COSASCO®

ER-420 Transmitter

User Manual

11841 Smith Avenue
Santa Fe Springs, CA 90670
Tel: (562) 949-0123 • (800) 635-6898
Fax: (562) 949-3065

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www.cosasco.com

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8	D	14 Dec 18	Removed Test Probe with attached to probe cable	WH	WH	ENG

Table of Contents

Chapter 1 Introduction 1

Chapter 2 Specification 5

Chapter 3 Installation 7

Unpacking 7
Before Installation.....7
Mechanical Mounting of Transmitter.....8
Electrical Wiring of Transmitter.....9

Chapter 4 Operation 11

Metal Loss from 4-20 mA Signal.....11
Corrosion Rate Calculation.....11
Probe Spans.....13

Chapter 5 Maintenance 15

Appendix A 17

(ER) Electrical Resistance Theory.....17

Appendix B 23

Requirements for Intrinsic Safety Operation.....23

Figures and Drawings

Figure		Page
1.1	ER-420 Transmitter Unit	1
1.2	System Configuration Options	2
1.3	Instrumentation Type/Probe Type Compatibility	3
3.1	Types of Cables Connectors and Probes	7
3.2	Mounting Dimensions	8
3.3	Wiring Configurations with Safety Barriers	9
4.1	Electrical Resistance (ER) Probe Types and Spans	13

IMPORTANT INSTRUCTIONS

Cosasco is committed to providing the safest and highest quality products, services, and training for the industries it serves. We are committed to ensuring that all users of our equipment work safely and efficiently. Fully anticipating the infinite variety of conditions that may be encountered in the field would be impossible, but we have designed this user manual to emphasize safe working practices and, as much as possible, to convey the full benefit of our knowledge and collective experience in the use of the DCMS Downhole Tool and Accessories. This user manual is not meant to be a sole source of instruction.

Because these tools are used in a broad range of environments and applications, it is important that the owner and operation personnel have been assessed, certified, and deemed competent in all safety, work management and additional risk assessment requirements in the application of this user manual.

BE SURE ALL PERSONNEL READ AND FOLLOW THE INSTRUCTIONS IN THIS USER MANUAL AND ALL PRODUCT WARNINGS.

Product Owners (Purchasers):

1. Use the correct product for the environment and pressures present. If you are unsure, discuss your needs with your Cosasco representative.
2. Inform, educate, and train all personnel in the proper installation, operation, and maintenance of this product.
3. To ensure proper performance, only competent, field experienced and trained personnel should install, operate, repair and maintain this product.
4. Save this user manual for future reference.

Product Operation Personnel:

1. Read and understand all instructions and operating procedures for this product.
2. Follow all warnings, cautions, and notices marked on, and supplied with, this product.
3. Follow all instructions during the installation, operation, and maintenance of this product.
4. To prevent personal injury, ensure that all components are in place prior to and during operation of the product.
5. If you do not understand an instruction, or do not feel comfortable following the instructions, contact a Cosasco service technician for clarification or assistance.
6. If this user manual is not the correct user manual for your Cosasco product, contact Cosasco at +1-562-949-0123 and Cosasco will provide you with the requested manual.
7. Use only replacement parts specified by Cosasco. Unauthorized parts and procedures can affect this product's performance, safety, and invalidate the warranty. "Look-a-like" substitutions may result in improper operation and may result in serious injury or death.
8. Save this user manual for future reference.

NOTICE

It is imperative that the safety warnings throughout this user manual are taken into important consideration during assembly, disassembly, installation, and removal of the Downhole Tool. Safety warnings are noted throughout this document to ensure precautions are taken for all procedures where there are risks involved. Failure to follow these warnings could result in serious injury or worse.

Information provided in this User Manual should not be considered as all encompassing or suitable for all situations, conditions or environments. Each individual and the organization he/she represents is responsible for implementing training and its/his/her own safety/injury/illness prevention program in connection with this user manual, and should consult with their respective legal, medical or other advisors as to the suitability of using the information in connection with this user manual.

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Introduction

CHAPTER 1

The Model ER-420 Transmitter is a two-wire transmitter for use with (ER) Electrical Resistant probes. This transmitter is well suited for plant locations, widely separated monitoring points, and connection into a distributed control system (DCS). (Note that the DCS must be able to graph data against time and compute metal loss corrosion rates from supplied algorithms.)

Figure 1.1 ER-420 Transmitter Unit

The Model ER-420 is easily field mounted and readily applied to the measurement of corrosivity in most process applications. Most wire loop, tube, strip or all welded ER Probes may be used with the Model ER-420 Transmitter.

WARNING! *The Model ER-420 transmitter is not suitable for use with ER Dual Sensor Temperature Probes*

The ER-420 is attached to the probe using the integral extension cable with a maximum of length of 100 feet. A single twisted pair cable connects the Transmitter to a standard 4-20mA current loop. The Transmitter controls loop current as a function of metal loss, beginning at 4mA, and ending at 20mA when the ER probe sensing element has been fully corroded.

NOTE: *The check element of the ER Probe is not utilized with ER-420.*

The general system configuration that may be used are indicated in Figure 1.2.

