

Wireless Corrosion Transmitter

Features

Quick, non-invasive installation on live plant

Low profile sensor can be installed under insulation

Separate wireless and sensing modules provide flexibility in locating transmitter to maximise RF range and minimise repeaters

Automatic reporting and analysis

Self-organising mesh network

High measurement resolution

Intrinsically safe system (Zone 1)

High reliability ensured by continuous on-board diagnostics

Applications

Corrosion and erosion monitoring of difficult-to-reach locations.

Rapid detection of accelerated corrosion.

General Description

The Wi-Corr wireless corrosion transmitter is comprised of a battery powered wireless communication unit (Wi-Corr WU) which connects to an ultrasonic sensor (Wi-Corr US) and optionally, a temperature sensor (Wi-Corr TMP). The wireless unit is housed in a lightweight, rugged enclosure and automatically forms part of a WirelessHART compliant self-organising radio network when first deployed. Wi-Corr's robust, proprietary adhesives, surface preparation tools and installation fixtures ensure that the sensors are reliably bonded to the pipework in minutes.



This non-invasive, proven process is compatible with straight pipes, elbows, reducers or tank walls.

General Specifications:

Wireless Unit: Wi-Corr WU

Enclosure: Glass-Reinforced Polyester.

Ingress Protection: IP65

Dimensions: 130mm x 135mm x 90mm

Weight: 1.5kg

Operating Temperature: -40°C to +70°C

Storage Temperature: -40°C to +85°C

Humidity Limits: 0-100% relative humidity

Ultrasonic Sensor: Wi-Corr US

Housing: Stainless steel 304 (standard)
(Stainless 316 available on request)

Ingress Protection: IP66

Dimensions: 45mm length x 32mm dia.

Cable length: 1.5 metres (standard)

(3 or 6 metres available on request)

Weight: 200g

Min and max operating temperature of pipework: -40°C to +200°C

Humidity Limits: 0-100% relative humidity

Measurement Specifications:

Technique: Ultrasonic Pulse-Echo
Measurement Range: 3mm – 25mm
Resolution: 0.01mm (0.4 mil)
Repeatability: 0.01mm (0.4 mil)
Compatible Pipe Diameters: 4" and greater (standard system)*
User Data: Metal thickness
 Ultrasonic A-Scan
 Ambient Temperature
Units: Imperial or metric

Additional Measurement Options:

Pipe temperature. Implementation of this additional measurement parameter yields automatic temperature compensation of ultrasonic velocity.

Temperature Sensor Specifications:

Recommended temperature sensor:
Wi-Corr TMP

Sensor Type: Platinum RTD

Range: -50°C to +220°C

Resolution: 0.1°C

Repeatability: 1°C

Accuracy: 1°C

Lifetime: 6+ year power module life based on reference conditions: 1 measurement per day, 25°C, routing data for up to three additional wireless devices.

Power supply: 3 x user-replaceable, commercially available, Tadiran SL2770 Lithium Thionyl Chloride C cells. Certified for replacement in hazardous zones.

*Contact 3-Sci if compatibility with smaller pipe diameters is required

Wireless Specifications:**Protocol and Channel:**

2.4GHz self-organising mesh network enabling coexistence with IEC 62591 (WirelessHART).

Range: >100 metres (line of sight)

Modulation: Direct Sequence Spread Spectrum (DSSS)

Wireless units per gateway: 1 - 250

Gateways per user interface: Up to 4

Transmit Rate: On-command at any time or automated transmissions via the user interface with a selectable periodicity of every hour to once per year.

Diagnostics:

Calibration & verification: Continuous diagnostics are conducted on ultrasonic parameters and system performance, to detect:

- Low battery
- Temperature sensor installed
- Temperature sensor malfunction
- Internal timing error
- Ultrasonic sensor malfunction
- High and low pipe temperature
- High and low ambient temperature
- Thickness under range (<3.1mm)
- Thickness over range (>25mm)
- Poor adhesive bond

If a problem is detected, the user interface will describe the problem and recommend a course of action.

