4020LT-A CORROSOMETER®

TRANSMITTER

User Manual

Rohrback Cosasco Systems, Inc.
11841 E. Smith Avenue
Santa Fe Springs, CA 90670
Tel: (562) 949-0123
(800) 635-6898
Fax: (562) 949-3065
www.cosasco.com

P/N 741099rev. -

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Introduction

CHAPTER 1

The Model 4020LT-A transmitter is a two-wire transmitter for use with Corrosometer 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 4020LT-A Transmitter Unit

The Model 4020LT-A is easily field mounted and readily applied to the measurement of corrosivity in most process applications. Most wire loop, tube, strip or all welded CORROSOMETER probes may be used with the Model 4020LT-A Transmitter.

WARNING! *The Model 4020LT-A transmitter is not suitable for use with CORROTEMP CORROSOMETER Probes*

The 4020LT-A is attached to the probe using the integral extension cable with a maximum 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 CORROSOMETER probe sensing element has been fully corroded.

NOTE: *The check element of the CORROSOMETER probe is not utilized with Model 4020LT-A.*

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

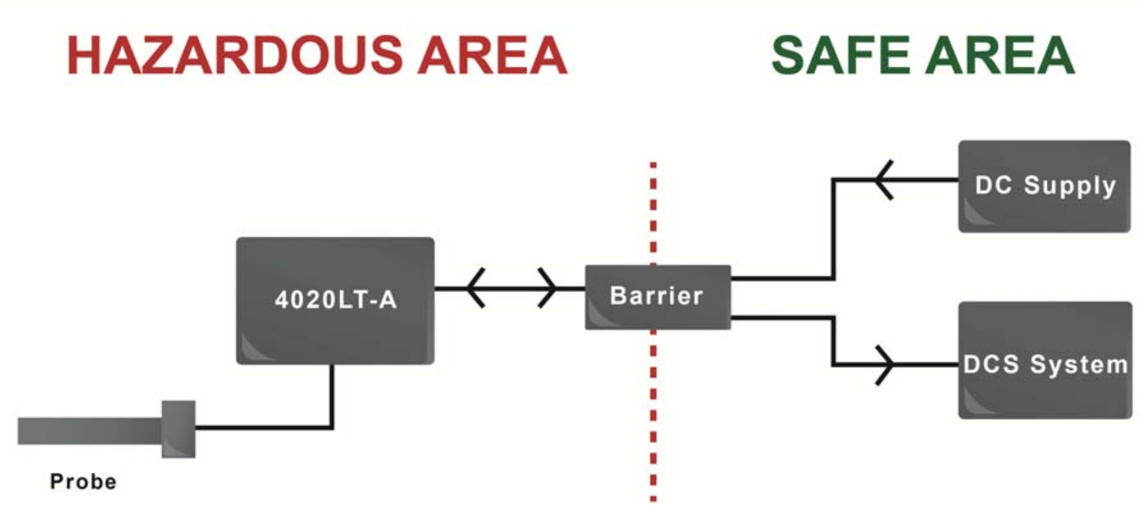


Figure 1.2 System Configuration Options

The Model 4020LT-A is compatible with any Rohrback Cosasco CORROSOMETER 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 front panel.

Transmitter Suffix	Probe Type	Element Type Applicable
-W-	A	W40, W45, W60, W80
-T-	B	T4, T8, S20, S40, S60
S	C	S4, S8, S10,
-SP-	D	T10, T20, T50

Figure 1.3 Instrument Type/Probe Type Compatibility

CHAPTER 2

Specification

Transmitter Model 4020LT-A

- 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
- Hazardous Area Certifications

USA/Canada

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

Europe

Sira	ATEX Ex ib IIC T4 Gb, T_{amb}= -40°C to +80°C

IECEx

Sira	IEC Ex ib IIC T4 Gb, T_{amb}= -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 4020LT-A Transmitter
- Test probe attached to probe cable
- Instruction Manual

NOTE: *All 4020LT-A 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 4020LT-A consists of two separate tasks:

- Mechanical mounting
- Electrical wiring

Before proceeding with the installation, several items must be considered. Make sure the Model 4020LT-A has the correct Rohrback Cosasco Systems type probe connector and the correct setting for the probe type selector switch.

