MS2900E

High Resolution ER 4-20mA (HART) Transmitter

Operator's Manual

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I. Introduction

A. General Description

The MS2900E is a high-resolution meter designed to transmit corrosion (metal loss) data from an Electrical Resistance (ER) probe to a plant control system or other recording device. The MS2900E utilizes traditional 4-20mA current loop communication and is loop-powered with HART digital signal, so it requires only a two-wire interface. This results in a simple and low-cost installation. The use of the 4-20mA protocol also allows the MS2900E to be placed great distances from the control system or recorder while maintaining good noise rejection. Practical current loop distances can be many thousands of feet (see pages 6 and 7 for exact specifications.)

The MS2900E is compatible with all types of Metal Samples ER probes, as well as any standard ER probe from other manufacturers. Unlike competitors' products, the MS2900E Transmitter does not require factory modification to accommodate different probe types. The probe type can be easily changed at any time using the on-board probe selection switches (see page 9.)

The MS2900E is available as direct-mount (standard) or remote-mount. In the direct-mount version the MS2900E is mounted directly to the ER probe. This option offers the simplest installation and minimizes noise problems. The remote-mount option allows the MS2900E to be mounted independently from (but in close proximity to) the ER probe. It is then connected to the probe via a short probe cable. (See page 5 for mounting diagrams and specifications.)

B. Principles of Operation

The MS2900E operates on the Electrical Resistance (ER) technique and is used in conjunction with an ER probe. The ER probe utilizes a resistive sensing element manufactured from the material of interest (or a close approximation) which is exposed to a corroding environment. This is called the Exposed or Corroding Element. The resistance of the Exposed Element is directly related to its thickness, so as the element corrodes the resulting loss of metal causes a proportional increase in the element's resistance. The probe also contains an internal Reference Element which is used to compensate for the influences of temperature on the Exposed Element.

The MS2900E is designed to work with any standard ER probe, but it is recommended that Cylindrical and Large Flush type probes be used to ensure optimum performance. Their physical design places the Reference Element in closer proximity to the Exposed Element compared to other probe types, providing more effective temperature compensation and thus reducing the effects of thermal noise.

Because they are designed to corrode, ER probes are sacrificial in nature. Each ER probe will have a finite life that is based on the element thickness. ER probes are available in a number of geometries and thicknesses designed to suit a wide variety of applications. Table 1 lists the common ER element options available from Metal Samples and the effective life of each.

Element Type		Compatibility	Thickness	Probe Life (Span)
	**Tubular Loop**	Compatible	4	2
			8	4
	**Wire Loop**	Compatible	40	10
			80	20
	**Flush (Small)**	Compatible	4	2
			8	4
			20	10
	**Cylindrical**	**Preferred**	10	5
			20	10
			50	25
	**Flush (Large)**	**Preferred**	5	2.5
			10	5
			20	10
			40	20

Table 1. Standard ER Probe Elements

The MS2900E measures an ER probe utilizing a high-resolution, 16-bit measurement. This allows the MS2900E to detect much smaller amounts of metal loss, thus responding faster to corrosion events and upsets (compared to traditional ER meters.) At 16-bit resolution the MS2900E can measure metal loss amounts as small as 0.0015% of the probe life.

Metal loss readings taken by the MS2900E are converted to a linearized 4-20mA current loop output. The 4-20mA signal can be fed into a plant control system or other devices and scaled accordingly to reflect metal loss. Then corrosion rates can be calculated based on the metal loss data over time. This is covered in more detail on pages 11 and 12. More information on ER probes, their theory, selection, and use can be found on our web site at http://www.alspi.com/erintro.htm.

C. Technical Specifications

Model MS2900E - High Resolution ER 4-20mA(HART) Transmitter

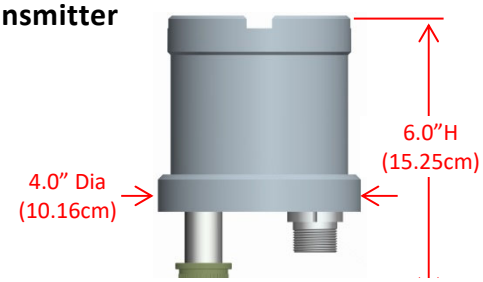

Figure 1. MS2900E Dimensions

Physical Data

Instrument Weight:	3.70 lb. (1.68 Kg)
Total Weight w/ Accessories:	5.76 lb. (2.61 Kg)
Instrument Dimensions:	6.0"H x 4.0"Dia (15.25cm H x 10.16cm Dia)
Operating Temperature:	-40° to 158°F (-40° to 70°C)
Storage Temperature:	-40° to 176°F (-40° to 80°C)
Enclosure Material:	316 Stainless Steel
Mounting Specifications:	Direct probe mount (standard) May be pole mounted using optional hardware (Up to a 2.5” (6.35cm) Dia. pole)

