

Wi-Corr Bond: 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 Bond 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 self-organising radio network when 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)

Front Face: Ceramic

Ingress Protection: IP66

Dimensions: 45mm length x 32mm dia.

Cable length: 1.5 metres (standard)

(3 or 6 metres available on request)

Weight: 160g (including 1.5m cable)

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: 5+ year power module life based on reference conditions: 1 measurement per day (>1800 measurements), 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)
 Measured thickness approaching limit
 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°C to +70°C)

Wi-Corr US Ultrasonic Sensor:

Ex ib IIC T6 Gb (T_a = -40°C to +85°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°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°C as long as the effect on the temperature class is taken into account.

Hazardous Locations

Temperature Sensor Parameters:

U_o = 6.51V

I_o = 3.1mA

P_o = 7.4mW

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

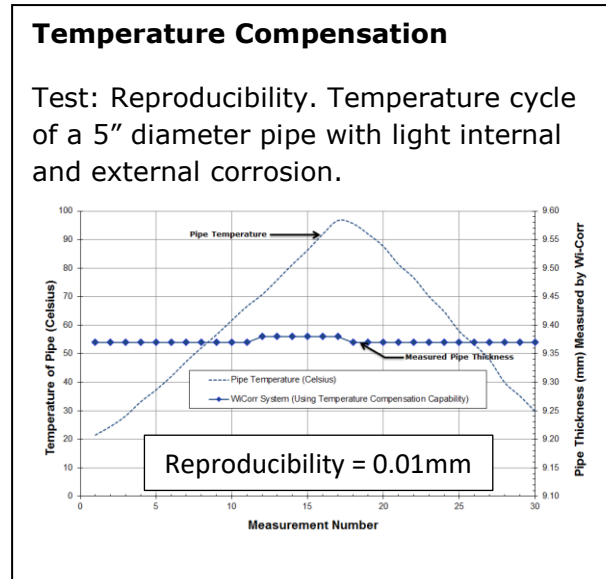
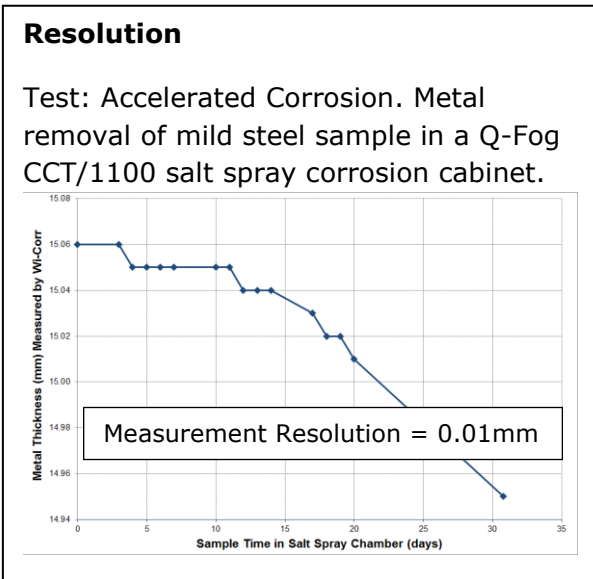
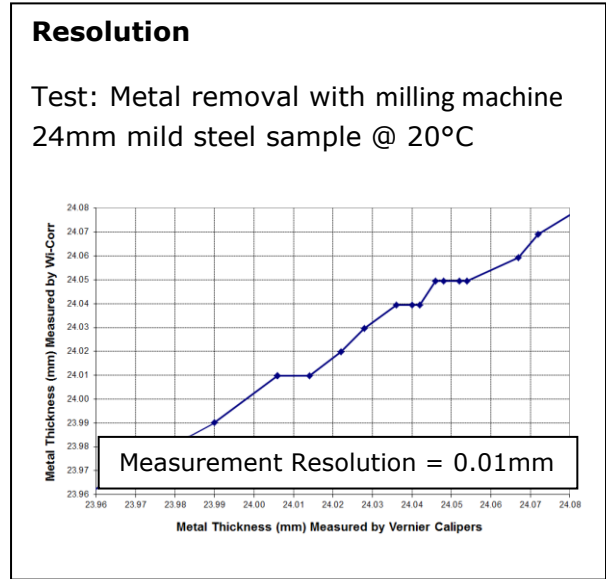
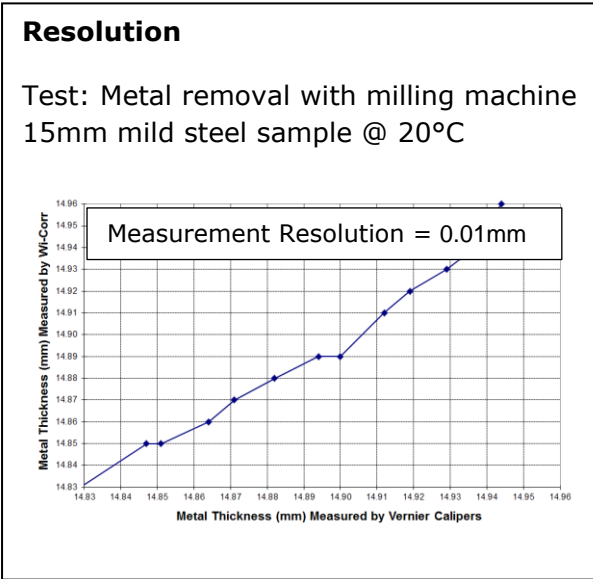
EN 61326-2-3:2013

