT

- Install on live plant in minutes with a single tool.
- No welding options for pipes - Ionix clamps are safe to use and can be readily removed.
- Welded stud deployment option for vessels. Compatible with legacy stud mountings.
- Standard transducer <50 mm total deployed height – install under insulation and weatherproofing to maintain your CUI defences.
- Manual or automated data collection options available.

SOLUTIONS

- Fixed UT sensors provide increased measurement precision & collection frequency for reliable and real-time corrosion trending supporting RBI & FFS programmes.
- Optimise Asset Integrity and Performance Management (AIM/APM) programmes with accurate and reliable wall loss data.
- Reduce operational costs and maximise production margins.
- Data collection using standard UT flaw detectors with Measurement Hub™.
- Autonomous data collection and data direct to control centre wirelessly.

STANDARD TRANSDUCER SPECIFICATION

PARAMETER	VALUE	UNIT
Operating Temperature	-200 to +380 / [-328 to +716] upto +550 [+1,022] on request	°C / [°F]
Delay Line Material	304 Stainless Steel - Passivated	
Delay Line Length	25 / [1"] (up to 75 on request)	mm / [in]
Alternative delay line options on request		
Ruggedisation	Certified to IP 66/68 Stainless steel construction	
Standard Cable Length	1 m MIMS + 2 or 15 m RG316	
Connector Type	Lemo 00 Male	
Acoustic characteristics certificate of conformity to ISO 22232-2 supplied with each unit		
Transducer Centre Frequency	3.25	MHz
-6 dB Bandwidth	80	%
Signal to Noise Ratio	>20	dB
For use with Measurement Hub™ manual and Caliperay automated monitoring solutions. Also compatible with UT flaw detectors and thickness gauges.		
Other variations available via special request For other specification requirements please contact our sales team.		

STANDARD DEPLOYMENT SPECIFICATION

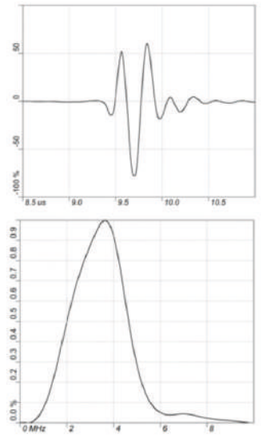
PARAMETER	VALUE	UNIT
Mounts/Clamp Materials	316 Stainless Steel - Passivated	
Standard Pipe Clamp Sizes	NPS 2" to NPS 32"	Other sizes available on request
Standard Stud for Vessels	M8 x (40-60 mm)	
Standard Stud Spacing	52.5 +/- 5 mm	
Stud Torque Resistance	>20 N.m	
Total Mass (Deployed)	1.0 - 1.4 kgs	Dependent on deployment method
Flexible integration and monitoring system options. Can be used with a wide range of flaw detectors, local, remote or wireless data collections systems for WirelessHART, Cellular and LoraWAN.		

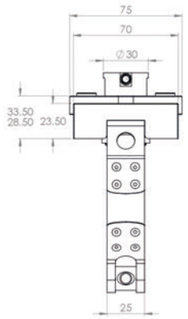
CERTIFICATION

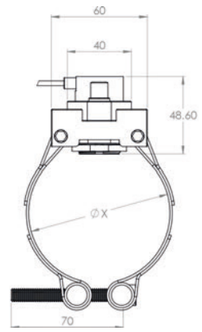
II 1 GD Ex ia IIC T* Ga / Ex ia IIIC T* Da