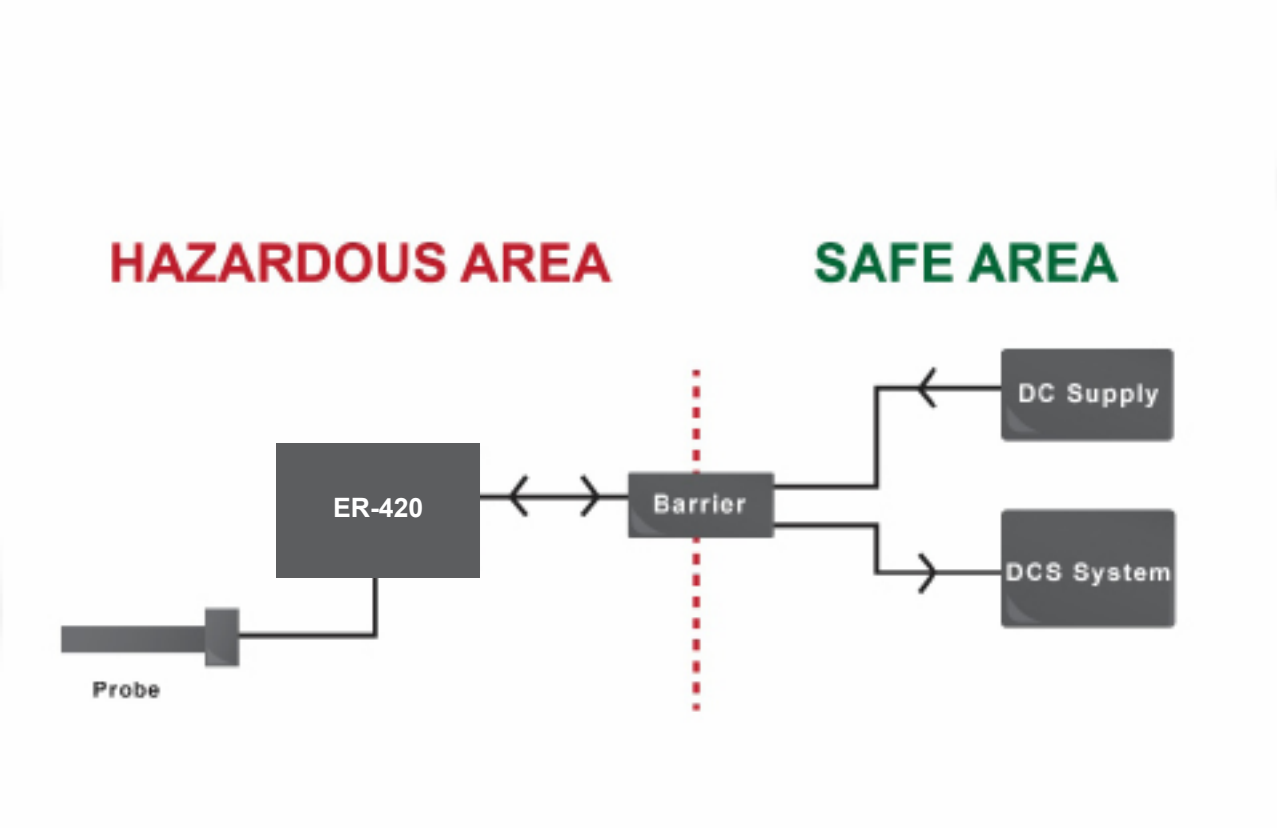


Figure 1.2 System Configuration Options

The Model ER-420 is compatible with any Cosasco ER probe type, but is furnished specifically for each of the three basic probe types from the factory. The compatibility is listed in Figure 1.3. It is field convertible from one type to another by selecting a probe type with the rotary switch on the internal panel.

Transmitter	Probe Type	Element Type Application	Switch Position
- W -	A	W40, W45, W60, W80	0
- T -	B	T4, T8, S20, S40, S60	1
S	C	S4, S8, S10	2
- SP -	D	T10, T20, T50	3

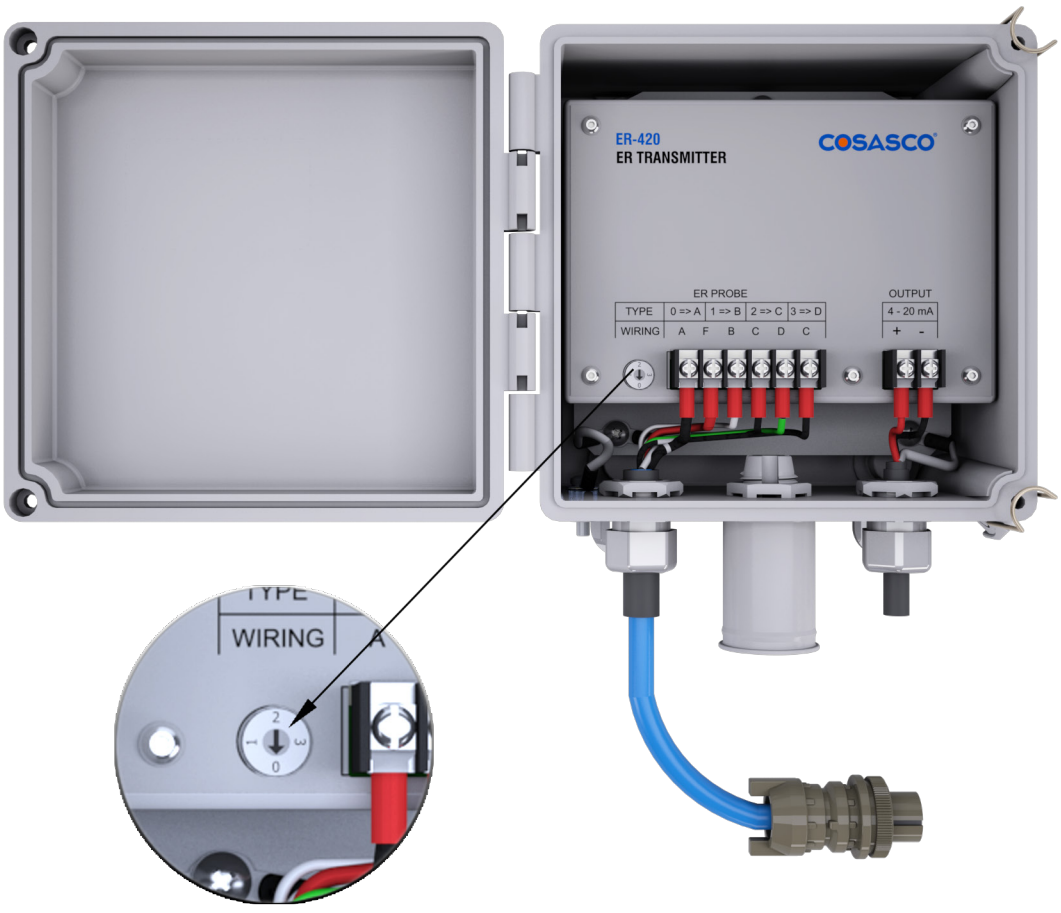


Figure 1.3 Instrument Type/Probe Type Compatibility

Specification

CHAPTER 2

Transmitter Model ER-420

- Enclosure NEMA 4X, IP66 or Stainless Steel (316L), IP66
- Weight 4 lbs. (1.8 Kg)
- Dimensions 8.00”H x 6.25”W x 4.25”D (203mm x 165mm x 108mm)
- Probe Cable Length 5ft. Standard, 100ft. Maximum
- Hazadous Area Certifications

USA/Canada

CSA Canada	Ex ib IIC T4 Gb, Tamb= -40°C to +80°C
CSA US	Class I, Zone 1, AEx ib IIC T4 Gb, Tamb= -40°C to +80°C

Europe

Sira	ATEX Ex ib IIC T4 Gb, Tamb= -40°C to +80°C

IECEx

Sira	IEC Ex ib IIC T4 Gb, Tamb= -40°C to +80°C

Hazardous Area Certification Notes:

Requires the use of a galvanically isolated safety barrier if probe or transmitter is in a Class 1 Division 2 area, Zone 1, or Zone 2.

CE Complies with all applicable EU Product Directives: EMC Directive 9/336/EEC

ATEX Complies with all applicable EU Product Directives: ATEX Directive 94/9/EC

- Supply Voltage Range 10-30 VDC at 20 mA
- Output 4-20 mA into maximum safe area load of 600 ohms with safety barrier
- Resolution ± 0.1%
- Ambient Temperature Range -40°C (-40°F) to +80°C (176°F)

INSTALLATION

CHAPTER 3

Unpacking

Check that the package contains the following items:

- Model ER-420 Transmitter
- Instruction Manual

NOTE: *All ER-420 system components are carefully tested, inspected and packaged prior to shipment. Before unpacking the instruments, please inspect the packaged materials for shipping damage and retain damaged materials to support any claim against the freight carrier should this become necessary.*

Before Installation

Installation of the ER-420 consists of two separate tasks:

- Mechanical mounting
- Electrical wiring

Before proceeding with the installation, several items must be considered. Make sure the Model ER-420 has the correct Cosasco type probe connector and the correct setting for the probe type selector switch.