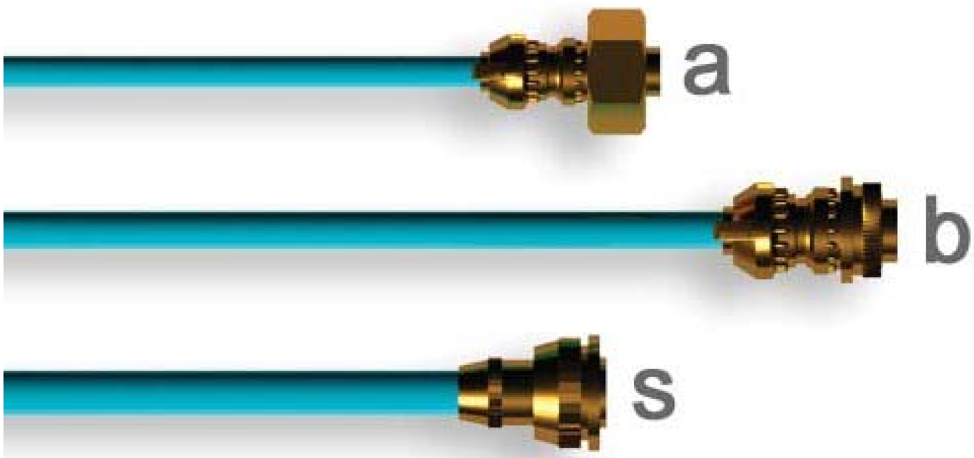


Figure 3.1 Types of Cable Connectors and Probes

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 4020LT-A Transmitter should be located within 48 inches of the CORROSOMETER 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.

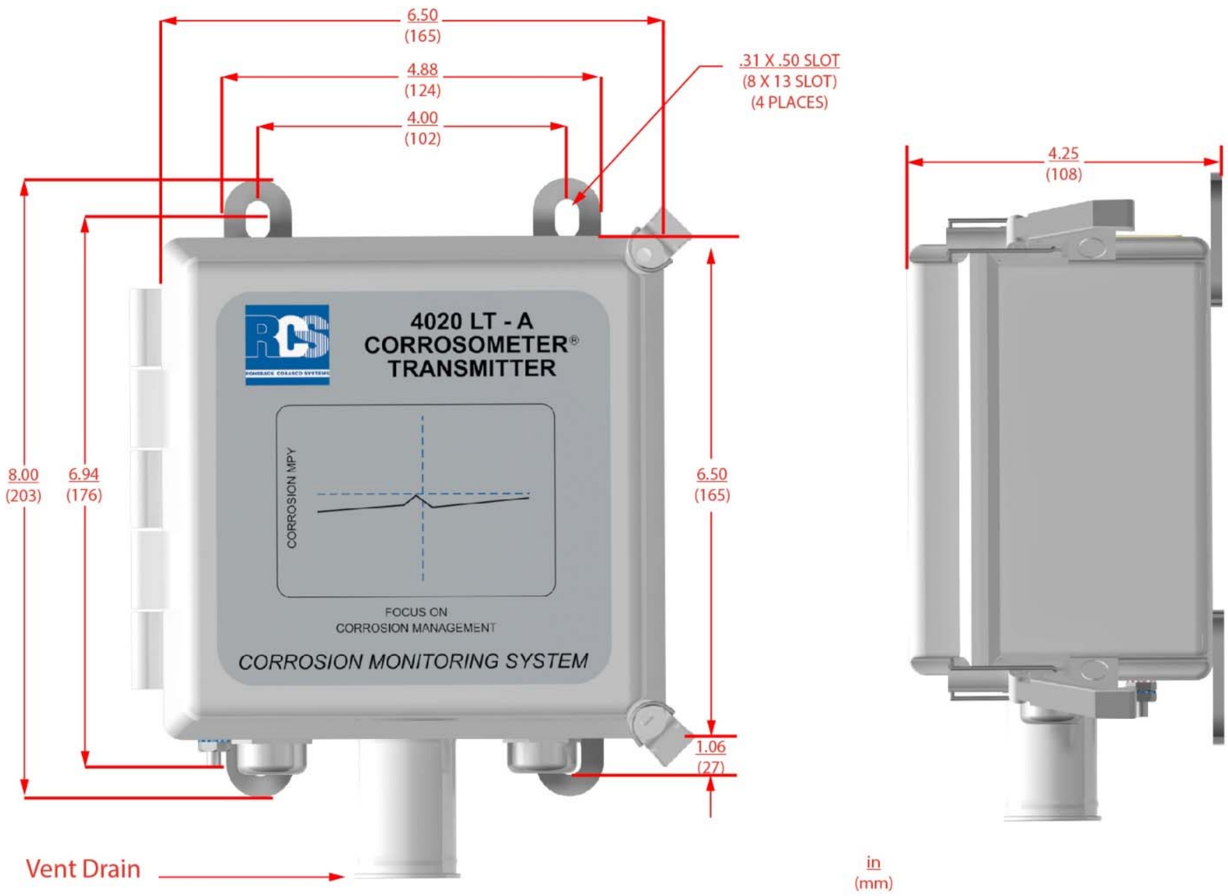


Figure 3.2 Mounting Dimensions

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 2 or Zone 1 a safety barrier must be used.*