Performance Data

Measurement Type:	ER measurement using any standard ER probe type (Wire Loop, Tube Loop, Cylindrical, Flush, Strip, etc.)
Range:	0-100% of probe life
Resolution:	0.0015% of Probe Life (16-bit)
Cycle Time:	1 Minute

Electrical Data

Power Requirements:	11 to 28 VDC
Maximum Probe Cable Distance:	30 ft (9.1 m)

Output Data

Output Signal:	4-20mA output with HART protocol
Alarm Signal:	- Current Output Configurable - Digital interface
Load:	- min. 250 Ohms for HART Communication

Hazardous Location Certifications - Intrinsic Safety

Europe and worldwide (ATEX and IECEx)	II 1 G Ex ia IIC T4 Ga - 40°C ≤ Tamb ≤ + 70°C Ex ia IIC T4 Ga - 40°C ≤ Tamb ≤ + 70°C ATEX Certificate No: **ITS14ATEX27981X** IECEx Certificate No: **IECEx ITS 14.0010X**
USA and Canada (ETL)	Ex ia IIC T4 Ga Class I, Division 1, Groups A, B, C & D, T4 Class I, Zone0, AEx ia IIC T4 Ga -40° C ≤ Ta ≤ +70° C

Included Accessories

33’ (10 meters) Current Loop Wiring Harness (provided to facilitate wiring to a nearby junction box, can be cut to length if required), Meter Prover, Operations Manual

Optional Accessories

Probe Extension Cable, Remote Mounting Hardware

II. Installation and Operation

A. Receiving the MS2900E Transmitter

Check the MS2900E Transmitter for any shipping damage when it is first received. When the MS2900E is unpacked, verify that the following items are included:

- MS2900E Transmitter
- Current Loop Wiring Harness
- Meter Prover
- User's Manual
- Probe Cable (optional, for remote-mount only)
- Mounting Hardware (optional, for remote-mount only)

In the event of shipping damage, quantity shortage, or missing items, it is recommended that the event is documented immediately and that digital photographs are taken. Any shortages or missing items should be reported to Metal Samples immediately. In the event of shipping damage, a claim should be opened with the responsible carrier.

B. Installation

CAUTION: *Using this product in any way other than that specified within this manual may impair the intrinsic safety protection.*
ATTENTION: L'utilisation de ce produit d'une manière autre que celle spécifiée dans ce manuel peut altérer la protection de sécurité intrinsèque.

Installation of the MS2900E Transmitter involves the following steps:

1. Physical Mounting
2. Electrical Connection
3. Setup and Programming

1. Physical Mounting and Probe Connection

Warning: Disconnect power and probe connections before opening the enclosure. Refer user manual for installation instructions and maximum electrical input & output parameters.
Avertissement: Débranchez les connexions d'alimentation et de sonde avant d'ouvrir le boîtier. Reportez-vous au manuel de l'utilisateur pour les instructions d'installation et les paramètres d'entrée et de sortie électriques maximum.

When selecting a location to mount the MS2900E it is important to consider the surrounding environment. To ensure proper operation:

- Do not mount the MS2900E in a location that exceeds its operating temperature.
- Avoid mounting the MS2900E near sources of strong electrical noise.
- Ensure that there is sufficient clearance for installation and to open the transmitter cover afterwards.

a. Direct-Probe Mounting

The MS2900E is designed for direct-probe mounting which eliminates the need for additional hardware and transmitter-to-probe cabling. This greatly simplifies installation, reduces costs, and minimizes electrical noise that can be coupled onto probe cabling from nearby electrical equipment.

Before mounting the MS2900E, first ensure that the probe is installed properly and securely. During installation it is important that you do not apply excessive force on the probe or seals, as doing so could break the seal and result in system leakage.

To mount the MS2900E:

1. Align the keyways of the transmitter and probe connectors.
2. Insert the transmitter connector plug fully into the probe connector receptacle.
3. Secure the transmitter to the top of the probe by tightening the coupling nut.