BS EN ISO/IEC 80079-34:2011

BS EN ISO/ IEC 60079-11:2012

BS EN 60079-0:2012 +A11:2013

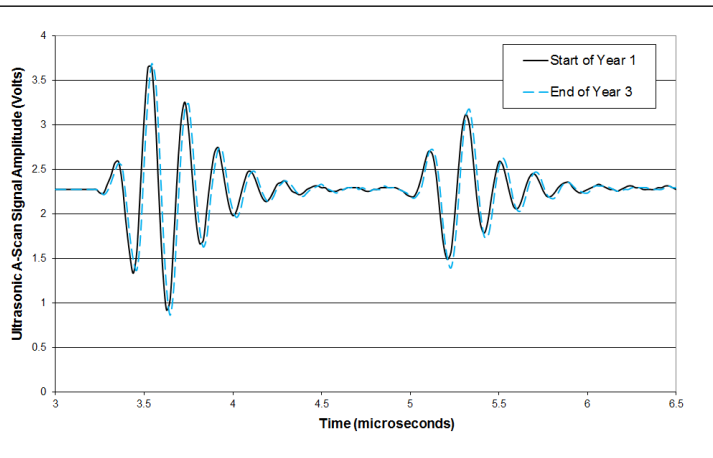
Typical Performance Characteristics



Stability of Adhesive Bond

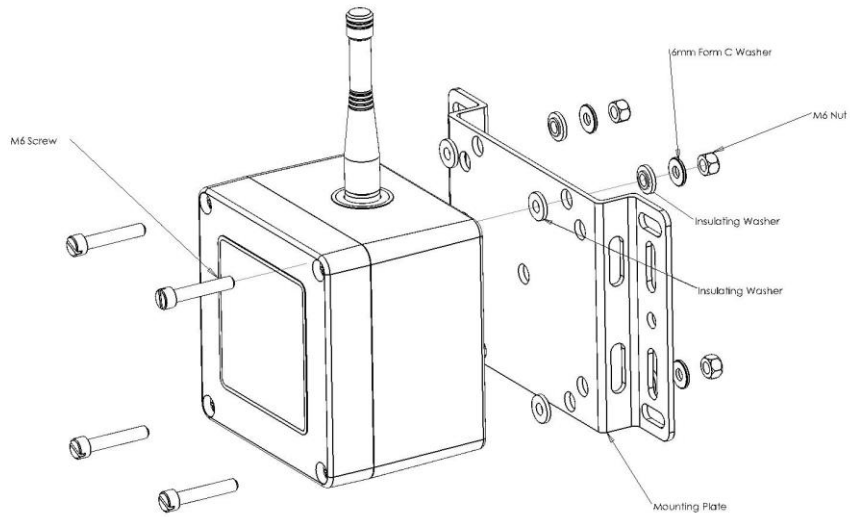
Test: Wi-Corr ultrasonic sensor bonded to 150°C pipe for 36 months. A-scans taken by the Wi-Corr wireless system.