IP 68

TYPICAL ULTRASONIC RESPONSE



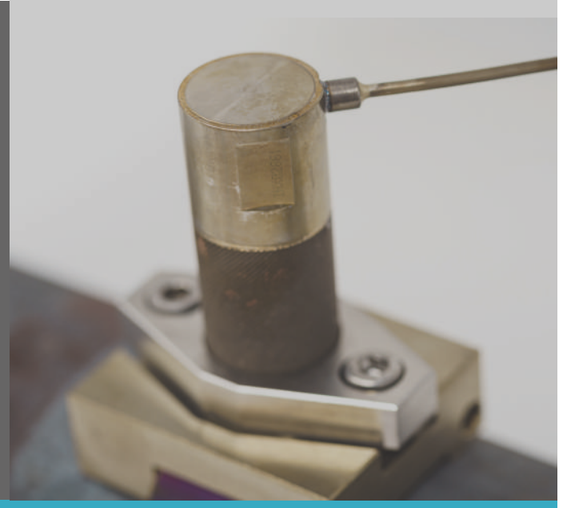


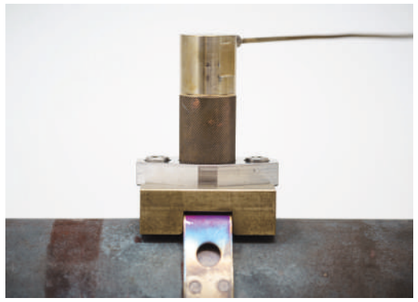


HotSense™ Ultrasonic High Temperature Sensors (UHT)

Robus and rugged ultrasonic transducers for extreme temperatures and thick parts.

Keywords: corrosion, erosion, hazardous environments, high-temperature, radiation





HOTSENSE™

- **The original, truly high temperature transducer** powered by the Ionix HPZ piezo ceramic.
- **Continuous in-service, on-stream monitoring** up to 600 °C [1,112 °F].
- **Permanent or temporary installation** in the most extreme environments.
- **Wide operating temperature range** for continuous in-service, on-stream, monitoring applications.
- **On-stream installation and calibration** with integrated reference block for reliable data.
- **Highest sensitivity in class** provides highest accuracy and precision for the most challenging measurement conditions.
- **Intrinsically safe certified to Zone 0** for use in the most hazardous locations.

APPLICATION

- Install on live plant in minutes with a single tool.
- Weld-free sensor mounting options for pipes - Ionix clamps are safe to use and can be readily removed.
- Welded stud deployment option for vessels. Compatible with legacy stud mountings.
- Manual or automated data collection options available.

SOLUTIONS

- Fixed UT sensors provide increased measurement precision & collection frequency for reliable and real-time corrosion trending supporting RBI & FFS programmes.
- Optimise Asset Integrity and Performance Management (AIM / APM) Programmes with accurate and reliable wall loss data.
- Maximise production margins and reduce operational costs with data driven process insights.
- Data collection using standard UT flaw detectors with Measurement Hub™. Autonomous data collection and data direct to desk wirelessly.

STANDARD TRANSDUCER SPECIFICATION

PARAMETER	VALUE	UNIT
Operating Temperature	-200 to +600/ [-328 to +1,112]	°C / [°F]
Delay Line Material	304 Stainless Steel - Passivated	
Delay Line Length	75 / [3"] other lengths by request	mm / [in]
Alternative delay line options on request		
Ruggedisation	Certified to IP 66/68 Stainless steel construction	
Standard Cable Length	1 m MIMS + 2 or 15 m RG316	
Connector Type	Lemo 00 Male	
Acoustic characteristics certificate of conformity to ISO 22232-2 supplied with each unit		
Transducer Centre Frequency	3.25	MHz
-6 dB Bandwidth	80	%
Signal to Noise Ratio	>20	dB
For use with Measurement Hub™ manual and Caliperay automated monitoring solutions. Also compatible with UT flaw detectors and thickness gauges		
Other variations available via special request For other specification requirements please contact our sales team		

STANDARD DEPLOYMENT SPECIFICATION

PARAMETER	VALUE	UNIT
Mounts/Clamp Materials	316 Stainless Steel - Passivated	
Standard Pipe Clamp Sizes	NPS 2" to NPS 32"	Other sizes available on request
Standard Stud for Vessels	M8 x (40-60 mm)	
Standard Stud Spacing	52.5 to 70mm	Custom installation equipment available on request for legacy or nonconformal stud spacings
Stud Torque Resistance	>20 N.m	Welded Deployments
Total Mass (Deployed)	1.0 - 1.4 kgs	Other sizes available on request
Flexible integration and monitoring system options. Can be used with a wide range of flaw detectors, local, remote or wireless data collections systems for WirelessHART, Cellular and LoraWAN		