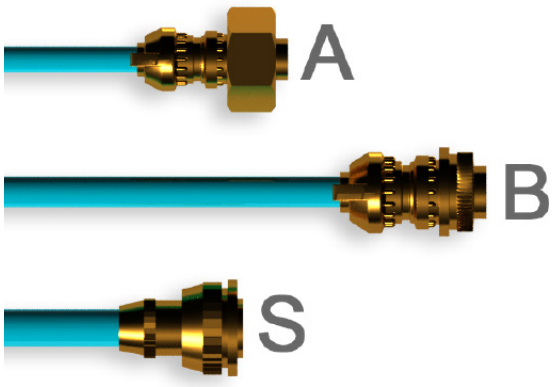


Figure 3.1 Types of Cable Connectors and Probes

The transmitter should be mounted close enough to the probe to allow the use of the 60-inch extension cable supplied. For mounting of the transmitter or probe in a hazardous area the correct galvanically isolated safety barrier and instructions of the intrinsic safety certification must be followed.

NOTE: *Transmitters are available with longer cables up to a maximum of 100 ft.*

Mechanical Mounting of Transmitter

The Model ER-420 Transmitter should be located within 48 inches of the ER probe to be monitored. The standard cable is 60 inches long and the extension cable is 1200 inches long, but it is preferable to allow a service loop of approximately 12 inches to the probe.

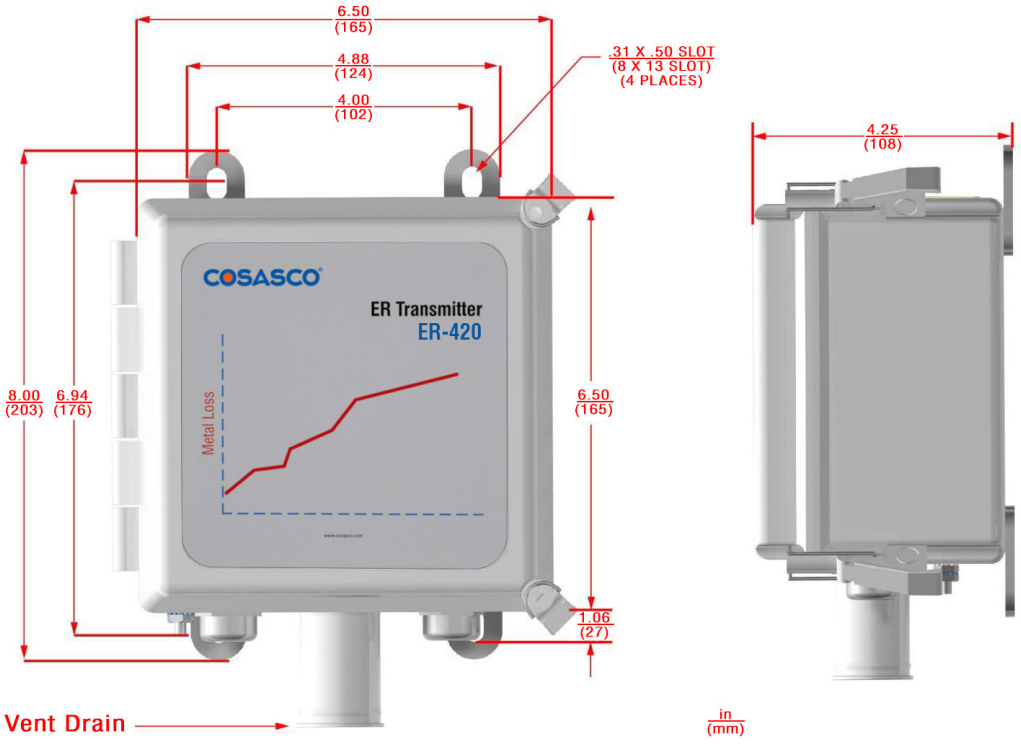


Figure 3.2 Mounting Dimensions

Electrical Wiring of Transmitter

If both the probe and transmitter are located in a non-electrically hazardous area, the transmitter may be connected as any other typical two wire transmitter.

A DC supply of typically 24 VDC is required to power the 4-20mA loop. The transmitter requires between 10 and 30 VDC at the transmitter terminals for correct operation.

NOTE: *If the environment for both the probe element in the process stream, AND the transmitter are classified as Class 1, Division 2 or Zone 2 the transmitter may be used without a safety barrier (see intrinsic safety certifications). If either probe element OR transmitter are in a Class 1, Division 1 or Zone 1 a safety barrier must be used.*

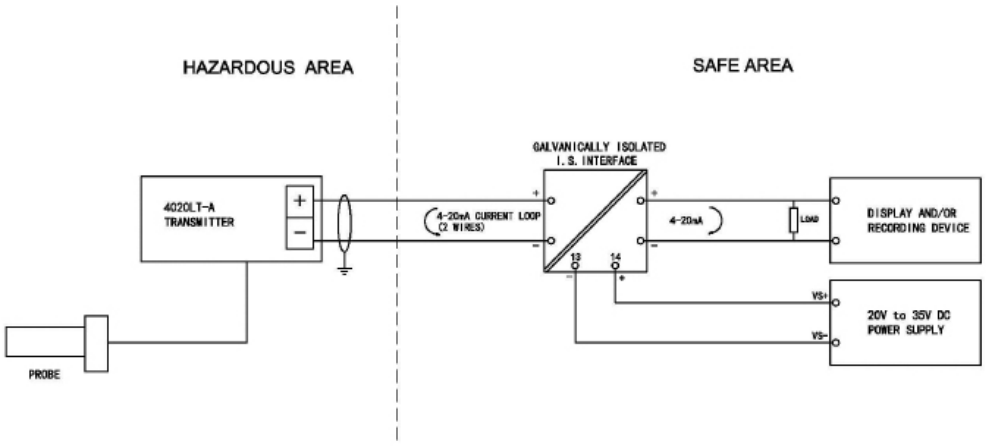


Figure 3.3 Wiring Configurations with Safety Barriers

Operation

CHAPTER 4

The output from a model ER-420 transmitter is a 4-20mA signal that corresponds linearly to the range of zero to the probe span.

WARNING! *This linear output is different from the earlier model 4020 transmitter, which had a non-linear characteristic. If using the ER-420 to replace a model 4020 the conversion formula for the corrosion data must be modified.*

Metal Loss From 4-20mA Signal

To convert the 4-20mA signal into metal loss the conversion formula is as follows:

$$Metal\ Loss\ in\ mils = \frac{\{I_L - 4\}}{16} * Probe\ Span\ (mils)$$

$$Metal\ Loss\ in\ mm = \frac{\{I_L - 4\}}{16} * Probe\ Span\ (mils) * 0.0254$$

$$Metal\ loss\ in\ \mu m = \frac{\{I_L - 4\}}{16} * Probe\ Span\ (mils) * 25.4$$

It is advisable to record the metal loss typically every five minutes and generate a graph of metal loss against time. Visual display of the data is very useful to check general trends and the significance of any signal noise. It is also helpful in determining the filter factor for the corrosion rate algorithm as detailed in the next section.

Corrosion Rate Calculation

For Distributed Control Systems (DCS) we recommend a corrosion rate algorithm based on linear regression (the best straight line), with an adjustable filter factor. The adjustable filter factor is obtained by varying the number (or time period) of readings (m in the formula) over which the liner regression is applied. Readings are best taken every five minutes.