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

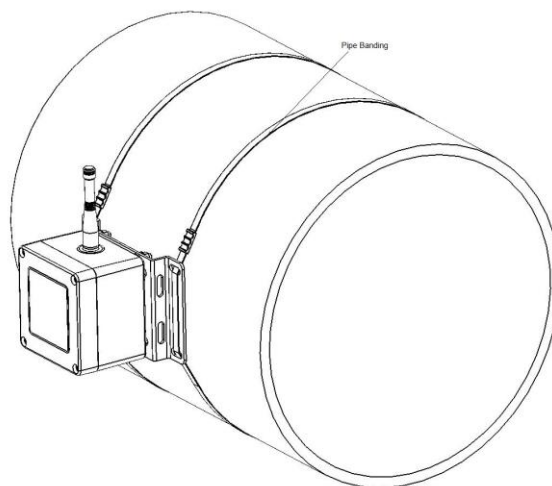
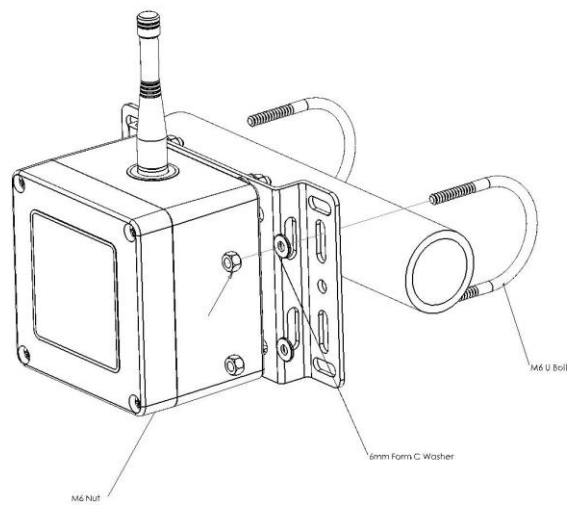


Installation Details: Wi-Corr WU Wireless Transmitter

Wi-Corr Mounting Bracket (Part Number: MK01)



MK01 Mounting Options



Installation Details: Wi-Corr Bond Ultrasonic Sensor

With 3-Sci’s recommended installation procedures, the Wi-Corr Bond 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 Bond 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. Three different adhesives are available from 3-Sci to cover the various installation and operational temperatures as shown in the tables below:

Adhesive	Compatible maximum and minimum operational temperatures of the pipe or vessel		
EP-60	-40 °C to 60 °C (-40°F to 140°F)	80 °C (176°F)	
EP-100	-40 °C to 120 °C (-40°F to 248°F)	160 °C (320°F)	
EP-200	-40 °C to 180 °C (-40°F to 356°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 but the performance of the bond at these temperatures will be improved if the adhesive was cured when the pipe was hot and if time was allowed to achieve a full cure of the adhesive.

Black – the sensor may not be able to make thickness measurements if the adhesive is exposed to temperatures in this range.

Adhesive	Compatible pipe temperatures when performing the process of bonding the sensor to the pipe (and related time for the adhesive bond to reach handling strength, enabling the magnetic jig to be removed)							
	5°C (41°F)	25°C (77°F)	40°C (104°F)	60°C (140°F)	100°C (212°F)	120°C (248°F)	150°C (302°F)	200°C (392°F)
EP-60	48 hours	24 hours	3 hours	45 mins				
EP-100		7 hours	45 mins	20 mins	10 mins			
EP-200						6 hours	2 hours	15 mins

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

Black – installation of the sensor using this adhesive cannot be undertaken at this temperature.

Ordering Information: Wi-Corr Bond 1 System

Ultrasonic Sensor for Adhesively Bonded Applications

Wi-Corr Bond US sensors are available pre-shaped for all common ANSI pipe diameters. See Ordering Information below 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 5" 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
TMP101	Temperature sensor
WU101	Wireless Unit
MK01	Universal High Temperature Steel Mounting Bracket for WU101
MK02	Nylon Mounting Bracket for WU101 (for long term deployment on pipes at temperatures < 80°C)
GW101	Low Cost Wireless Gateway (includes mains power adaptor). Must be located in a non-explosive zone.
GW_ANT_EX	Gateway antenna compatible with explosive zones for use with GW101. Antenna is rated for Zone 1 / Zone 2 Hazardous Area Environments and is supplied with a 5-metre cable and mounting brackets, as standard. IECEX markings: IECEX Ex e IIC T6 Gb Ex t IIIC T85°C Db
GW_ANT_OUT	Non-ATEX Gateway Antenna (for outdoor use). Supplied with mounting brackets.
GW_ANT_IN	Non-ATEX Gateway Antenna (for indoor use only)
GW_EX	Wireless Gateway for use in Explosive Zones. Gateway is mounted within a flameproof enclosure. IECEX markings: Ex d [ia IIC Ga] IIB+H2 T5 Gb Ex tb [ia Da] IIIC T100°C Db -40°C or -20°C ≤ Tamb ≤ 60°C
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-60	Adhesive to install US101 on pipes which are below 60°C
EP-100	Adhesive to install US101 on pipes which are below 100°C
EP-200	Adhesive to install US101 on pipes which are below 200°C