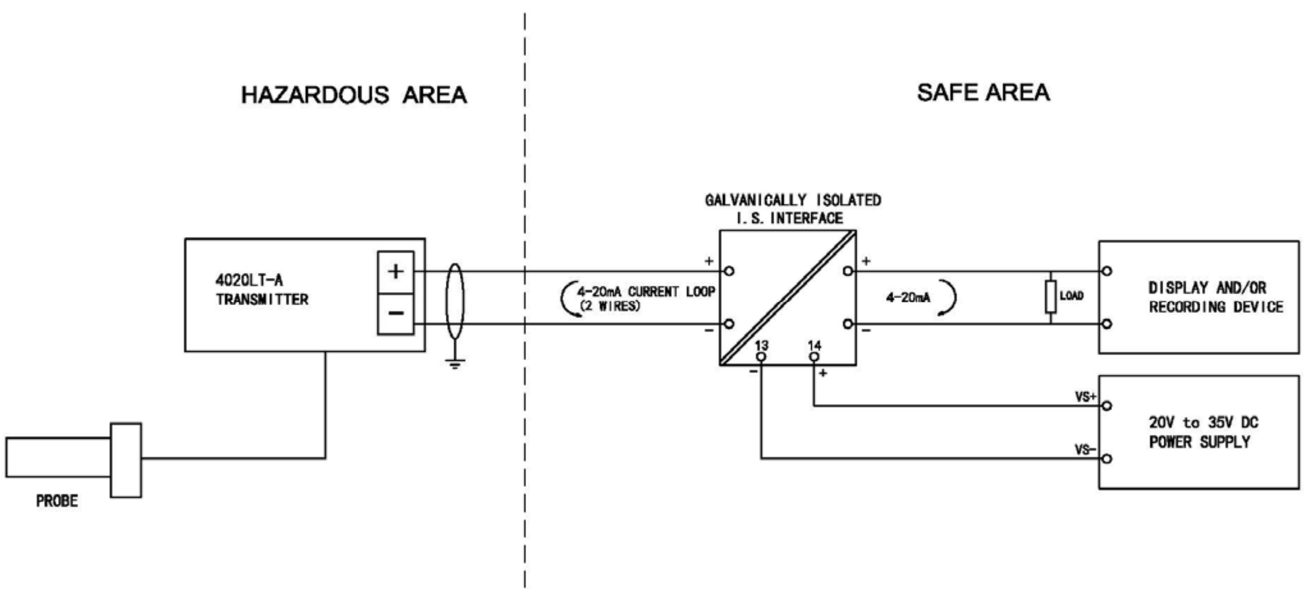


Figure 3.3 Wiring Configurations With Safety Barriers

CHAPTER 4

Operation

The output from a model 4020LT-A 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 4020LT-A 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

CORROSOMETER PROBE ELEMENT	TYPE	SPAN		
		mils	mm	m
Strip Loop S4	C	1.0	0.025	25
Flush Element S4* Atmospheric Element S4* Strip Loop S8 Tube Loop T4	B D C B	2.0	0.051	51
Flush Element S8* Atmospheric Element S8* Tube Loop T8	B D B	4.0	0.102	102
Flush Element S10* Cylindrical Element T10	B D	5.0	0.127	127
Flush Element S20* Cylindrical Element T20 Wire Loop Element W40	B D A	10.0	0.254	254
Wire Loop Element W45	A	11.25	0.285	286
Flush Element S40* Wire Loop Element W80	B A	20.0	0.508	508
Cylindrical Element T50	D	25.0	0.635	635

Figure 4.1 CORROSOMETER Probe Types and Spans

Maintenance

CHAPTER 5

The Model 4020LT-A 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.

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

The Model 4021L Receiver requires no maintenance. If a problem is suspected with the probe or transmitter, use the test probe provided with the transmitter to test the loop. The test probe is marked with the loop current in mA that this should provide in the 4-20 mA loop. This signal may be converted to check the display on the receiver if applicable

$$\text{Metal loss display} = \left(\frac{\text{Test probe mA - 4}}{16}\right) \text{ x Probe SPAN (mils)}$$

CORROSOMETER THEORY

APPENDIX A

CORROSOMETER Systems are based on the electrical resistance method of corrosion monitoring pioneered by Rohrback in the 1950's and 1960's. CORROSOMETER 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 CORROSOMETER 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.