The time period over which the data should be computed is 1 to 5 days, with the ability to adjust this, preferably on an individual probe channel basis.

$$Slope = Corrosion\ rate = \frac{\sum y_i (x_i - \mu)}{\sum (x_i - \mu)^2} \quad (1)$$

where,

$$\mu = \frac{\sum x_i}{m} \quad (2)$$

and,

y = value of metal loss numbers, corresponding to x time base values

x = the time base values

m = the number of points used for the regression

Depending on the units chosen for x and y, the corrosion rate may need to be converted to the rate units required.

As an example if y is in units of mils, as determined from the formula in the Metal Loss from 4-20 mA signal section, and x is in units of days from some nominal origin. Using a time base of 3 days of data for calculation of rate (i.e. 3 x 24 x 12 = 864 data points) the corrosion rate from equations (1) and (2) would be in units of mils/day. This could normally be converted to mils/year by multiplying by 365.

In setting up the algorithm the time period of 3 days in the example should be adjustable from 1 to 5 days to provide filtering as necessary to minimize noise yet give adequate sensitivity to upsets. The shorter the time period, the more sensitive but noisier will be the rate calculation. The longer the time period, the less sensitive but quieter will be the rate calculation.

Probe Spans

The following table indicates the probe spans for the various probe types available

ER PROBE ELEMENT	TYPE	SPAN		
		mils	mm	m
Flush Element S4* Atmospheric Element S4*	B D	2.0	0.051	51
Flush Element S8* Atmospheric Element S4*	B D	4.0	1.102	102
Flush Element S10 Cylindrical Element T10	B D	5.0	0.127	127
Flush Element S20* Cylindrical Element T20	B D	10.0	0.254	254
Flush Element S40*	B	20.0	0.508	508
Cylindrical Element T50	D	25.0	0.635	635

Figure 4.1 ER Probe Types and Spans

Maintenance

CHAPTER 5

The Model ER-420 Transmitter should require little maintenance. Normal probe replacement is required in order to maintain continuous corrosion monitoring at a site. All probes have a certain life based on their geometry and amount of corrosion they are exposed to. A probe replacement schedule should be established with a criterion such as 7/8 of probe life (875 span divisions) to time change out.

As a reminder, proper probe selection should be based on closely matching probe span to mpy corrosion rate for optimum instrument accuracy.

During probe replacement, all connections, such as the connectors at the probe, should be environmentally protected and checked for good electrical conduction. Under normal conditions the Transmitter should not require recalibration when replacing identical probes. It is recommended as a good procedure that the current loop power source be powered down during probe change out.

WARNING! For reasons of maintaining the intrinsic safety certifications it is important that any repairs be carried out by Cosasco or its authorized agent to maintain the certification of the instrument.

APPENDIX A

ER Theory

ER Systems are based on the electrical resistance method of corrosion monitoring pioneered by Cosasco in the 1950's and 1960's. ER probes are basically "electrical coupons." They determine the loss of metal from the probe by measuring the change in its resistance. Because of the very low resistances involved, very sensitive monitoring circuits are used in ER instruments to measure the change in probe resistance compared to a protected reference element resistance series-connected to the corroding measurement element. A "check" element is also included and is protected from the process along with the reference element.
The ratio of check to reference resistance should remain constant. If it doesn't, this indicates that degradation of the reference element may be occurring and that metal loss readings obtained from the probe are questionable. A simplified diagram of a typical electrical resistance monitoring circuit is shown in Figure 1.

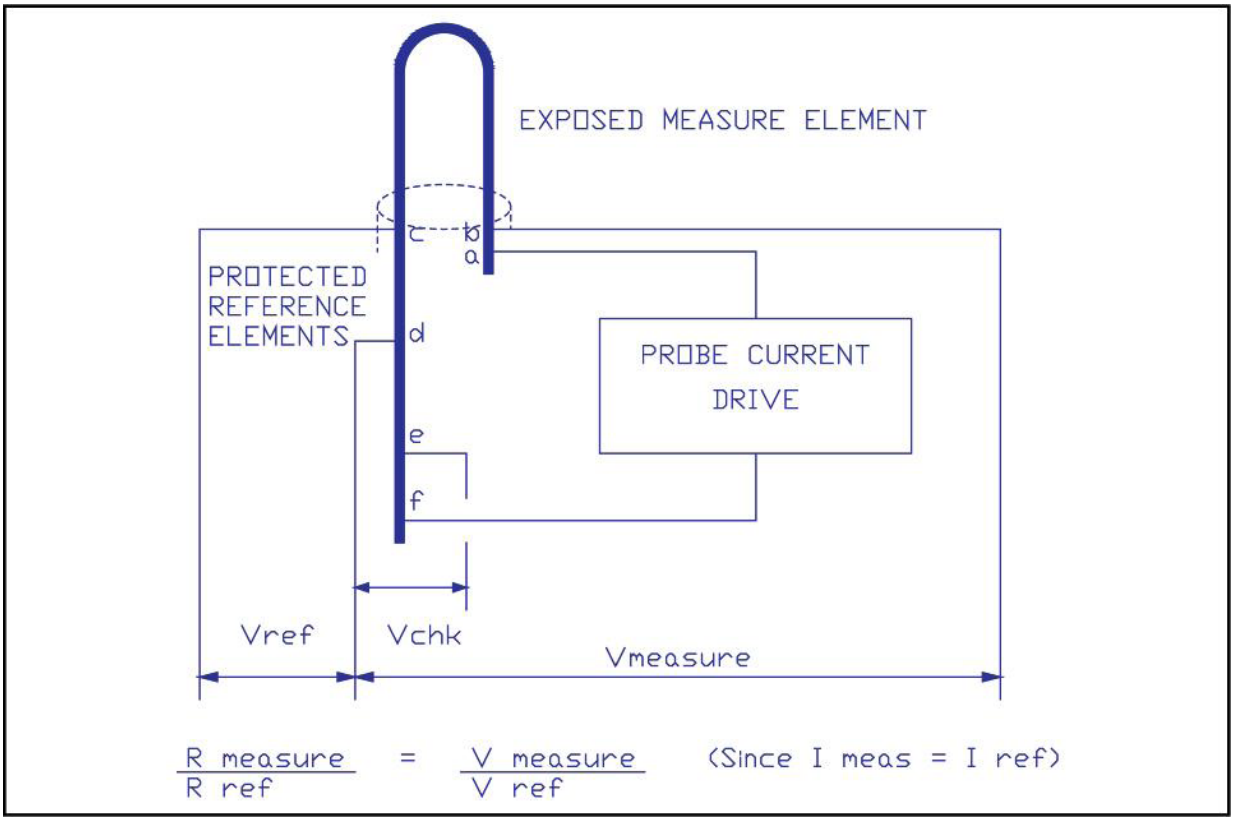


Figure 1

As with coupons, ER probes must be allowed to corrode for a period of time before accurate corrosion rate measurements can be made. The actual length of time required depends upon the corrosion rate--the higher the rate, the shorter the time required, and vice-versa. ER probes are available in a variety of styles and with useful probe life ("span") ranging from 2-25 mils, in styles commonly used in process piping systems. Instrumentation to measure electrical resistance probes divides the probe span into l000 "divisions." A probe with a 2 mil span is therefore theoretically capable of measuring thickness changes of 0.002 mils. In practice, however, we recommend that a change in indicated metal loss of l0 divisions
be required before the data is used to calculate corrosion rate. Indications of an upward or downward trend can be obtained with as little as a 4-division change, but care must be exercised in interpreting such small changes because other factors (e.g. temperature changes) can also be responsible. The actual time required to produce meaningful corrosion rate information with common probe spans at different corrosion rates is shown in Figure 2 and summarized in Table 1.