NOTE: Hand-tight is sufficient. Do not over-tighten the coupling nut.

NOTE: Never force the connectors to mate. If there is resistance, stop and check for bent pins on the probe and for foreign material in the female sockets of the transmitter connector. Gently straighten any bent pins and clear any foreign material that may be found.

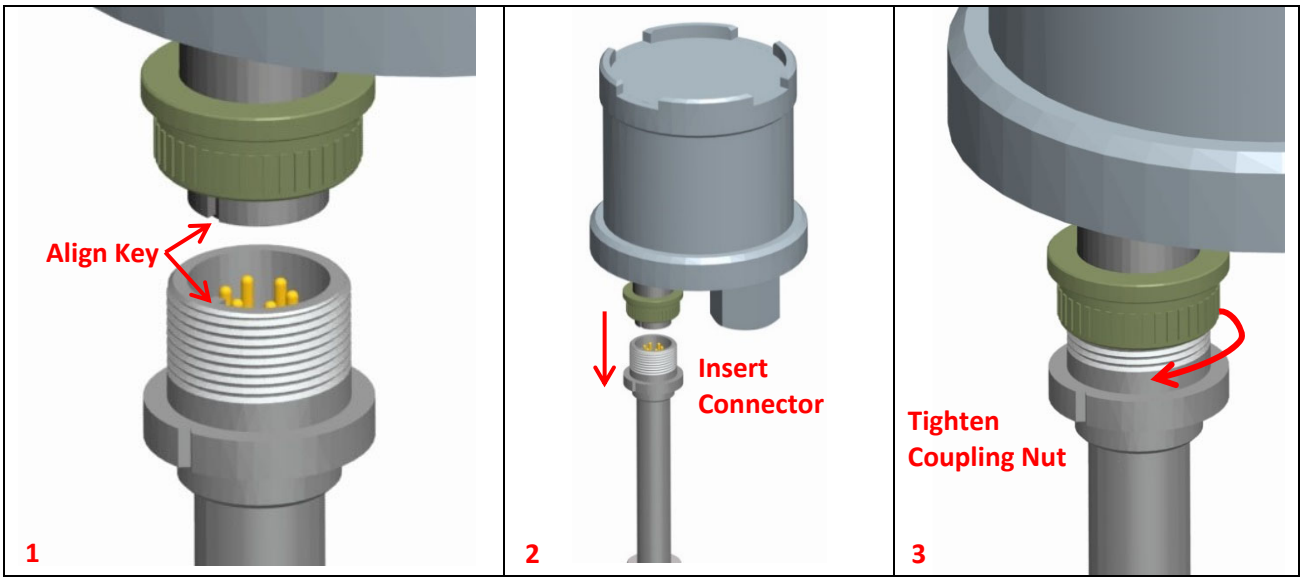

Figure 2. MS2900E Direct Mount Installation

b. Remote Mounting

When it is not practical to direct-probe mount the MS2900E, the unit can be remote mounted instead. In this case the instrument is mounted to a separate mounting pole using the optional Remote Mounting Hardware Kit. The MS2900E is then connected to the ER probe via the optional probe extension cable. When possible, the MS2900E should be mounted within 10' (3m) of the probe to keep the probe cabling short and minimize signal degradation.

2. Current Loop Connection

a. Making Connections

The MS2900E current loop connection is made via the external 6-pin circular connector as shown below. This hermetically sealed connector prevents moisture ingress, and eliminates the need for internal wiring by an operator which reduces the risk of damage to the circuit.

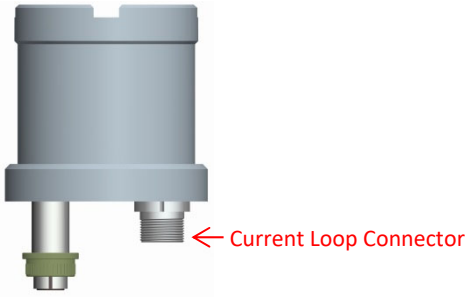

Figure 3. MS2900E Current Loop Connector

To facilitate wiring, a thirty-three foot (10 meter) Current Loop Wiring Harness is provided. This wiring harness connects directly to the 6-pin connector, and extends to a nearby junction box (not included) to make the necessary wiring connections to the current loop wiring from the control (DCS/SCADA) system. The wiring harness can be cut to length if required.