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CERTIFICATION

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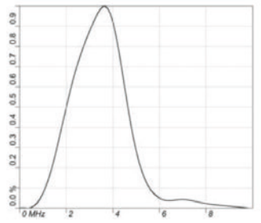
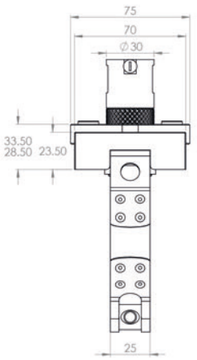
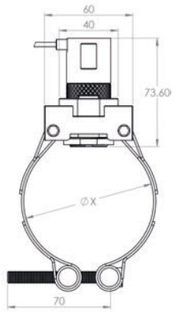
TYPICAL ULTRASONIC RESPONSE







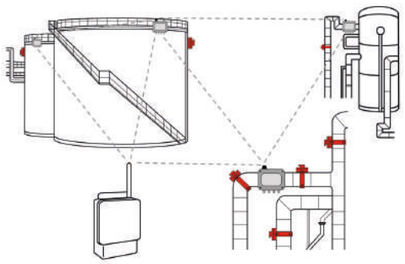
HotSense™ Automated Wireless Ultrasound for On-Stream Corrosion, Erosion and Wear Monitoring

Track wall loss rates, detect changes and see into the future to optimise operations and reduce outages

Keywords: corrosion, erosion, in-service monitoring, extreme environments, high-temperatures.

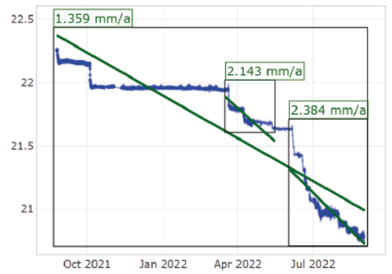
CALIPERAY

- **Automated non-invasive** corrosion, erosion and wear monitoring.
- **High precision** HotSense™ probes for range of deployment options.
- **-200 to +550 °C** (-328 to +1022 °F) operating range.
- **On-stream installation** on pipes or vessels.
- **Low profile** under insulation or in confined spaces.
- **High frequency data collection** direct to server or control room.
- **Automated, WirelessHART mesh, Battery Powered, Ex.**



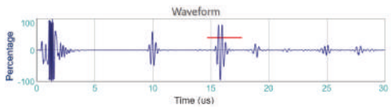
TRENDING

- Track wall loss rates, detect changes and forecast into the future.
- Understand current wall loss rates to feed maintenance planning.
- Detect changes and relate to process conditions.
- Extrapolate trends to predict impact of changes on asset condition.
- Optimise decision making.
- Predict maintenance intervals and avoid un-planned shutdowns.
- Optimise process conditions to maximise productivity.



DATA COLLECTION

- Get trending data now!
- Data collection on-premise or remote server.
- No internet or cloud required (cloud option available).
- Fully contained Field Data Logging Kit can be deployed in under an hour.
- Data in standalone system or integrated into control systems.
- Implement alongside current inspections.
- Complements traditional NDT inspections.
- Integrate with current integrity data.