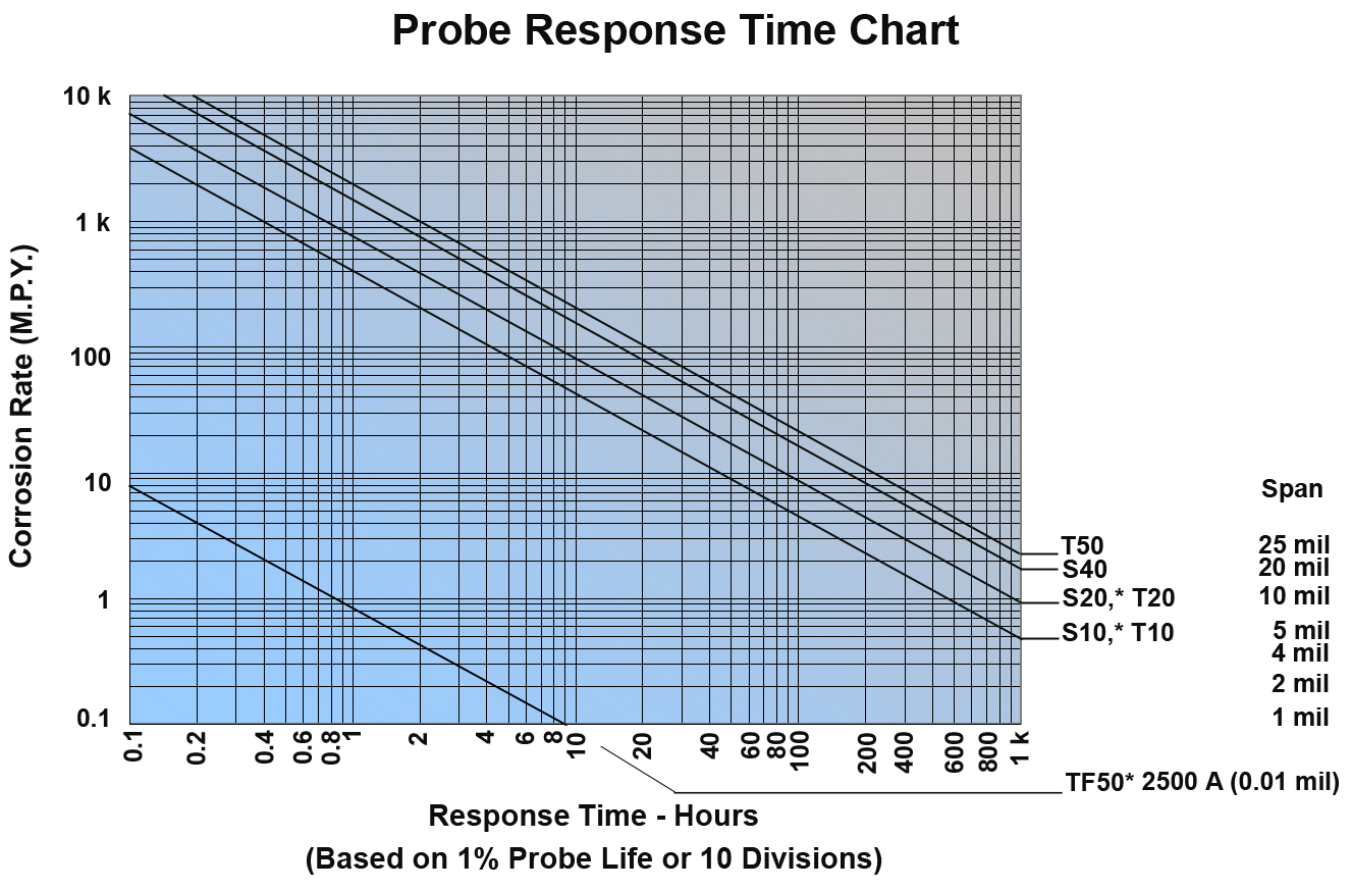


Figure 2

Corrosion Rate (mpy)	5	10	20	25
0.1	6 months	12 months	24 months	30 months
0.5	37 days	73 days	5 months	6 months
1.0	18 days	36 days	73 days	3 months
5.0	4 days	7 days	15 days	18 days
10	2 days	4 days	7 days	9 days
25	18 hours	35 hours	3 days	4 days
50	9 hours	18 hours	35 hours	2 days
75	6 hours	12 hours	23 hours	29 hours
100	5 hours	9 hours	18 hours	22 hours

Table1

Elapsed Time* To:			Corrosion Rate* with 10 mil Span Probe
Early Trend Indication (4 Div.)	Meaningful Rate Data (10 Div.)	End of Useful Probe Life (1000 Div.)	
1.6 hour	4.0 hour	17 days	220 mpy (5.6 mm/y)
4.0 hour	10.0 hour	1.4 months	88 mpy (2.2 mm/y)
9.6 hour	1 day	3.3 months	37 mpy (0.94 mm/y
18.0 hour	1.8 days	6.0 months	20 mpy (0.51 mm/y)
1.1 days	2.7 days	9.0 months	13 mpy (0.33 mm/y)
1.5 days	3.7 days	12.0 months	10 mpy (0.25 mm/y)
1.8 days	4.6 days	15.0 months	8 mpy (0.20 mm/y)
2.2 days	5.5 days	18.0 months	6.7 mpy (0.17 mm/y)
2.9 days	7.3 days	24.0 months	5 mpy (0.13 mm/y)

**All data shown to two significant digits only*

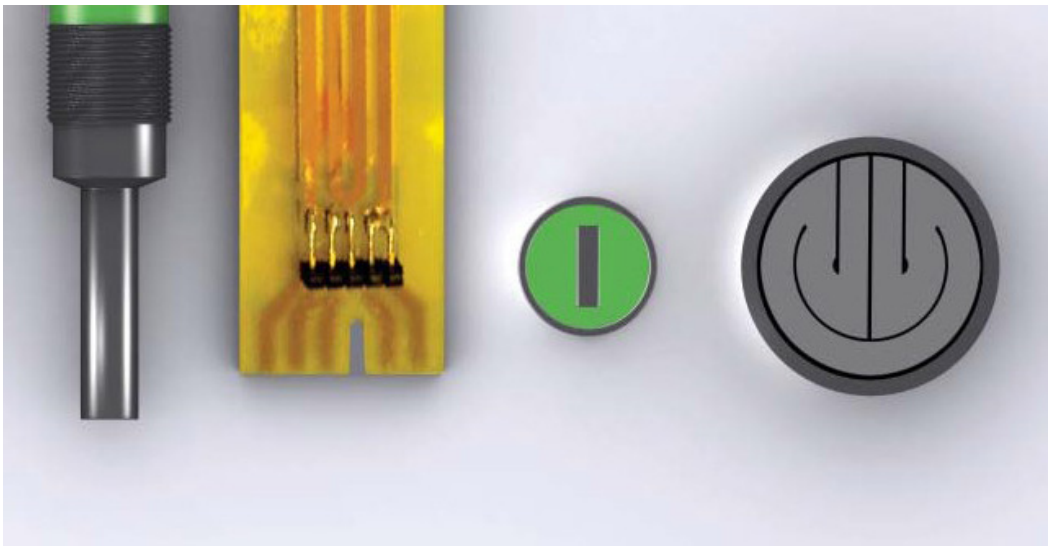
Table 2

From Table 1, it would appear desirable to always choose probes with the lowest span available in order to get the greatest sensitivity. However, the more sensitive the probe, the faster the entire probe span will corrode away and require a new probe to be installed.