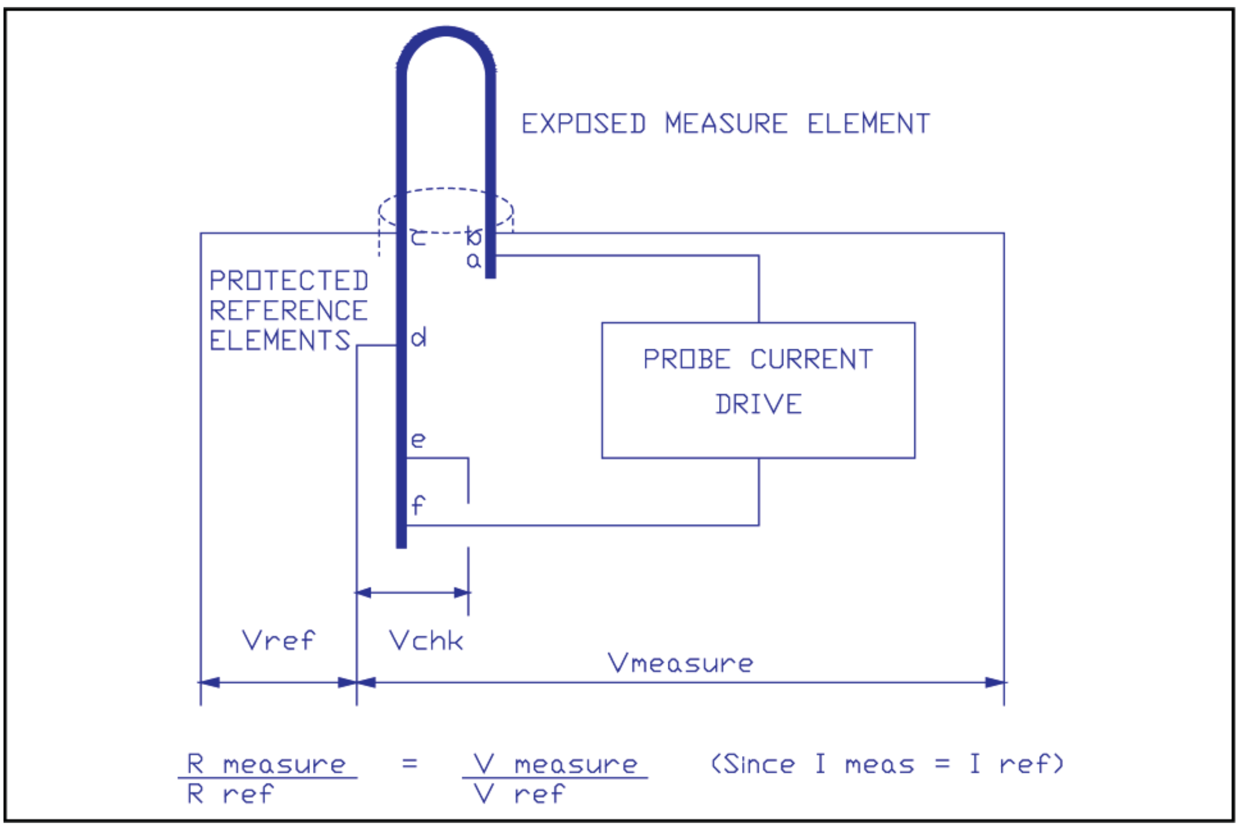


Figure 1

As with coupons, CORROSOMETER 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. CORROSOMETER 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.