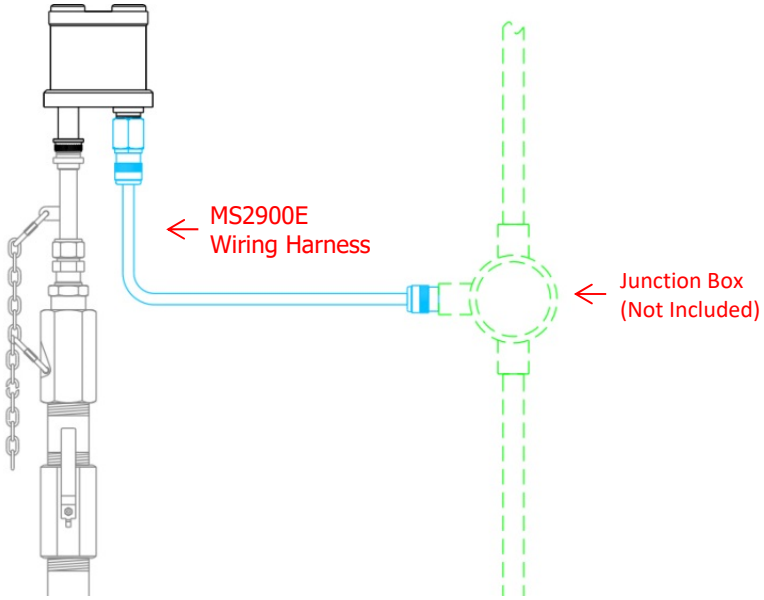

Figure 4. MS2900E Wiring Harness

NOTE: Do not connect cable shielding to the Transmitter. The shield must remain floating at the Transmitter.

The maximum permissible length of the current loop wiring between the MS2900E Transmitter and

the control system is determined by the control system supply voltage, the electrical resistance of the current loop cable and the load of the control system input. If the Transmitter is to be installed in a safe area, refer to section *c. Wiring for a Safe Area Installation* for details. If the Transmitter is to be installed in a hazardous area, refer to section *d. Wiring for a Hazardous Area Installation*.

b. Grounding

The MS2900E enclosure is grounded internally through the wiring harness, but an additional, external grounding terminal is provided as well. The enclosure should be grounded properly using the external grounding terminal to ensure safe operation.

c. Wiring for a Safe Area Installation

CAUTION: *When used in non-hazardous areas, equipment must be supplied with a pre-approved power supply unit or approved equipment with the following maximum input parameters.*

ATTENTION: *Lorsqu'il est utilisé dans des zones non dangereuses, l'équipement doit être fourni avec un bloc d'alimentation pré-approuvé ou un équipement approuvé avec les paramètres d'entrée maximum suivants.*

Ui = 28 V, Ii = 93 mA and Pi = 0.65 W

The pre-approved equipment must be certified to the electrical safety standards for equipment in ordinary location. For Example EN/IEC/CSA UL 61010-1, EN/IEC/CSA UL 60950-1 etc…,

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For basic safe area wiring information refer to the circuit diagram shown on page 19. Use the following equation to determine maximum permissible cable length:

$$D = \frac{(V_S - 10)}{(4 * 10^{-5})(R)}$$

Where:

D = Max. cable length in feet.

V_S = Power supply voltage.

R = Cable resistance in ohms per 1000 feet.

Example:

VS = 24 Volts

R = 16.1 (22 AWG cable)