Table 2 illustrates this relationship.

It is our experience that the objectives of most monitoring programs can be achieved cost-efficiently by selecting ER probes which will reach the end of their useful life in 6 - 9 months at the expected corrosion rate. Unlike a monthly coupon replacement program, this electrical resistance probe will continuously produce data that verifies that the average corrosion rate over the previous 2-3 days is still at the originally-expected (design) rate. If the corrosion rate increases to twice the design rate, meaningful data to permit the new rate to be calculated will be available in a day and a half. Conversely, if the actual corrosion rate is below design, a longer period is required before meaningful data are available to calculate the new rate.

ER probe elements are available in a variety of styles. A selection of the available styles is shown in Figure 3. Cylindrical elements utilize specially-made, thin-wall tubing as the measurement element. Cylindrical probes are generally “all-metal;” i.e., there is no other material exposed to the process. There are, however, also some cylindrical probes available which join the probe body at a hermetic glass seal. A variety of flush-mounted probes are also available; so-called because the measuring element is mounted parallel to the flow stream, flush with the inside pipe wall.



CYLINDRICAL ATMOSPHERIC FLUSH END VIEW (Small Diameter) FLUSH END VIEW

Figure 3

Most cylindrical probes are of all-welded construction in order to eliminate the need for sealing metal elements to non-metallic glass, epoxy or ceramic. This all-welded construction gives the probe superior resistance to leaking. Probes with higher temperature ratings can also be constructed in the all-welded style. A drawback to the all-welded style is that the element is electrically connected to the pipe wall which can, in certain conditions, interfere with the corrosion reaction on the probe. Also, because cylindrical probes are welded, in some conditions preferential corrosion can occur in the heat-affected zones near the weld.

Flush probe elements are thin, flat metal sections embedded in epoxy or a hermetic glass seal inside a metal probe body. Flush probes also experience certain characteristic problems, most notably: lack of adhesion of the metal element to the epoxy, cracking of glass seals due to differential expansion and erosion of the epoxy or glass due to high velocities, abrasive materials in the flow stream or both. Flush ER probes mounted on the bottom of the line have been shown to provide good results in a sour gas gathering system.

Because the measurement element is part of the primary pressure seal, and because it's designed to corrode, ER probes have a reduced resistance to leaking after prolonged exposure. Once the measurement element has corroded through, the internals of the probe body are exposed to the process fluid. Although materials are chosen in part for their strength and lack of permeability, it is our experience that process fluids will permeate throughout the probe packing material. For this reason, quality probes are constructed of corrosion-resistant body materials and include a secondary pressure seal, often consisting of a hermetic glass-sealed connector. Other back-up seals are utilized in special cases, especially where process fluids will attack glass (e.g. hydrofluoric acid service). Please contact the factory if you have any questions about the compatibility of probe materials with your application.

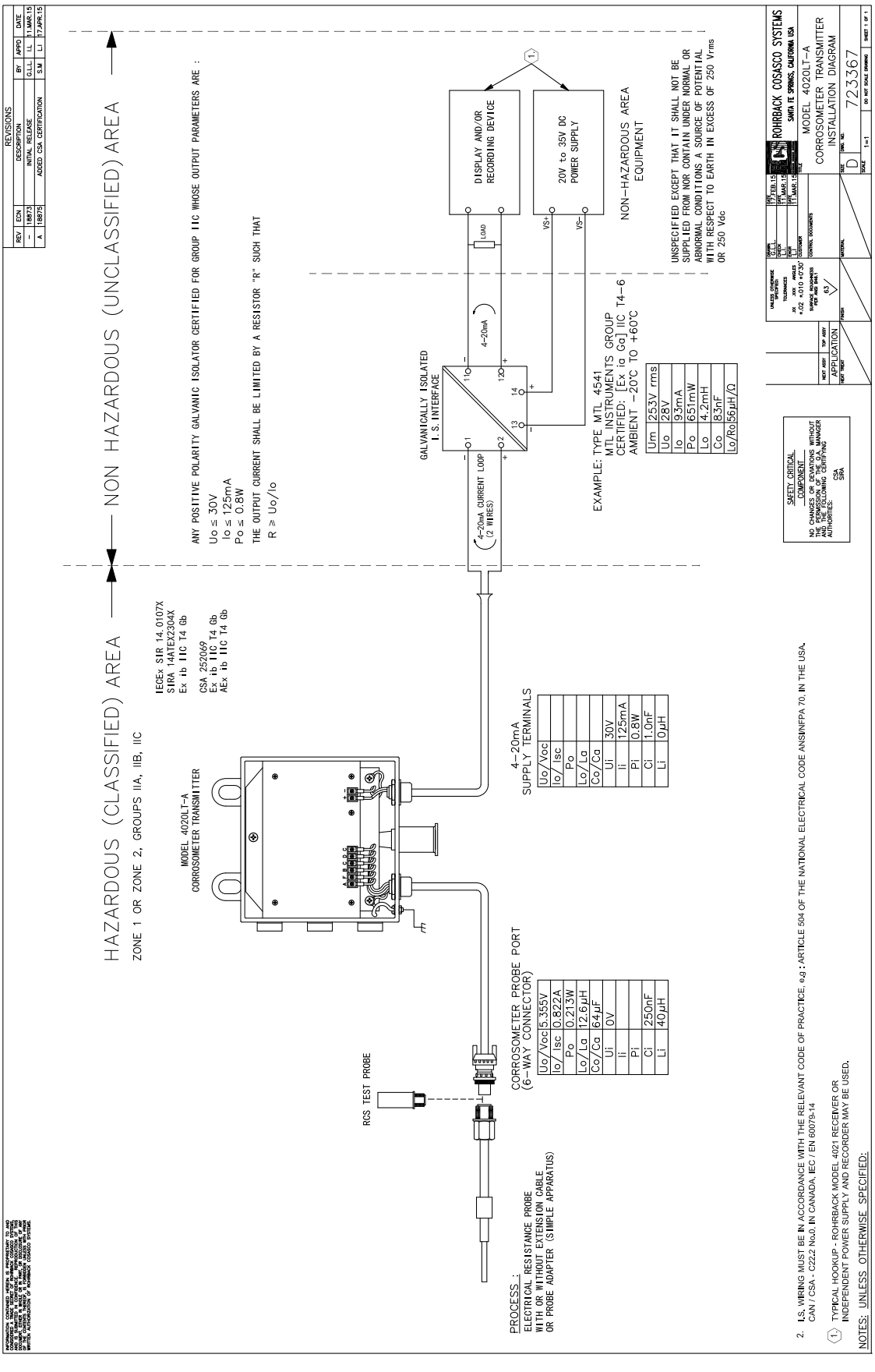
The reference and check elements are protected from the process to which the measurement element is directly exposed. Temperature changes in the process will, therefore, affect the measure element before the reference and check elements. Because of the very low resistances involved, these changes can significantly affect the metal loss readings. ER probes incorporate special design features to minimize the thermal resistance of the materials insulating the reference and check elements from the process. It should also be noted that cylindrical probes are inherently better able to react to temperature changes due to location of the reference and check elements concentrically inside the measure element.

