



A MISTRAS GROUP BRAND

FAMILY OF  
REMOTE CORROSION  
MEASUREMENT  
SYSTEMS



**AVOID  
COSTLY  
MEASURES™**

# CALIPERAY® FAMILY OF REMOTE CORROSION MEASUREMENT SYSTEMS

Piping and other assets in high-temperature, hard-to-reach locations are often not tested as frequently as they should be, due to the costs and hazards associated with accessing them. But without regular measurements, plant operators have little-to-no warning of developing corrosion and erosion - a costly surprise.

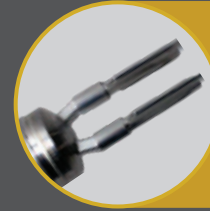
As a global leader in asset protection, MISTRAS Group (NYSE: MG) offers multiple corrosion monitoring options through its CALIPERAY® family of remote corrosion measurement systems.

The **CALIPERAY® 1616** and the **CALIPERAY® CorrFlow™** are strategically designed to operate individually or as a tandem, helping you to detect and mitigate erosion and corrosion remotely and cost-effectively, before they cost you.



## CALIPERAY® 1616 System

Remote thickness tracking system monitors corrosion and erosion by utilizing permanently-installed ultrasonic sensors.



## CALIPERAY® CorrFlow™ System

Remote monitoring system deploys vibrating tuning fork corrosion probes into process piping to detect fluid corrosivity and metal loss.

## EXPERTISE

When the integrity of your critical assets is at stake, trust the latest innovation from the industry-experts. MISTRAS Group is a publicly-listed, leading, global asset protection solutions provider with decades of industry-proven expertise and thousands of talented engineers,



scientists, and technicians on staff. MISTRAS' immense knowledge and expertise has influenced the industry at large, working closely with industry leaders and major corporations.

## FEATURES & BENEFITS



MISTRAS' CALIPERAY® family of remote corrosion measurement systems collect data more frequently and accurately than traditional methods, because the permanent sensors remove many of the variables that can create inconsistencies in manual readings. This enables operators to make more informed run-repair-replace decisions. This level of insight delivers benefits in cost, safety, planning, and peace-of-mind.

### GREATER INSIGHT



Frequent thickness measurements and corrosivity monitoring enable the opportunity for practical asset maintenance, rather than extensive repairs. MISTRAS' CALIPERAY® family of remote corrosion measurement systems help to extend maintenance budgets and assets' operational lifelines by enabling operators to address potential concern areas before corrosion and erosion create more significant, and costly, damages.

### DECREASED COSTS



Through their automated monitoring capabilities, MISTRAS' corrosion monitoring systems help limit the need to send employees into hazardous areas of a plant. Frequently testing pipes and vessels makes them inherently safer, as many assets contain hazardous materials. The CALIPERAY® 1616 and CorrFlow™ systems not only reduce the need for employees to be in the operating area, it also makes it safer for them when they do have to be in the vicinity.

### ENHANCED SAFETY



HIGHLY-PRECISE READINGS



HIGH-TEMPERATURE FUNCTIONALITY



DECREASED READING INTERVALS



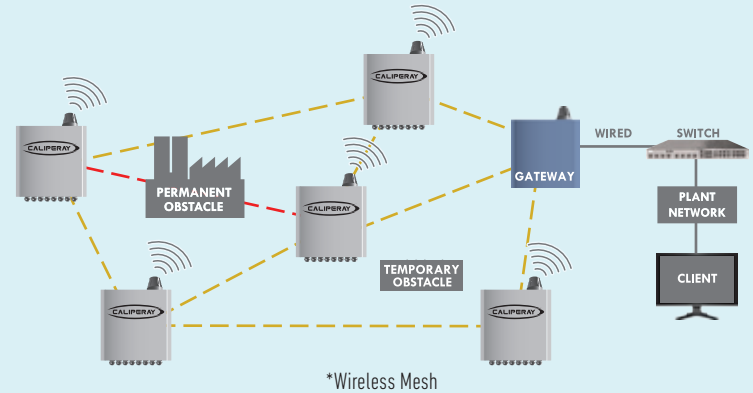
IMPROVED CORROSION MGMT. & DETECTION

# OVERVIEW OF CALIPERAY® 1616

The CALIPERAY® 1616 utilizes remote, permanent, non-intrusive ultrasonic (UT) sensors that collect data on pipe and vessel wall thickness. The system transmits the information back to a plant's host computer through a self-healing, self-organizing wireless mesh sensor network. By simply sending one wall thickness measurement a day, the CALIPERAY® 1616 enables plant operators to stay constantly aware of budding corrosion and erosion.

The CALIPERAY® 1616 provides a rich dataset, helping operators make more informed judgments on when to proactively take remedial action, and when maintenance can be delayed until a scheduled shutdown.

Through its remote monitoring capabilities, the CALIPERAY® 1616 limits the need to send employees into hazardous areas of a plant, and enhances safety by reporting regular wall thickness updates to plant operators.



If an obstacle ever interrupts communication between sensors, they simply find another path to the gateway. The network simplifies installation, streamlines data communication, and ensures higher reliability and lower maintenance.