$$D = \frac{(24 - 10)}{(4 * 10^{-5})(16.1)} = 21{,}739\ Feet$$

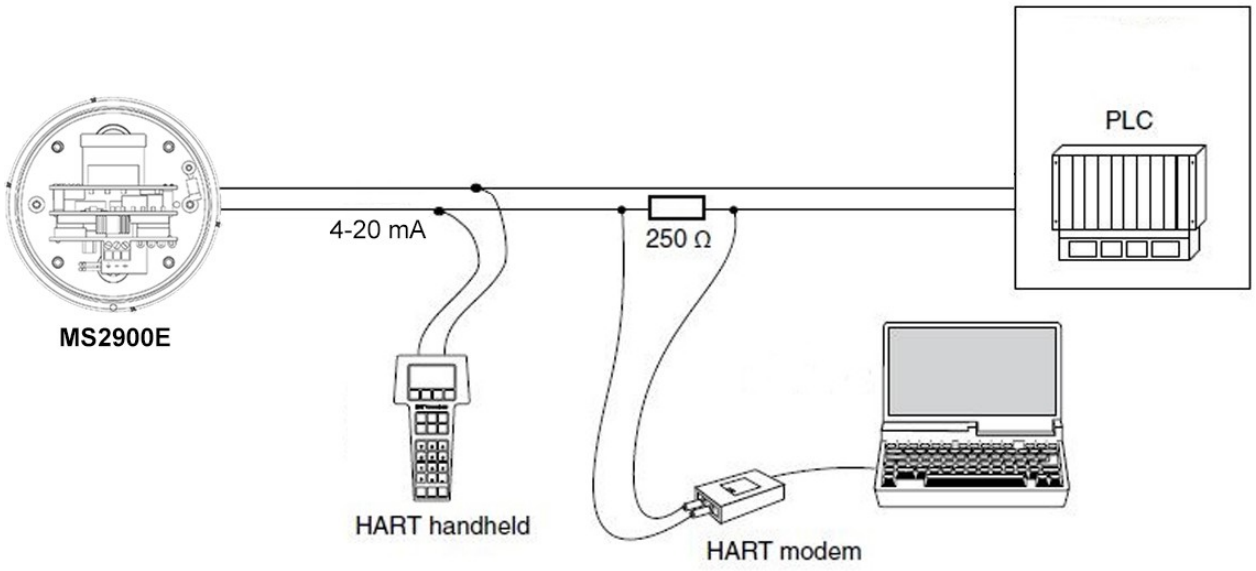
d. HART Connection for a Safe Area Installation

Metal Samples MS2900E supports HART communication protocol. HART is an acronym for Highway Addressable Remote Transducer. The HART protocol makes use of the Bell 202 FSK standard to superimpose digital signals at a low level on top of the 4-20 mA Signal. This enables two-way communication and makes it possible for additional information beyond just the normal process variable to be communicated to and from a field instrument.

MS2900E can be connected to HART modem to communicate with the computer in a safe area. Connect the modem across 250 Ohms resistor in line with current loop supply as shown in figure. Any certified handheld terminal can be connected to the current loop supply of the instrument to communicate and access the variables and the probe life and other items can be set from remote terminal. (Refer Handheld equipment's connection details for proper connection details).

Due to the sensitive nature of corrosion measurement, it is important to provide good electrical isolation between the I/O system/power supply and each 4-20 mA/HART signal from MS2900E. Metal Samples recommends using isolator or isolated I/o card to connect to the PLC /DCS HART connections

For all other general applications, a signal conditioner capable of repeating the 4-20 mA/HART signals and providing at least 500 V of isolation must be used. If you are using



CONNECTING MS2900E TO HANDHELD DEVICE

e. Wiring for a Hazardous Area Installation

CAUTION: *This section provides general guidelines for hazardous area wiring. However, regardless of anything stated here, the MS2900E must be installed in full compliance with the control drawing located on page 18 and all of the local area requirements.*

ATTENTION*: Cette section fournit des directives générales pour le câblage en zone dangereuse. Cependant, indépendamment de tout ce qui est indiqué ici, le MS2900E doit être installé en totale conformité avec le schéma de contrôle situé à la page 18 et toutes les exigences locales*

CAUTION: *When used in Hazardous areas, equipment must be supplied with a pre-approved power supply unit or approved equipment via a certified intrinsically safe barrier or a galvanically isolated barrier) with the following maximum input parameters.*

ATTENTION*: Lorsqu'il est utilisé dans des zones dangereuses, l'équipement doit être fourni avec un bloc d'alimentation pré-approuvé ou un équipement approuvé via une barrière de sécurité intrinsèque certifiée ou une barrière isolée galvaniquement) avec les paramètres d'entrée maximum suivants*

Ui = 28 V, Ii = 93 mA and Pi = 0.65 W

Whenever an electrically driven sensor or measuring device is used in a potentially explosive environment the measuring system must be installed in such a way that electrical energy is either effectively isolated from the explosive environment (via explosive-proof containers, cable conduits, etc.) or the amount of electrical energy produced in the hazardous area must be limited to an intrinsically safe level.

Limiting electrical energy is the most practical method of protecting the MS2900E measuring system when the Transmitter is installed in a hazardous area. In the MS2900E system, electrical energy limits are maintained by the use of a repeater safety barrier (or its equivalent) installed in the 4-20 mA current loop per standard practice. The safety barrier must be located in the safe area near the boundary between the safe and hazardous areas. The safety barrier will repeat the signal current generated by the Transmitter and will relay the signal to the data receiving station.