APPENDIX B

Requirements for Intrinsic Safety Operation

To meet the requirements of the certifying authorities for the intrinsic safety certifications under which the equipment is operated, it is important that the requirements of the certifications documents and installation practices are followed. The following certification documents provide this information.

WARNING! **The transmitter has certifications for use with a safety barrier. In general, the process stream into which the ER probe is installed will determine if a safety barrier is required. If this process stream is classified as Class 1 Division 1, or Zone 1 by the jurisdiction of the applicable authority, then a safety barrier MUST BE USED.**


REVISIONS
REV | ECN | DESCRIPTION | BY | APPD | DATE
- | 19873 | INITIAL RELEASE | G.L.L. | I.L. | 11-MAR-15
A | 19875 | ADDED CSA CERTIFICATION | S.M. | L.I. | 17-APR-15
HAZARDOUS (CLASSIFIED) AREA
ZONE 1 OR ZONE 2, GROUPS IIA, IIB, IIC
NON HAZARDOUS (UNCLASSIFIED) AREA
IECEx SIR 14.0107X
SIRA 14ATEX2304X
Ex ib IIC T4 Gb
CSA 252069
Ex ib IIC T4 Gb
AEx ib IIC T4 Gb
MODEL 4020LT-A
CORROSOMETER TRANSMITTER
ANY POSITIVE POLARITY GALVANIC ISOLATOR CERTIFIED FOR GROUP IIC WHOSE OUTPUT PARAMETERS ARE :
Uo ≤ 30V
Io ≤ 125mA
Po ≤ 0.8W
THE OUTPUT CURRENT SHALL BE LIMITED BY A RESISTOR "R" SUCH THAT
R ≥ Uo/Io
GALVANICALLY ISOLATED I.S. INTERFACE
4-20mA CURRENT LOOP (2 WIRES)
4-20mA
LOAD
DISPLAY AND/OR RECORDING DEVICE
20V to 35V DC POWER SUPPLY
VS+
VS-
NON-HAZARDOUS AREA EQUIPMENT
EXAMPLE: TYPE MTL 4541
MTL INSTRUMENTS GROUP
CERTIFIED: [Ex ia Ga] IIC T4-6
AMBIENT -20°C TO +60°C
Um 253V rms
Uo 28V
Io 93mA
Po 651mW
Lo 4.2mH
Co 83nF
Lo/Ro 56µH/Ω
UNSPECIFIED EXCEPT THAT IT SHALL NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250 Vrms OR 250 Vdc
4-20mA SUPPLY TERMINALS
Uo/Voc
Io/ Isc
Po
Lo/La
Co/Ca
Ui 30V
Ii 125mA
Pi 0.8W
Ci 1.0nF
Li 0µH
CORROSOMETER PROBE PORT (6-WAY CONNECTOR)
Uo/Voc 5.355V
Io/ Isc 0.822A
Po 0.213W
Lo/La 12.6µH
Co/Ca 64µF
Ui 0V
Ii
Pi
Ci 250nF
Li 40µH
ROS TEST PROBE
PROCESS :
ELECTRICAL RESISTANCE PROBE
WITH OR WITHOUT EXTENSION CABLE
OR PROBE ADAPTER (SIMPLE APPARATUS)
SAFETY CRITICAL COMPONENT
NO CHANGES OR DEVIATIONS WITHOUT PRIOR APPROVAL FROM THE FOLLOWING CERTIFYING AUTHORITIES:
CSA
SIRA
ROHRBACK COSASCO SYSTEMS
SANTA FE SPRINGS, CALIFORNIA USA
MODEL 4020LT-A
CORROSOMETER TRANSMITTER
INSTALLATION DIAGRAM
DWG. NO. 723367
SIZE D
SCALE 1=1
DO NOT SCALE DRAWING
SHEET 1 OF 1
2. I.S. WIRING MUST BE IN ACCORDANCE WITH THE RELEVANT CODE OF PRACTICE, e.g. : ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE ANSI/NFPA 70, IN THE USA, CAN / CSA - C22.2 No.0, IN CANADA, IEC / EN 60079-14
1 TYPICAL HOOKUP - ROHRBACK MODEL 4021 RECEIVER OR INDEPENDENT POWER SUPPLY AND RECORDER MAY BE USED.
NOTES: UNLESS OTHERWISE SPECIFIED:

CSA Group

Certificate of Compliance

Certificate: 70026842 **Master Contract:** 252069

Project: 70026942 **Date Issued:** 2015-04-27

Issued to: Rohrback Cosasco Systems, Inc.
11841 Smith Avenue
Santa Fe Springs
California 90670
USA

Attention: Mr Lucky Illev

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only

C US

Issued by: David Holton

PRODUCTS

CLASS 2258 04 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations

Ex ib IIC T4 Gb

CLASS 2258 84 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations - CERTIFIED TO U.S. STANDARDS

AEx ib IIC T4 Gb

Model 4020LT-A Corrosometer Transmitter, intrinsically safe, with input entity parameters Ui = 30V, Ii = 125mA, Pi = 0.84W, Ci = 1nF, Li = 0; output entity parameters Uo = 5.355V, Io = 0.822A, Po = 0.213W, Ci = 250nF, Co = 64µF, Li = 40µH, Lo = 12.6 µH; -40°C ≤ Ta ≤ +80°C

For details related to rating, size, configuration, etc. reference should be made to the CSA Certification Record or the descriptive report.

CSA Group

Certificate: 70026842 **Master Contract:** 252069

Project: 70026942 **Date Issued:** 2015-04-27

CONDITIONS OF ACCEPTABILITY

i. The equipment shall only be supplied from a galvanically-isolated interface. The circuit is isolated from the enclosure, but it is intended for connection to simple apparatus (a corrosion probe), which may not maintain a 500 V isolation circuit-to-earth/ground as the probe corrodes. In addition, there is a facility for earthing the cable screen/shield. The circuit and screen shall be assumed to become connected due to cable damage. The installer shall ensure that the system (i.e. circuit and screen) has no more than one connection to earth unless the two earths are connected together, either via the structure or via an additional earth cable.

ii. In the version with a plastic outer enclosure, exposed plastic parts and non-grounded metal parts may store an ignition-capable level of electrostatic charge. Therefore, the user/installer shall take precautions to prevent the build up of electrostatic charge, e.g. locate the equipment where a charge-generating mechanism (such as wind-blown dust) is unlikely to be present and clean only with a damp cloth.