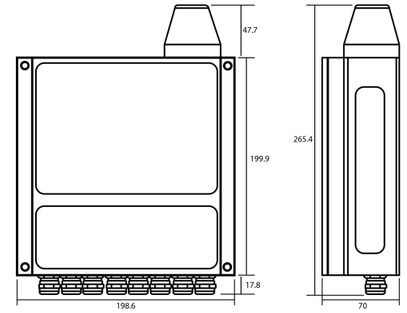
STANDARD SYSTEM SPECIFICATION

PARAMETER	VALUE
MEASUREMENT	
Temperature Range	-200 ˚C to +550 ˚C (-328 to +1022 °F)
Resolution	0.0025 mm**
Thickness Range	See transducers
Temperature Compensation	Automated when thermocouple installed
SYSTEM	
Channels Per Node	1-4
Thermocouples	Optional. Up to 4 with HotSense™ 380 and UHT. Up to 2 with HotSense™ DE
Certification	IS/Class I, Division 1, Groups A/B/C/D; Ex ia IIC T4 for -55 °C ≤ Ta ≤ +55 °C;
Rating	IP66
Battery Type	Lithium D
Battery Life	Up to 5+ year
WIRELESS	
Communication Protocol	WirelessHART (IEC 62591)
Security	128-bit AES encryption
Max Units Per Gateway	25, 100, 200 depending on spec
Max Total Number to Devices	30,000
Data Collection Frequency	1 hour +
Single Hop Range	>100m LOS
SOFTWARE	
Data Output	Thickness, wall loss rate (short & long), temperature, battery, A-scan
Export	Whole database or subset, .csv
Data Storage and Access	Local server, DCS, PIMS etc
Protocol	EtherNet/IP, Modbus RTU/ TCP, OPC, HART-IP
Diagnostics	Remote diagnostics of transducer, node, network and measurement
Calibration	At install and manual online
Battery Remaining Life	Automated

** Subject to pipe thickness and temperature.

STANDARD TRANSDUCER SPECIFICATION

	HOTSENSE™ 150 DE	380	UHT
Frequency	5 MHz	3.25 MHz	3.25 MHz
Application	Standard temperatures, measurements through coatings, large pipes and vessels	All	All
Thickness Range in Steel	>1 mm	2.5 - 22.5 mm	2.5 - 72.5 mm
Continuous Temperature Range	-55 °C to +150 °C	400 °C	550 °C
Deploymet Options	Magnetic mount + Epoxy or strap + rubber couplant	Straps or welded stud	Straps or welded stud
Cable Length	2 or 15 m flex	1 m high temperature + 2 or 15 m flex	1 m high temperature + 2 or 15 m flex
Ex Certification	ATEX Zone 0	ATEX Zone 0 / FM Cl1 Div1	ATEX Zone 0 / FM Cl1 Div1



CERTIFICATION

INSTALLATION, SURVEY AND MAINTENANCE

Ionix, with our system and global service partners can provide planning and pre-installation surveys, aswell as ongoing system service and data health packages tailored to your requirements.

Full online monitoring service and data health check packages available:

- Remote or on-site
- Review of system set-up and data outputs
- Sensor and network stability check
- Battery levels and health
- Training

HotSense™ Field Data Logging Kit (FDLK) for Automated Ultrasonic Measurement Logging

For the rapid deployment and management of WirelessHART ultrasonic projects and data collection.

Keywords: corrosion, erosion, in-service monitoring, hazardous environments, ultrasonics, high-temperature

HOTSENSE™ FIELD DATA LOGGING KIT (FDLK)

- **Self-contained and ready to deploy** HotSense™ WirelessHART Network.
- **Pre-configured data collection server** to log data from and manage HotSense™ Wireless Automated monitoring nodes.
- **No integration to site IT network required.** Fully independent and secure.
- **Reduce time** in project planning, preparation, and implementation with a plug-and-play solution.
- **Moveable and portable** storage for deployment inside with rugged antenna for outdoor installation.
- **Data collected and stored on site** - no cloud connection required.
- **Secure remote connection** option for data access and support.
- **Option to integrate into plant** data networks when ready.

APPLICATIONS

- Support the safe processing of new feedstocks or monitor the impact of changing processing conditions on asset integrity operating windows (IOWs).
- Enable trending of asset integrity data to guide decision making, maximise plant availability and enable predictive maintenance.
- Identify the causes of your most troubling asset integrity challenges with high frequency, high precision trending data.
- Rapidly deploy automated UT monitoring with no IT network integration.
- Ideal for rapid installations, temporary monitoring projects and trials.