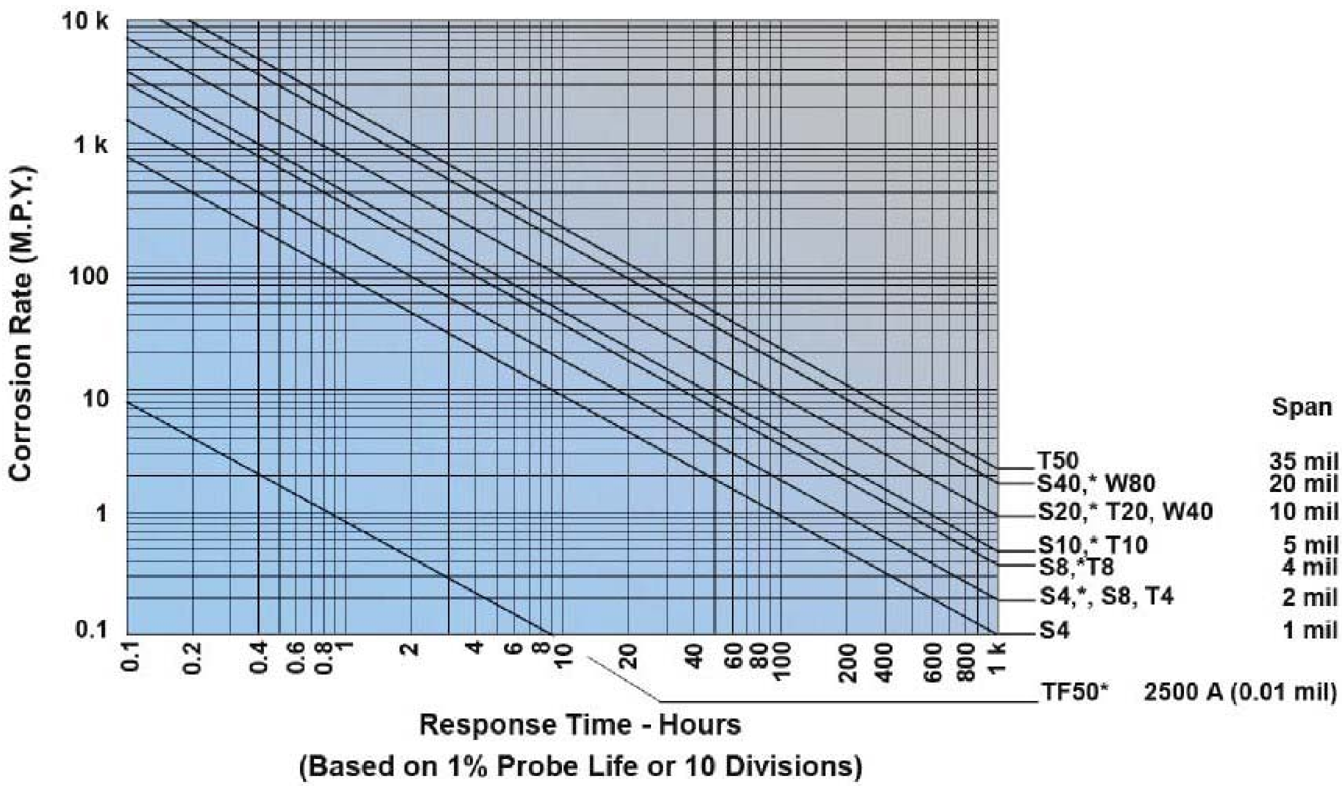


Figure 2

Corrosion Rate (mpy)	Probe Span (mils)					
	2	4	5	10	20	25
0.1	73 days	5 months	6 months	12 months	24 months	30 months
0.5	15 days	29 days	37 days	73 days	5 months	6 months
1.0	7 days	15 days	18 days	36 days	73 days	3 months
5.0	35 hours	3 days	4 days	7 days	15 days	18 days
10	18 hours	35 hours	2 days	4 days	7 days	9 days
25	7 hours	14 hours	18 hours	35 hours	3 days	4 days
50	4 hours	7 hours	9 hours	18 hours	35 hours	2 days
75	140 mins	5 hours	6 hours	12 hours	23 hours	29 hours
100	105 mins	4 hours	5 hours	9 hours	18 hours	22 hours

Table 1

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 CORROSOMETER 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.

CORROSOMETER probe elements are available in a variety of styles. A selection of the available styles is shown in Figure 3. Wire, tube, and strip-loop styles all have a loop of metal exposed to the process. The loop protrudes from the end of the probe body through either a hermetic glass seal or a Teflon/ceramic, Teflon/epoxy or epoxy seal/packing system. Choice of materials is dependent upon stream composition, process conditions and performance requirements. 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.

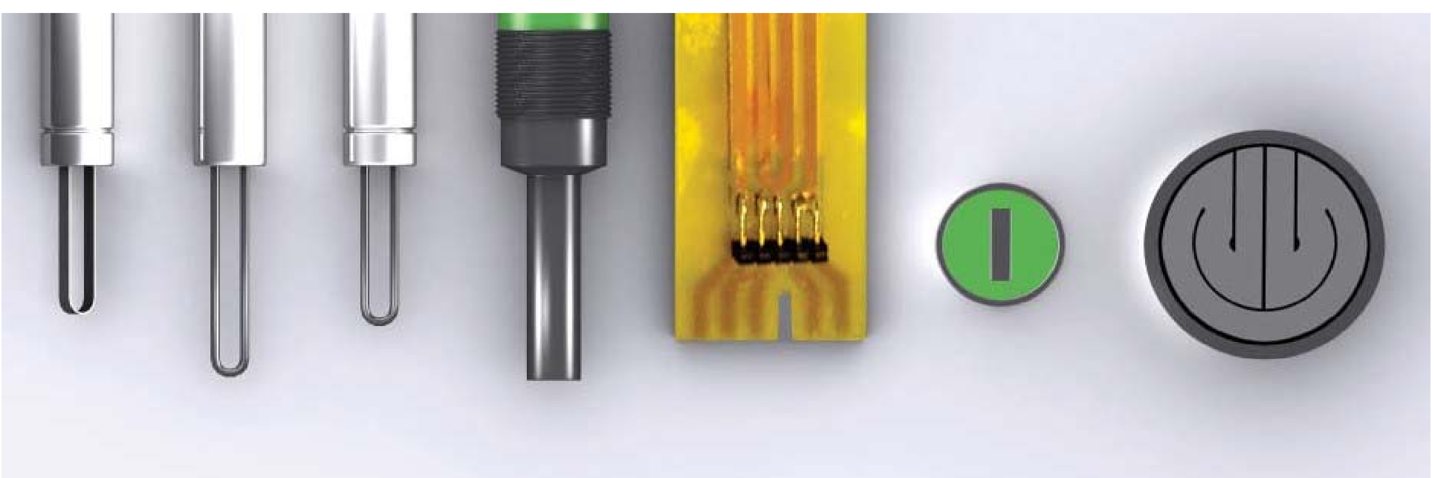


Figure 3

CORROSOMETER monitoring systems can be applied to all processes. However, some types of CORROSOMETER probes are better suited to the requirements of particular applications than others.