Product Approvals

Hazardous Locations

The Ultrasonic Sensor and the Wireless Unit are part of the same equipment, covered by the same certificates, and together form the Wireless Corrosion Monitor. They must always be used together. Both units may be installed in the following hazardous zones: Zone 1 or Zone 2. The Wi-Corr 1 Wireless Corrosion Transmitter achieves the following classification:

European Certifications


ATEX and IECEx:


Certificate Numbers:

Baseefa15ATEX0116X

IECEx BAS 15.0083X

Intrinsic Safety

 II 2G

 1180

Wi-Corr WU Wireless Unit:

Ex ib IIC T4 Gb ($T_a = -40^{\circ}\text{C}$ to $+70^{\circ}\text{C}$)

Wi-Corr US Ultrasonic Sensor:

Ex ib IIC T6 Gb ($T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$)
(see schedule)

Special Conditions for Safe Use:

The Ultrasonic Sensor is considered to have negligible temperature rise and is assessed for temperature class T6 in ambient temperatures of -40° to $+85^{\circ}\text{C}$. It is considered not to add to any surface temperature ignition risks that are already present and may be used when attached to local heat sources of up to $+200^{\circ}\text{C}$ as long as the effect on the temperature class is taken into account.

Hazardous Locations

Temperature Sensor Parameters:

$U_o = 6.51\text{V}$

$I_o = 3.1\text{mA}$

$P_o = 7.4\text{mW}$

European Union Directives

Meets all relevant requirements of the Radio and Telecommunications Terminal Equipment Directive (R&TTE).



Relevant Approvals:

EN 301 489-1 V1.9.2

EN 301 489-17 V2.2.1

EN 61326-1:2013

EN 61326-2-3:2013

BS EN ISO/IEC 80079-34:2011

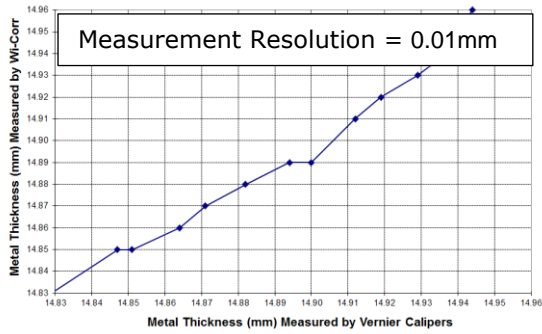
BS EN ISO/ IEC 60079-11:2012

BS EN 60079-0:2012 +A11:2013

Typical Performance Characteristics

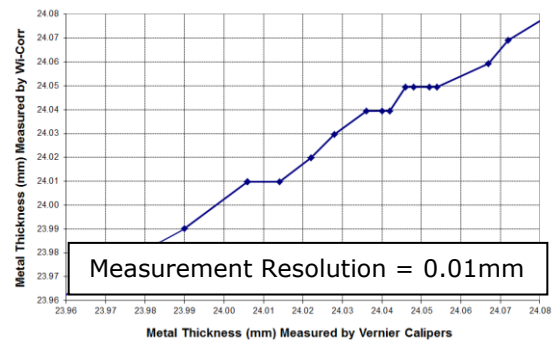
Resolution

Test: Metal removal with milling machine
15mm mild steel sample @ 20°C



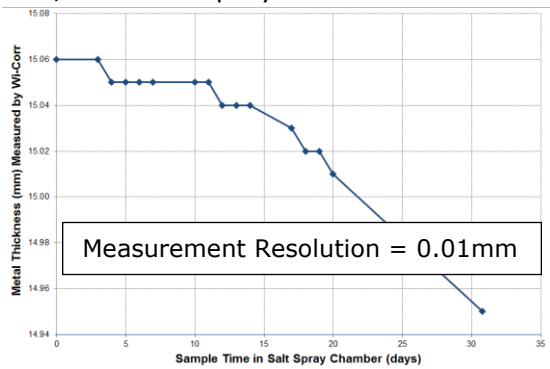
Resolution

Test: Metal removal with milling machine
24mm mild steel sample @ 20°C



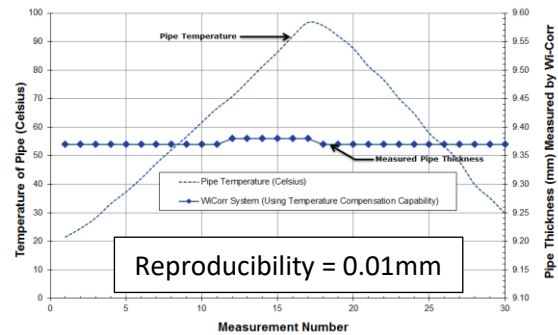
Resolution

Test: Accelerated Corrosion. Metal removal of mild steel sample in a Q-Fog CCT/1100 salt spray corrosion cabinet.