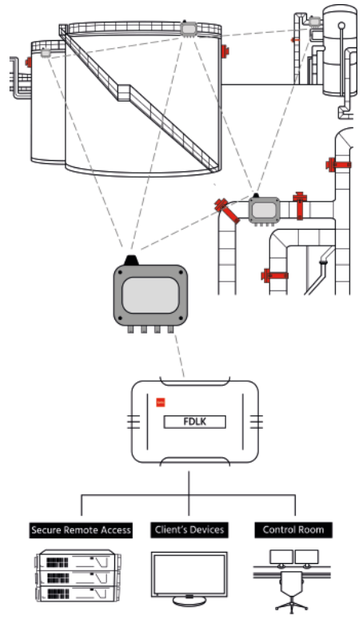
FEATURES

Pre-configured data server with:

- Automated data collection.
- Measurement and wall loss trending.
- Waveform collection.
- Manual and automated data export.
- Complete HotSense™ CALIPERAY remote management.

SPECIFICATION

CONTENTS	
Gateway	WirelessHART Gateway
Antenna	10 m external antenna with pole mount
Data Server	On-site. Rugged industrial PC running Windows
Data Collection and Management	HotSense™ WAMP software pre-installed
Case	Rugged, portable, Peli-type case for deployment inside, vented
Power Supply	External power supply for local AC supply
Maximum Number of WirelessHART Nodes Per Kit	= 25 (100 by request)
Ex Rating	None. Optional Ex rated external antenna with barriers
OPTIONS	
Remote Access	Outdoor LTE modem and router for global deployments
Data Contract	Local Fixed IP Public SIM
Outdoor Deployment	Rugged outdoor cabinet, IP55, with pole mounting hardware
Outdoor Power Supply	Rugged AC -> DC power supply for deployment outside
Device Commissioning	WirelessHART configuration software pre-installed
Device Maintenance	HART USB Modem for device commissioning
Data Integration	Gateway Protocols OPC DA and/or Modbus TCP



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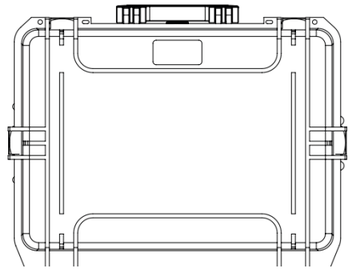
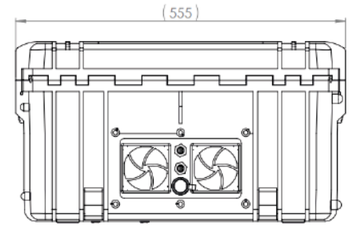
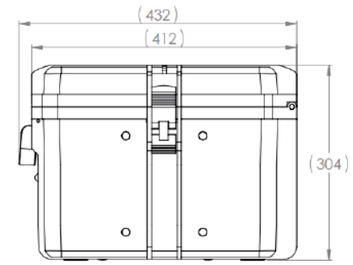


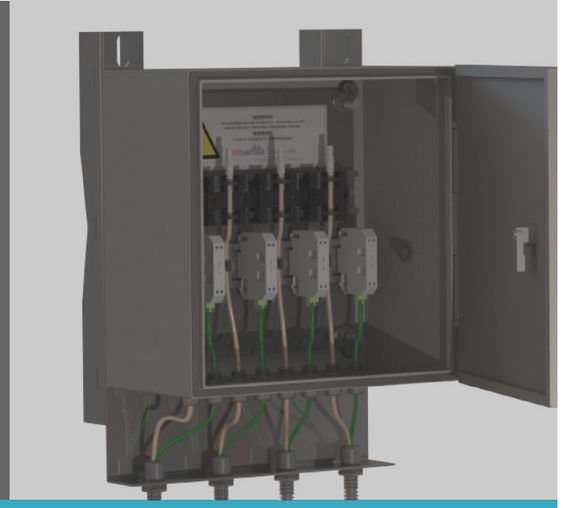




HotSense Measurement Hub™ for Low Cost, Manual Data Collection from Installed Ultrasonic Probes

Improve measurement precision through reduced operator variability and enable data trending to facilitate predictive and preventative maintenance of critical assets

Keywords: corrosion, erosion, in-service monitoring, extreme environments, high temperatures.