Different styles of CORROSOMETER probes are affected to different degrees by pitting attack. Figure 4 shows the results of pitting attack on a wire loop probe. Although the remaining wire thickness shows that only 30% or so of the probe span has been consumed, the probe is obviously out of service. Cylindrical elements on the other hand, are affected to a much lesser degree by pitting because of the much larger circumference of the measuring element. Wire loop and tube loop elements also have a tendency to be electrically shorted by a bridge of iron sulfide corrosion product. This is especially prevalent in low-velocity streams over an extended period. The effect of such bridging is to reduce the measured metal loss of the probe, creating a misleadingly low corrosion rate. Cylindrical probes demonstrate more resistance to iron-sulfide bridging due to their construction and lower inherent resistance per unit length, thus minimizing the effect of the shunt resistance. Where pitting or substantial Fe_xS_y deposition are expected to be problems, cylindrical probes should be chosen wherever possible over loop-style probes.

Figure 4

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 CORROSOMETER 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, CORROSOMETER 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.

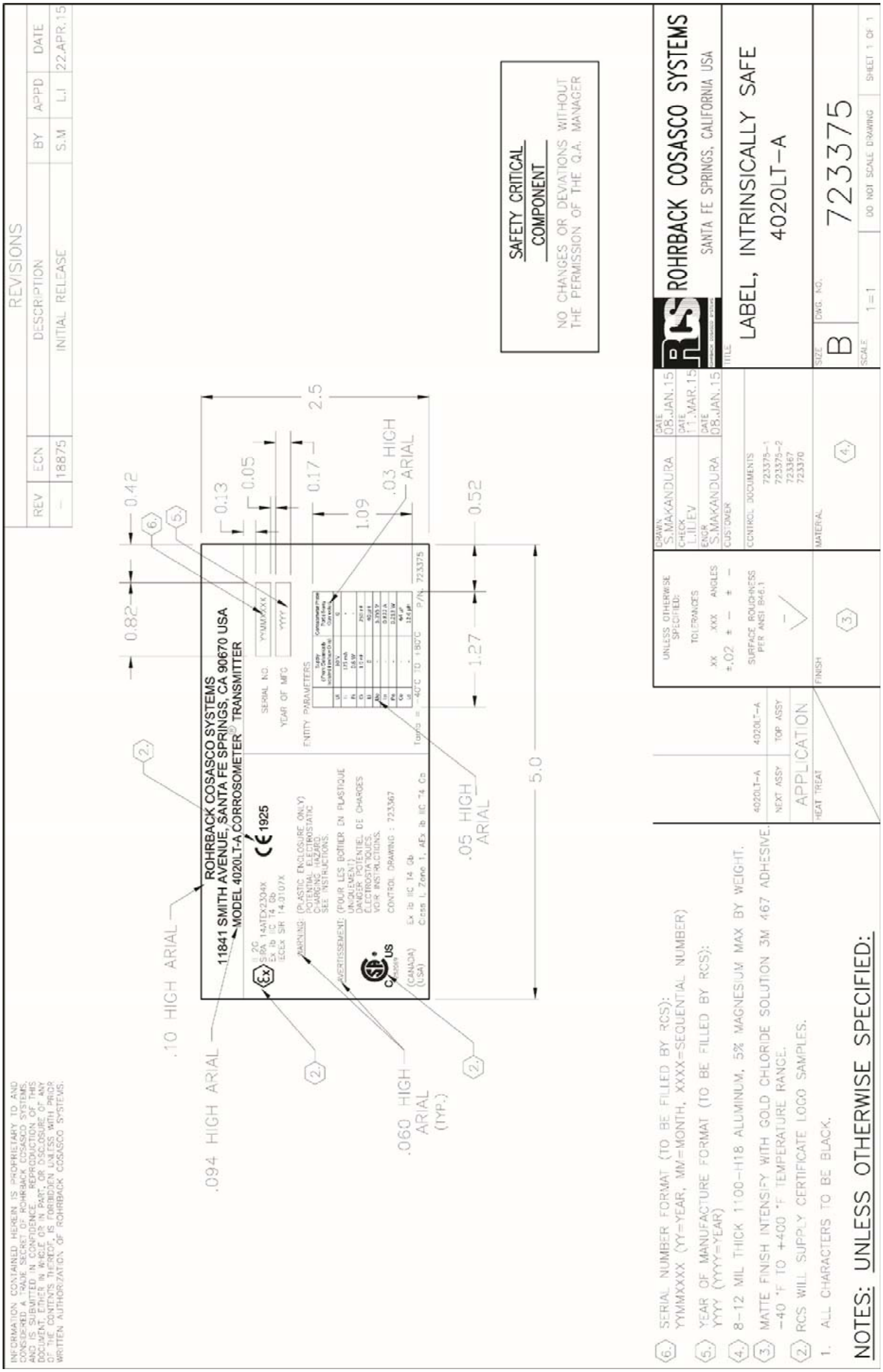
The reference and check elements are protected from the process to which the measurement element is directly exposed. Temperature changes in the process will, therefore, affect the measure element before the reference and check elements. Because of the very low resistances involved, these changes can significantly affect the metal loss readings. CORROSOMETER 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 CORROSOMETER probe is installed will determine if a safety barrier is required. If this process stream is classified as Class 1 Division 2, or Zone 1 by the jurisdiction of the applicable authority, then a safety barrier MUST BE USED.***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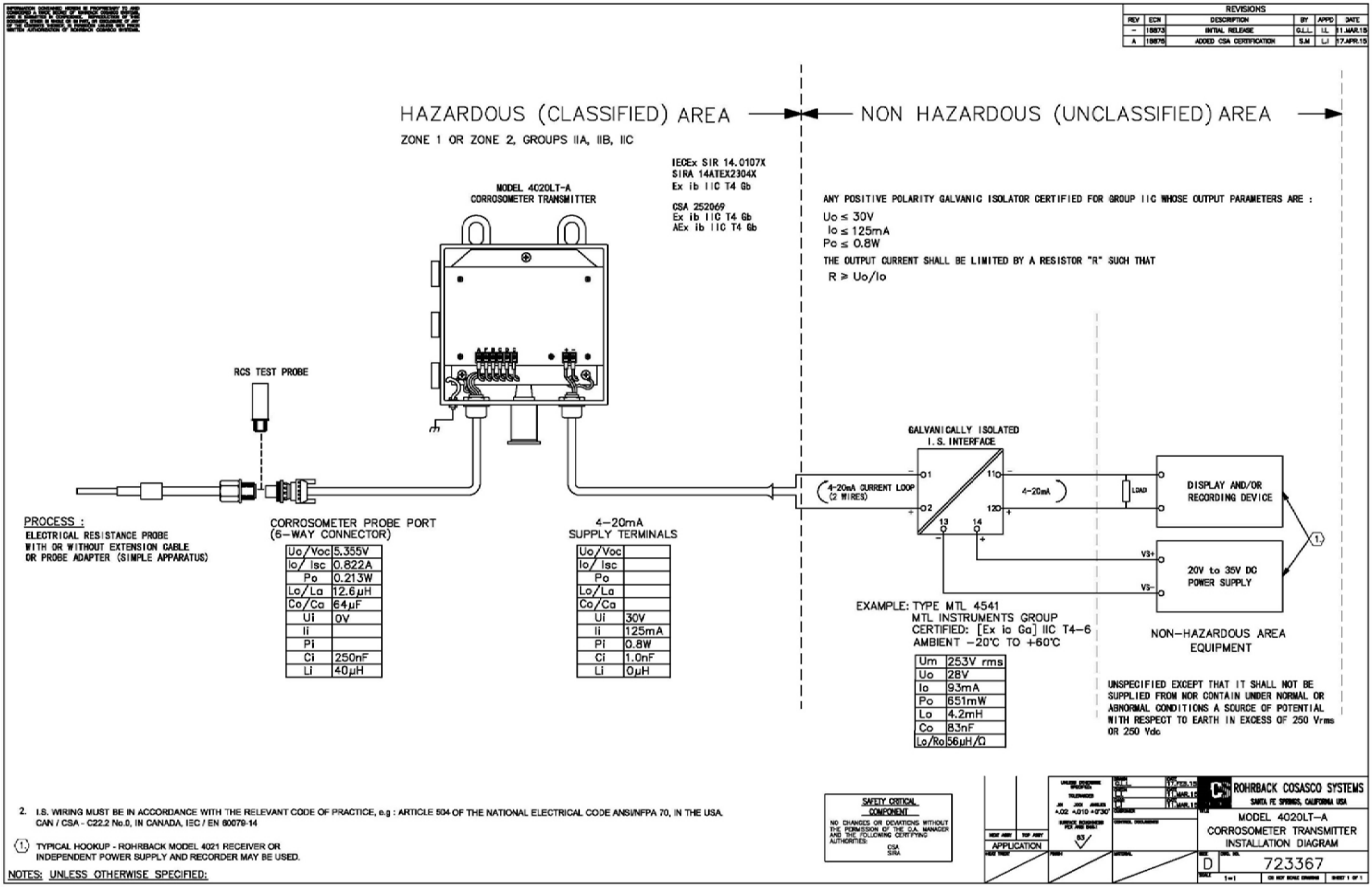