## CALIPERAY® 1616 APPLICATIONS



OVERHEAD LINES



REDUCERS



ELBOWS



PRESSURE VESSELS



TEES



AND MORE

# CALIPERAY® 1616 SPECIFICATIONS

## GENERAL

Manufacturer: MISTRAS Group, Inc.  
Product Line: CALIPERAY® Remote Corrosion Measurement Systems  
System Name: 1616  
Model Number: 1616-5015 (IS Certified)  
Multiplexer: 4-Channel for single or dual crystal transducers



Receiver: 20-70dB Gain  
Bandwidth: 1MHz to 9MHz  
Battery Life: Up to 5-Years at 1 measurement per day  
Temperature Range: -28°C to 55°C  
Made in USA

## SINGLE CRYSTAL SENSOR

Manufacturer: IONIX	Connector Type: LEMO 00
Model: HSM-T-T10	Connector Location: Side
Operational Frequency Range: 3 - 5 MHz	Sensor Type: Contact, Delay
Shock Limit: 10,000 g	Seal Type: Laser Welded
Surface Temperature: -55°C to 350°C	Sensor Height: 1.5 inch
Sensor Material: Stainless Steel 316	Sensor Diameter: 0.75 inch
	Delay Line: 1 inch
	Cable Type: 1' hard line + 2M (6.6') soft line



## SENSOR

## DUAL CRYSTAL SENSOR

Model: ISDUT5M	Connector Type: LEMO 00
Operational Frequency Range: 5 MHz	Connector Location: Side
Shock Limit: 10,000 g	Sensor Type: Contact
Surface Temperature: -55°C to 150°C	Seal Type: IP66
Sensor Material: Stainless Steel 304/316	Sensor Height: 0.934 inch
	Sensor Diameter: 0.65 inch
	Cable Type: 2M (6.6')

\*Options for thickness range, temperature compensation, and mounting available.

# OVERVIEW OF CALIPERAY® CORRFLOW™

The **CALIPERAY® CorrFlow™** system is an online corrosion monitoring system utilizing vibrating tuning fork corrosion probes, which are inserted into the process stream to detect fluid corrosivity.

The probes, deployed in process piping, are designed to detect frequency changes due to thickness losses in the tines, enabling operators to react to areas with potentially high rates of wall thinning.

Additionally, real-time evaluation of effectiveness of corrosive inhibitors and feedstock helps to add confidence that your assets are being protected as intended.



## TUNING FORK TECHNOLOGY

The vibrating tuning forks combine high sensitivity and long life to monitor fluid corrosivity. The CorrFlow's™ corrodible insert design virtually eliminates effects of corrosion product deposition and minimizes fouling effects, as the tuning fork responds to spring constant changes.



# CALIPERAY® CORRFLOW™ SPECIFICATIONS

## GENERAL

Manufacturer: MISTRAS Group, Inc.  
Product Line: CALIPERAY®  
System Name: CorrFlow™  
Communication: WirelessHART™ Protocol



Range: 100 feet line of sight  
Battery Life: >3 years @ 1 measurement/day (reduced if unit is used as repeater for HART)  
Temperature Range: -40 degrees C to 55 degrees C

## SENSOR PROBE

Resolution: 0.3mils [8um]  
Sensitivity: >10 mpy in 2 weeks of measurements  
Probe life: 6 years at 10 mpy  
Temperature Range: -45 degrees C to 450 degrees C



Pressure Range: Fixed Flange - up to flange rating, Mechanical Retrievable System - up to 2,000psi, Hydraulic Retrievable System - up to 3,600 psi

# COMPATIBILITY & SOFTWARE



**CALIPERAY™  
WEB APP**

**PCMS**

**OTHER  
TOP-TIER  
IDMS**

## SEAMLESS INTEGRATION WITH ON-SITE SENSOR NETWORKS

Designed with plants' interoperability needs in mind, the systems utilize WirelessHART™ protocol to seamlessly incorporate into existing sensor networks and other WirelessHART™ infrastructure.



## SIMPLE ON-LINE MONITORING OF PIPE WALL THICKNESS AND FLUID CORROSION

The systems utilize MISTRAS' Web Asset Monitoring Portal (WAMP) for advanced data management. The online monitoring suite tracks, stores, and analyzes data in real time as it comes into the host computer, offering information on corrosion rates and trends.



# INSTALLATION

**1**  
**SURFACE PREPARATION**  
Ground clean to prepare the surface where the CALIPERAY® 1616 will be installed for use.

**2**  
**INSTALLATION**  
Unit sensors are mounted on the prepared surface. The system does not require sensors to be welded on.

**3**  
**THERMOCOUPLE HOOK-UP**  
Spring terminals inside the unit allow for easy thermocouple hook-up.

**4**  
**COMPLETED INSTALL**  
System mounted and installed on vertical piping (left) and horizontal piping (right).

\*CALIPERAY® 1616 installation shown

# CERTIFICATIONS

Intrinsically safe for Class I, Division 1, Groups A, B, C and D, AEx ia for Class I, Zone 0, Group IIC, temperature code T4 for  $-55^{\circ}\text{C} < \text{Ta} < +55^{\circ}\text{C}$ ; IP66 hazardous (classified) locations; IS/I/1/ABCD/T4 for  $-55^{\circ}\text{C} < \text{Ta} < +55^{\circ}\text{C}$ ; I/O/AEx ia/IIC/T4 for  $-55^{\circ}\text{C} < \text{Ta} < +55^{\circ}\text{C}$ ; II 1 G Ex ia IIC T4;  $\text{Ta} = -55^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ ; IP66FM15ATEX0043X, FM18U50162X; FM18CA0074X. APPROVED.



\* Certifications for CorrFlow™ pending



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**SCHEDULE A  
LIVE DEMO**

VISIT US ON THE WEB AT  
**CALIPERAY.COM**



# LOCAL PRESENCE, GLOBAL REACH

CorrFlow™ Certifications Pending as of Print Date  
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.  
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