MEASUREMENT HUB™

- **Full fixed point non-invasive corrosion and erosion monitoring** solution utilising the HotSense™ extreme environment UT probes for -55 to +550 °C [-67 to 1,022 °F] applications.
- **No electronics, batteries or wireless -** make measurements by connecting an industry standard UT thickness gauge or flaw detector.
- **ATEX / IECEx Zone 0 ready** to enable quick and safe deployments to be made in the most hazardous and inaccessible locations.
- **Better data** with fixed probes providing increased precision, accuracy, and measurement frequency.
- **Low-cost** entry into non-invasive corrosion and erosion monitoring using standard UT hardware and procedures.
- **Flexibility to enable upgrade** to a full automated wireless system.

DEPLOYMENT

- HotSense Measurement Hub™ houses intrinsically safe sensor connections to enable quick and easy measurements to be collected from HotSense™ from an accessible location using your existing NDT equipment and procedures.
- Compatible & configurable to Ex location installations to meet site requirements and enable simple data collection under hot work permits.
- Probes installed on live plant in minutes for in-service measurements, designed to survive the harshest of environments.
- The widest range of sensor deployment options for pipes and vessels.

SOLUTIONS

- Your first step towards in-service automated integrity monitoring which uses your current NDT equipment and personnel.
- Increase your accuracy and precision by monitoring using installed probes up to 5X increase in precision compared to standard inspection methods.
- Facilitate measurements in hot, inaccessible locations and increase data collection frequency for improved trending to support RBI, FFS and FEA.
- Save operational costs with replacement of manual inspections, reducing scaffolding and insulation removal requirements.
- Increase safety with reduced exposure to hazards and man-hours at asset.

MEASUREMENT HUB™ APPLICATION SPECIFICATION

PARAMETER	VALUE
Compatible UT Probes	HotSense™ DE, HotSense™ 380, HotSense™ UHT
Number of Probes Per Hub	1 to 4
Thermocouple Type	K-type with IEC miniature connector
Number of Thermocouples per Hub	0 to 4
Maximum Distance from Measurement Location	3 m or 16 m total cable length options
Sensor Connector*	Lemo 00 (adapter available by request)
UT Hardware Compatibility	Any meeting or ASTM E1065 with A-scan representation. Contact Ionix for compatibility enquiries. Optimised gauges available from Ionix.
Measurement Standard	Solution compatible with ISO 16809 and conventional in-service UT procedures

*Variations Available via Special Request

For other specification requirements or to purchase measurement hardware please contact our sales team.

MEASUREMENT HUB™ ENCLOSURE SPECIFICATION

PARAMETER	VALUE
IP Rating	IP66
Ex Compatibility	Suitable for installation in ATEX / IECEx Zone 0 & 20 to IEC 60079-14
Material of Construction	Stainless Steel
Dimensions	See diagram
Hub Access	Lockable, swing door
Mounting	Wall, pipe, pole or rail mounted with straps

Measurement Hub™ can be upgraded to a fully automated and wireless monitoring solution at any time.

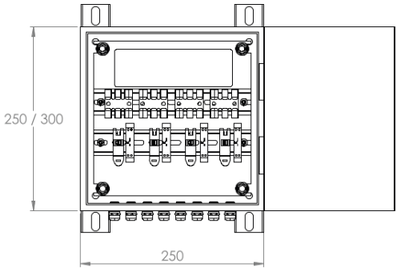
HAZARDOUS LOCATION INFORMATION

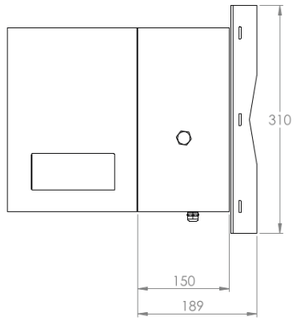
HotSense™ probes and supplied thermocouples are certified to intrinsically safe standards.

The Measurement Hub™, when installed within the requirements of IEC 60079-14, is compatible with Zones 0 (gas/vapour) and 20 (dust) hazardous locations.

Certificates and Descriptive System Documents available on request.

Measurements must be taken under a hot work permit or other recognised safe method when installed in an explosive environment.