Temperature Compensation

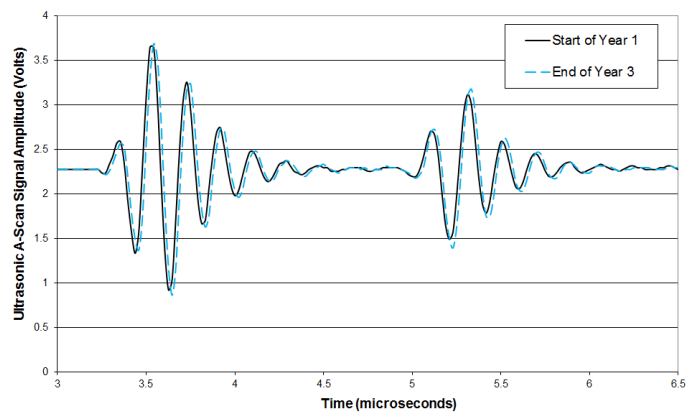
Test: Reproducibility. Temperature cycle of a 5" diameter pipe with light internal and external corrosion.



Stability of Adhesive Bond

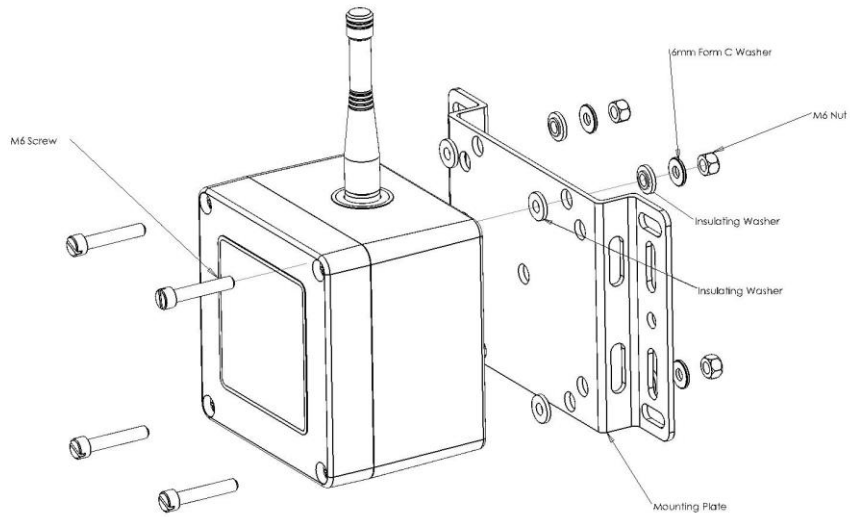
Test: Wi-Corr ultrasonic sensor bonded to 150°C pipe for 36 months. A-scans taken by the Wi-Corr wireless system.

Result: No visible degradation in ultrasonic performance of the epoxy after 36 months.

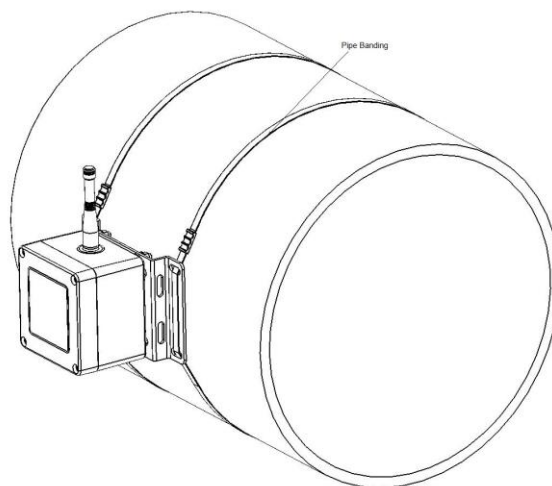
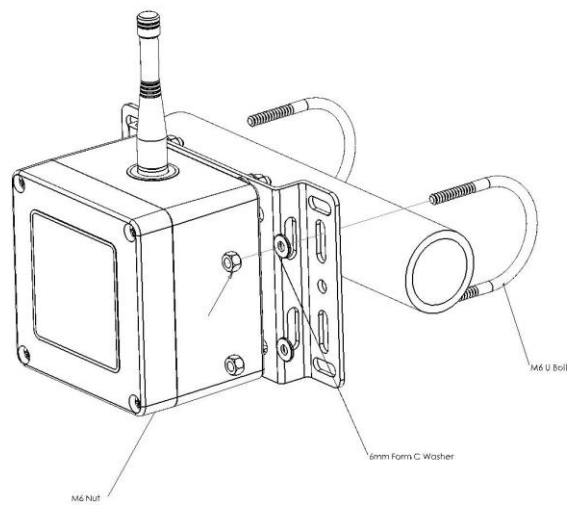


Installation Details: Wi-Corr WU Wireless Transmitter

Wi-Corr Mounting Bracket (Part Number: MK01)



MK01 Mounting Options



Installation Details: Wi-Corr US Ultrasonic Sensor

With 3-Sci’s recommended installation procedures, the Wi-Corr Ultrasonic Sensor can be quickly installed on live plant in minutes and relied upon to remain operational for many years. The installation process involves preparing the pipe surface and then bonding the sensor to the pipework with one of 3-Sci’s robust, proprietary adhesives. A magnetic installation tool holds the sensor in place while the adhesive cures. An ultrasonic test set with A-scan capability can be used to confirm the ultrasonic coupling to the pipe before connection to the wireless unit, if desired.