REVISIONS
REV ECN DESCRIPTION BY APPD DATE
– 18875 INITIAL RELEASE S.M L.I 22.APR.15
.10 HIGH ARIAL
.094 HIGH ARIAL
.060 HIGH ARIAL (TYP.)
.05 HIGH ARIAL
.03 HIGH ARIAL
ROHRBACK COSASCO SYSTEMS
11841 SMITH AVENUE, SANTA FE SPRINGS, CA 90670 USA
MODEL 4020LT-A CORROSOMETER® TRANSMITTER
II 2G
SIRA 14ATEX2304X
Ex ib IIC T4 Gb
IECEx SIR 14.0107X
CE 1925
WARNING: (PLASTIC ENCLOSURE ONLY) POTENTIAL ELECTROSTATIC CHARGING HAZARD. SEE INSTRUCTIONS.
AVERTISSEMENT: (POUR LES BOITIER EN PLASTIQUE UNIQUEMENT) DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES. VOIR INSTRUCTIONS.
CONTROL DRAWING : 723367
(CANADA) (USA)
Ex ib IIC T4 Gb
Class I, Zone 1, AEx ib IIC T4 Gb
SERIAL NO. YYMMXXXX
YEAR OF MFG YYYY
ENTITY PARAMETERS
Tamb = -40°C TO +80°C
P/N 723375
0.82 0.42 0.13 0.05 0.17 2.5 1.09 1.27 0.52 5.0
SAFETY CRITICAL COMPONENT
NO CHANGES OR DEVIATIONS WITHOUT THE PERMISSION OF THE Q.A. MANAGER
6. SERIAL NUMBER FORMAT (TO BE FILLED BY RCS): YYMMXXXX (YY=YEAR, MM=MONTH, XXXX=SEQUENTIAL NUMBER)
5. YEAR OF MANUFACTURE FORMAT (TO BE FILLED BY RCS): YYYY (YYYY=YEAR)
4. 8-12 MIL THICK 1100-H18 ALUMINUM, 5% MAGNESIUM MAX BY WEIGHT.
3. MATTE FINISH INTENSIFY WITH GOLD CHLORIDE SOLUTION 3M 467 ADHESIVE. -40 °F TO +400 °F TEMPERATURE RANGE.
2. RCS WILL SUPPLY CERTIFICATE LOGO SAMPLES.
1. ALL CHARACTERS TO BE BLACK.
NOTES: UNLESS OTHERWISE SPECIFIED:
4020LT-A NEXT ASSY 4020LT-A TOP ASSY
APPLICATION
HEAT TREAT
UNLESS OTHERWISE SPECIFIED: TOLERANCES XX .XXX ANGLES ±.02 ± – ± –
SURFACE ROUGHNESS PER ANSI B46.1
FINISH
DRAWN S.MAKANDURA DATE 08.JAN.15
CHECK L.ILIEV DATE 11.MAR.15
ENGR S.MAKANDURA DATE 08.JAN.15
CUSTOMER
CONTROL DOCUMENTS 723375-1 723375-2 723367 723370
MATERIAL
ROHRBACK COSASCO SYSTEMS
SANTA FE SPRINGS, CALIFORNIA USA
TITLE LABEL, INTRINSICALLY SAFE 4020LT-A
SIZE B DWG. NO. 723375
SCALE 1=1 DO NOT SCALE DRAWING SHEET 1 OF 1