High-Precision Wall Thickness Monitoring in Nuclear Power Plant

In-service, high-temperature, high-precision wall loss monitoring of steam piping circuit in a nuclear powerplant

Products: HotSense™ 380, Measurement Hub™, Automated Wireless Ultrasound

OVERVIEW

A solution was sought by a European nuclear power plant (NPP) to monitor high-pressure steam lines in proximity to the electricity generating turbines. Previous assets had been experiencing wall loss due to steam condensate causing erosion at piping T-junctions and as such had been replaced. The operator suspected that the wall loss rate and location was accelerated due to process conditions and so sought to collect data at increased frequency to allow wall loss rate to be correlated with specific process parameters. The operator was also advised that the greatest wall loss may occur during the first year of operation of the new piping and so a solution which could be installed immediately was required. The non-standard steel 21" and 25" NPS diameter steam lines, with surface temperatures above 230°C, were located across several levels up to 30 m high in an area that is restricted to personnel during operation.

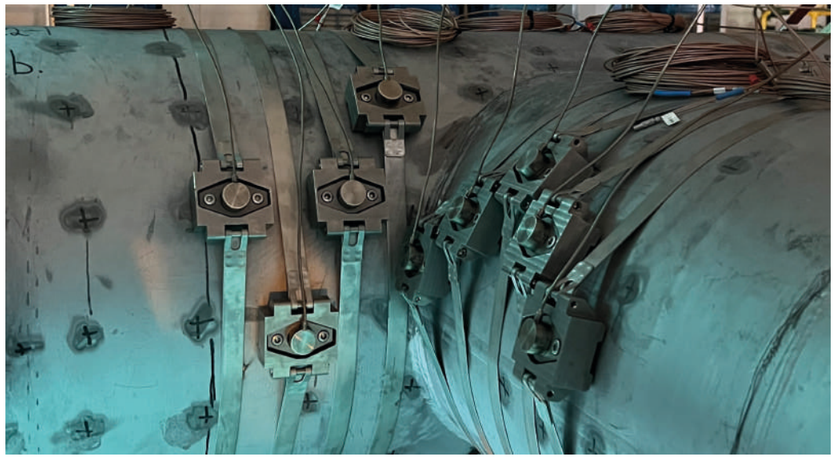
THE CHALLENGE

There were a number of challenges around the deployment which required a flexible monitoring solution.

- A high-temperature wall thickness monitoring solution was required which could operate over 230 °C continuously.
- The pipe geometry was non-standard, and the monitoring locations were distributed around two T-sections.
- The piping is lagged, and the location is inaccessible during normal operation.
- The wall loss was thought to be process dependent, requiring a high frequency of measurements.
- Wireless/RF systems are restricted in proximity to sensitive electricity generating plant.
- The equipment needed to be installed very short notice before the end of a shutdown as subsequent access would not be possible.

THE SOLUTION

- 16 x HotSense™ 380 sensors were deployed around each T-junction to provide a sensor which could operate continuously above 230 °C and provide a stable and reliable thickness measurement.
- The HotSense™ strap deployment system allowed for fast installation during the limited shutdown and offered flexibility to place sensors in the expected pattern to detect wall loss.
- Initially, all sensors were connected to Measurement Hubs™ for manual data collection from a lower platform using a GE flaw detector.
- The CALIPERAY automated monitoring system was inspected by the local electrical engineering team and the radio output found to be of no concern to the safe operation of the site.
- The Measurement Hub™ was subsequently upgraded to a fully automated CALIPERAY WirelssHART node with Field Deployment Logging Kit (FDLK) for simple implementation and data collection.



SN Integrity

EXECUTION

- The full system solution was successfully deployed within 2 months from initial enquiry to meet the scheduled turnaround.
- All sensors were successfully installed within the first day. The NPP inspection team had live, continuous, reliable wall thickness data within 24 hours of the equipment being delivered on site.
- Transferring from a rapid deployment, non-wireless, Measurement Hub™ solution to the fully WirelessHART CALIPERAY system provided a path to monitoring that met the clients time scales and security.

KEY DELIVERABLES

- High frequency, high quality data from inaccessible locations allows maintenance teams to optimise repair and replacement programs to **increase safety, maximise productivity and reduce costs.**
- Frequent, consistent, and high-quality wall thickness data collection now enables the customer to **minimise unplanned shutdowns and maximise plant up-time–ROI within hours.**
- **Plant and personal safety was increased** by increasing inspection frequency whilst removing personal from hazardous environments.