Left: The installation tool for straight pipes (Mag-ST) and a Wi-Corr ultrasonic sensor bonded to a straight pipe section.

Recommended pipe surface preparation: Cleaned back to base metal (SSPC SP-10)

Adhesive options: For reliability and a long working life, the correct Wi-Corr adhesive must be selected based on the maximum expected operating temperature of the pipework and the temperature of the pipe at the time of installation. Four different adhesives are available from 3-Sci to cover the various installation and operational temperatures as shown in the tables below:

Adhesive	Maximum operational temperature of the pipe or vessel	
EP-RT	30 °C (86°F)	50 °C (122°F)
EP-LT	120 °C (248°F)	180 °C (356°F)
EP-MT	140 °C (284°F)	180 °C (356°F)
EP-HT	190 °C (374°F)	200 °C (392°F)

Green - pipe temperatures should remain below this value for stable, long term sensor operation.

Yellow - temperatures up to this level are acceptable for short durations.

Adhesive	Compatible pipe temperatures when bonding the sensor to the pipe (and related time to reach handling strength when the magnetic jig can be removed)								
	-5°C (-23°F)	25°C (77°F)	40°C (104°F)	50°C (122°F)	100°C (212°F)	105°C (221°F)	120°C (248°F)	150°C (302°F)	200°C (392°F)
EP-RT	2 hour	20 mins	10 mins	5 mins					
EP-LT		7 hours	45 mins	30 mins	5 mins	3 mins			
EP-MT					60 mins	50 mins	30 mins	7 mins	
EP-HT							6 hours	2 hours	15 mins

Green - recommended pipe temperatures to cure the adhesive and achieve a strong bond.

Yellow - alternative option.

Ordering Information: Wi-Corr 1 System

Ultrasonic Sensor

Wi-Corr US sensors are available pre-shaped for all common ANSI pipe diameters. See Ordering Information for more details.

Wi-Corr US101 – XX – X – X

Part Number incorporates: the pipe radius and type (S – straight; E-elbow) and cable length (1.5, 3 or 6m)

Standard ultrasonic sensor surface profiles for optimum fit on pipe diameter:

04	4" ANSI Pipe Diameter
05	4" ANSI Pipe Diameter
06	6" ANSI Pipe Diameter
08	8" ANSI Pipe Diameter
10	10" ANSI Pipe Diameter
12	12" ANSI Pipe Diameter
14	14" ANSI Pipe Diameter
16	16" ANSI Pipe Diameter
24	24" ANSI Pipe Diameter
30	30" ANSI Pipe Diameter
FL	>30" Pipes or Flat Structures

Pipe type:

E	Elbow
S	Straight Pipe

Cable Length:

S	1.5 metre cable length
3	3 metre cable length
6	6 metre cable length

Example. For an ultrasonic sensor optimised for installation on a 10" ANSI pipe elbow with a standard 1.5 metre cable length, the order code is: **US101-10-E-S**.

Ordering Information: Wi-Corr 1 System

Accessories:

Part Number	Description
WU101	Wireless Unit (1 required per Ultrasonic Sensor)
GW101	Wireless gateway (includes mains power adaptor)
TMP101	Temperature sensor
MK01	Universal High Temperature Steel Mounting Bracket
MK02	Nylon Mounting Bracket (for long term deployment on pipes at temperatures < 80°C)
GW_ANT_EX	Gateway antenna rated for Zone 1 / Zone 2 Hazardous Area Environments with 5 metre cable. IECEX markings: IECEX Ex e IIC T6 Gb Ex t IIIC T85°C Db
GW_ANT	Non-ATEX Gateway Antenna (for indoor use only)
MS01	USB memory stick containing PC based Wi-Corr Trend user interface software and manuals
D01	Licence dongle for Wi-Corr Trend User Interface Software
	Installation Tools:
MagST01	For installation of ultrasonic sensors on straight pipe sections
MagEB01	For elbows, reducers or straight pipe
	Epoxy Adhesives:
EP-RT	Adhesive to install US101 on pipes cooler than 50°C
EP-LT	Adhesive to install US101 on pipes at up to 105°C
EP-MT	Adhesive to install US101 on pipes at up to 150°C
EP-HT	Adhesive to install US101 on pipes at up to 200°C