REVISIONS
REV | ECN | DESCRIPTION | BY | APPD | DATE
- | 18873 | INITIAL RELEASE | G.L.L. | I.L. | 11.MAR.15
A | 18876 | 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
RCS TEST PROBE
PROCESS :
ELECTRICAL RESISTANCE PROBE
WITH OR WITHOUT EXTENSION CABLE
OR PROBE ADAPTER (SIMPLE APPARATUS)
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
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
GALVANICALLY ISOLATED
I.S. INTERFACE
4-20mA CURRENT LOOP
(2 WIRES)
4-20mA
LOAD
DISPLAY AND/OR
RECORDING DEVICE
VS+
VS-
20V to 35V DC
POWER SUPPLY
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
NON-HAZARDOUS AREA
EQUIPMENT
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
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:
SAFETY CRITICAL COMPONENT
NO CHANGES OR DEVIATIONS WITHOUT THE PERMISSION OF THE Q.A. MANAGER AND THE FOLLOWING CERTIFYING AUTHORITIES: CSA SIRA
APPLICATION
ROHRBACK COSASCO SYSTEMS
SANTA FE SPRINGS, CALIFORNIA USA
MODEL 4020LT-A
CORROSOMETER TRANSMITTER
INSTALLATION DIAGRAM
D
723367

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 Iliev**

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; $-40^{o}C \leq Ta \leq +80^{o}C$

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

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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**

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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/UL/QAR08.0005/04

IECEx Certificate of Conformity

Certificate No.: IECEx SIR 14.0107X

Date of Issue: **2015-04-08**

Issue No.: **0**

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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	250 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.