Continuous On-Stream Wall Thickness Monitoring of Opportunity Crude Refinery Process Units

In-service, high-temperature corrosion monitoring of equipment to maximise productivity, safety and plant availability.

Products: HotSense™ 380, UHT, Automated Wireless Ultrasound

OVERVIEW

An automated solution was sought for on-stream corrosion monitoring of multiple refinery process units, including Crude Distillation Unit (CDU) and Fluid Catalytic Cracking Unit (FCCU) by a major oil company, to increase productivity and plant availability, by adapting process parameters to reduce corrosion rates when processing opportunity crude feedstock and variable slates. The deployment was required to cover various process units spread over the whole site, and included wall thickness monitoring locations at pipe surface temperatures of over 200 °C and as high as 520 °C.

- Enable operational decisions to be made and value to be generated from readily available real-time corrosion and asset integrity data that did not previously exist.
- Maintain the availability, up-time and profitability of ageing refining assets.
- Minimise the exposure of staff to hazardous locations during increased inspection frequencies.

THE CHALLENGE

The biggest challenge focussed around the extreme environment in which the monitoring system would be deployed:

- Sensors were required to operate continuously up to 380 °C under insulation to monitor corrosion and wall loss in pipes of various diameters, carrying various fluids and gas.
- Locations on the FCCU were required to operate at continuous operating temperatures up to 520 °C.
- An intrinsically safe solution with Class 1 Div 1 / ATEX Zone 0 certification was required for the entire system.
- The installation needed to be conducted while the plant was operational and running at high temperature.

THE SOLUTION

- HotSense™ sensors were chosen because of their wide operating temperature range: -55 °C to +550 °C and their intrinsically safe FM Class 1 Div 1 certification. The low profile HotSense™ sensor can be installed under insulation and weatherproofing to prevent water ingress, inhibiting Corrosion Under Insulation.
- The HotSense™ strap deployment system can be used to rapidly attach sensors at corrosion monitoring locations during normal operating conditions, providing robust and reliable measurements.
- The CALIPERAY WirelessHART enabled system was coupled with the HotSense™ sensors to provide a wireless automated wall thickness monitoring solution. The CALIPERAY is intrinsically safe to match the FM Class 1 Div 1 certification of the HotSense™ sensors.
- A full industry standard WirelessHART network was also established to provide robust and reliable data collection across all process units. Combined with the system software, data was made available at all the required control centres and also exported directly to the clients Plant Integrity Monitoring Systems.

EXECUTION

The full system solution was successfully deployed during live plant operation, comprising over 100 HotSense™ sensors across the multiple process units together with a full WirelessHART network system. System software has been installed and data was made available at all the required control centres feeding the client's Plant Integrity Monitoring Systems.

KEY DELIVERABLES

- Frequent, consistent, and high-quality wall thickness data collection now enables the customer to **maximise plant availability and avoid unplanned shutdowns.**
- In one quarter, the additional availability and efficiency of plant allowed production to deliver **121% of planned output of oil fuels which generated an additional $77.7m revenue.**
- Data collected directly from the installation, allowed deferring a scheduled 3 week outage, which contributed **$110m in revenue from oil fuel products produced in that time.**
- Process and Production engineers have access to integrity data at key locations allowing **optimisation of feedstock, corrosion inhibitor strategy and process parameters** to be made, allowing profitable decisions to be made based on measurable data.
- Maintenance and Turnaround planners can make informed decisions on repair and replacement, **optimising maintenance project costs and planning.**
- Continuous monitoring enables wall thickness data to be automatically collected twice per day from hazardous locations avoiding the requirement for scaffolding, hot work permits and exposure of staff to high temperature and hazardous environments – **enhancing safety and personnel risk reduction measures and reducing inspection costs.**

Case Study - Oil Refinery

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ADVANCED TECHNOLOGIES

Get in touch for consultation:

0430 041 643

info@snintegrity.com.au

snintegrity.com.au

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