APPLICABLE REQUIREMENTS

CAN/CSA C22.2 No. 61010-1-12 Ed 3	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements
CAN/CSA-C22.2 No. 60079-0:11 Ed. 5	Explosive Atmospheres - Part 0: Equipment - General requirements
CAN/CSA-C22.2 No. 60079-11:14 Ed. 6	Explosive Atmospheres – Part 11: Equipment protection by intrinsic safety "i"
ANSI/ISA-61010-1 Ed. 3	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements
ANSI/UL 60079-0:2013 Ed. 6	Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements
ANSI/UL 60079-11:2013Ed. 6	Electrical apparatus for Explosive Gas Atmospheres - Part 11: Intrinsic Safety "i"

CSA Group

Supplement to Certificate of Compliance

Certificate: 70026842 **Master Contract:** 252069

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
70026942	2015-04-27	Original Certification of the Model 4020LT-A Corrosometer Transmitter

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx SIR 14.0107X Issue No.: 0 Certificate history:

Status: Current

Date of Issue: 2015-04-08 Page 1 of 3

Applicant: Rohrback Cosasco Systems
11841 E. Smith Avenue
Santa Fe Springs
California 90670
United States of America

Electrical Apparatus: Model 4020LT-A Corrosometer Transmitter
Optional accessory:

Type of Protection: Intrinsically Safe

Marking: Ex ib IIC T4 Gb
Ta = -40°C to +80°C

Approved for issue on behalf of the IECEx Certification Body: A C Smith

Position: Certification Manager

Signature: (for printed version)

Date: 2015-04-08

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:
SIRA Certification Service
CSA Group
Unit 6, Hawarden Industrial Park
Hawarden
Deeside
CH5 3US
United Kingdom

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 14.0107X

Date of Issue: 2015-04-08 Issue No.: 0

Page 2 of 3

Manufacturer: **Rohrback Cosasco Systems**
11841 E. Smith Avenue
Santa Fe Springs
California 90670
United States of America

Additional Manufacturing location (s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Edition: 6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-11 : 2011 Edition: 6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:
GB/SIR/ExTR15.0092/00

Quality Assessment Report:

US/ULQAR08.0005/04

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 14.0107X

Date of Issue: 2015-04-08 Issue No.: 6

Page 3 of 3

Schedule

EQUIPMENT:
Equipment and systems covered by this certificate are as follows:

The Model 4020LT-A Corrosometer Transmitter is a 4-20mA loop-powered instrument used for the measurement of corrosion in process applications. The 4020LT-A is attached to a probe (not covered by this certificate) using the integral, six-wire, shielded cable and connector, the cable is up to 30 m (100 ft) long.
The electronics are on a single, encapsulated, printed circuit board, which is housed within an inner metal enclosure. An outer enclosure, which may be plastic or metal, provides additional protection.

	Supply (from a galvanically-isolated interface only)	Corrosometer probe port (6-way connector)
Ui	30 V	0
Ii	125 mA	-
Pi	0.8 W	-
Ci	1 nF	260 nF
Li	0	40 µH
Uo		5.355 V
Io		822 mA
Po		213 mW
Co		64 µF
Lo		12.6 µH

CONDITIONS OF CERTIFICATION: YES as shown below:

1. The equipment shall only be supplied from a galvanically-isolated interface. The circuit is isolated from the enclosure, but it is intended for connection to simple apparatus (a corrosion probe), which may not maintain a 500 V isolation circuit-to-earth/ground as the probe corrodes. In addition, there is a facility for earthing the cable screen/shield. The circuit and screen shall be assumed to become connected due to cable damage. The installer shall ensure that the system (i.e. circuit and screen) has no more than one connection to earth unless the two earths are connected together, either via the structure or via an additional earth cable
2. In the version with a plastic outer enclosure, exposed plastic parts and non-grounded metal parts may store an ignition-capable level of electrostatic charge. Therefore, the user/installer shall take precautions to prevent the build up of electrostatic charge, e.g. locate the equipment where a charge-generating mechanism (such as wind-blown dust) is unlikely to be present and clean only with a damp cloth.

sira CERTIFICATION

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: **Sira 14ATEX2304X** Issue: **0**

4 Equipment: **Model 4020LT-A Corrosometer Transmitter**

5 Applicant: **Rohrback Cosasco Systems**

6 Address: 11841 E, Smith Avenue
Santa Fe Springs
California 90670
USA

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 60079-0:2012/A11:2013 EN 60079-11:2012

The above list of documents may detail standards that do not appear on the UKAS Scope of Accreditation, but have been added through Sira's flexible scope of accreditation, which is available on request.

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

II 2G
Ex ib IIC T4 Gb
Ta = -40°C to +80°C

Project Number 70012511

C Ellaby
Deputy Certification Manager

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

Form 9400 Issue 3

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 14ATEX2304X**
Issue 0

13 **DESCRIPTION OF EQUIPMENT**

The Model 4020LT-A Corrosometer Transmitter is a 4-20mA loop-powered instrument, used for the measurement of corrosion in process applications. The 4020LT-A is attached to a probe (not covered by this certificate) using the integral, six-wire, shielded cable and connector, the cable is up to 30 m (100 ft) long.

The electronics are on a single, encapsulated, printed circuit board, which is housed within an inner metal enclosure. An outer enclosure, which may be plastic or metal, provides additional protection.

The Model 4020LT-A has the following entity parameters:

	Supply (from a galvanically-isolated interface only)	Corrosometer probe port (6-way connector)
Ui	30 V	0
Ii	125 mA	-
Pi	0.8 W	-
Ci	1 nF	250 nF
Li	0	40 µH
Uo		5.355 V
Io		822 mA
Po		213 mW
Co		64 µF
Lo		12.6 µH

14 **DESCRIPTIVE DOCUMENTS**

14.1 **Drawings**

Refer to Certificate Annexe.

14.2 **Associated Sira Reports and Certificate History**

Issue	Date	Report no.	Comment
0	24 March 2015	R70012511A	The release of the prime certificate.

15 **SPECIAL CONDITIONS FOR SAFE USE** (denoted by X after the certificate number)

15.1 The equipment shall only be supplied from a galvanically-isolated interface. The circuit is isolated from the enclosure, but it is intended for connection to simple apparatus (a corrosion probe), which may not maintain a 500 V isolation circuit-to-earth/ground as the probe corrodes. In addition, there is a facility for earthing the cable screen/shield. The circuit and screen shall be assumed to become connected due to cable damage. The installer shall ensure that the system (i.e. circuit and screen) has no more than one connection to earth unless the two earths are connected together, either via the structure or via an additional earth cable.

15.2 In the version with a plastic outer enclosure, exposed plastic parts and non-grounded metal parts may store an ignition-capable level of electrostatic charge. Therefore, the user/installer shall take precautions to prevent the build up of electrostatic charge, e.g. locate the equipment where a charge-generating mechanism (such as wind-blown dust) is unlikely to be present and clean only with a damp cloth.

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330
Email: info@siracertification.com
Web: www.siracertification.com

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 14ATEX2304X**
Issue 0

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, England
Tel: +44 (0) 1244 670900
Fax: +44 (0) 1244 681330

Certificate Annexe

Certificate Number: Sira 14ATEX2304X
Equipment: Model 4020LT-A Corrosometer Transmitter
Applicant: Rohrback Cosasco Systems

sira CERTIFICATION

Issue 0

Drawing no.	Sheets	Rev.	Date (Sira stamp)	Description
723357	1 of 1	-	24 Mar 15	Critical component list
723358	1 of 1	-	09 Jan 15	Sector diagram
723359	1 to 2	-	09 Jan 15	Schematic
723361	1 to 12	A	09 Jan 15	Artwork
723367	1 of 1	-	13 Mar 15	Control drawing
723370	1 to 2	-	13 Mar 15	General assembly
723375-1	1 of 1	-	13 Mar 15	Marking, IECEx/ATEX

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