Caution: When a safety barrier is used with the MS2900E system, the current loop cable must be connected to the barrier's hazardous area terminals. All other connections must be made to the barrier's safe area terminals.

The type of repeater safety barrier employed in the MS2900E system depends on the specific classification of the hazardous environment in question. Metal Samples will provide, upon request, assistance and technical advice in the selection of a repeater safety barrier or its equivalent.

For most installations, Metal Samples recommends the intrinsically safe MTL 5441 Repeater Power Supply.

The maximum length of the current loop cable that connects the MS2900E Transmitter to the repeater safety barrier is as follows:

Example:

17.5 Volts
22 AWG Cable = 5,434 feet maximum
16 AWG Cable = 21,788 feet maximum

CAUTION: *For hazardous area installations, the maximum inductance and capacitance of the loop wiring between the safety barrier and the transmitter cannot exceed the entity parameters of the selected barrier.*

ATTENTION: Pour les installations en zone dangereuse, l'inductance et la capacité maximales du câblage de la boucle entre la barrière de sécurité et le transmetteur ne peuvent pas dépasser les paramètres d'entité de la barrière sélectionnée.

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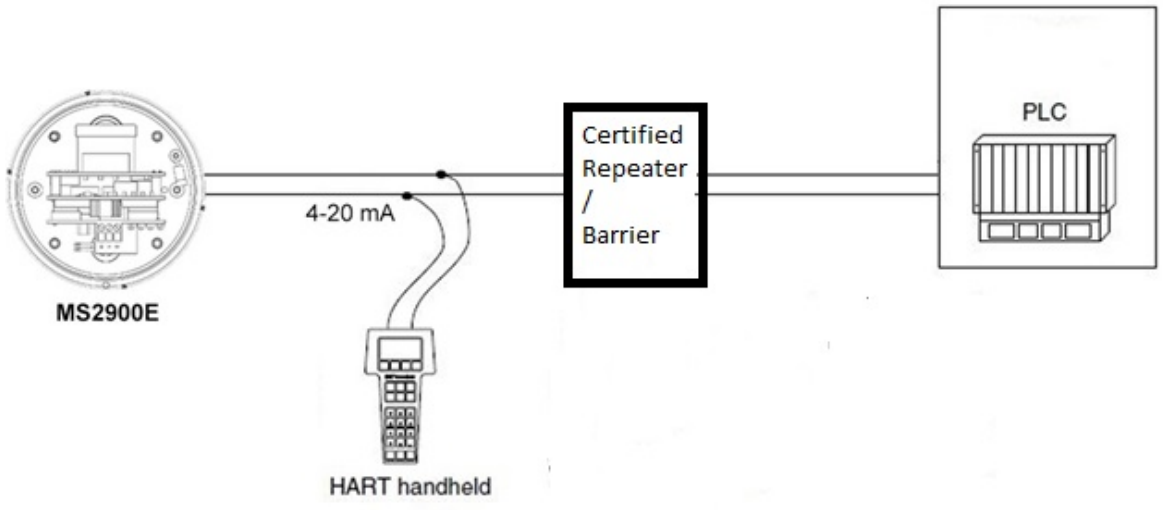
f. Wiring with HART at Hazardous locations

Using MS2900E in hazardous locations require intrinsic safety isolator to meet Intrinsic safety requirements and no additional isolators are necessary. Please ensure the entity parameters of the isolator meets the following ***Ui = 28 V, Ii = 93 mA and Pi = 0.65 W***

MS2900E can be connected thru certified safety Zener barriers (Uo = 28 V, Io = 93 mA and Po = 0.65 W), typically MTL 7787+ or equivalent barriers, in this case please observe the following guidelines to connect the instrument to the DCS/PLC I/o

- Always use a grounded power supply (on the AC side).
- Ensure that the I/O card is isolated from ground.

Any certified handheld terminal can be connected to the current loop supply of the instrument to communicate and access the variables and the probe life and other items can be set from remote terminal. (Refer Handheld equipment's connection details for proper connection details).



3. Setup and Operation

a. Probe Selection Switches

Housed within the MS2900E enclosure are probe selection switches which allow the instrument to be set for any standard ER probe type. They also allow the instrument to be placed into several test modes which output fixed values, allowing verification of the current loop connection and DCS program.

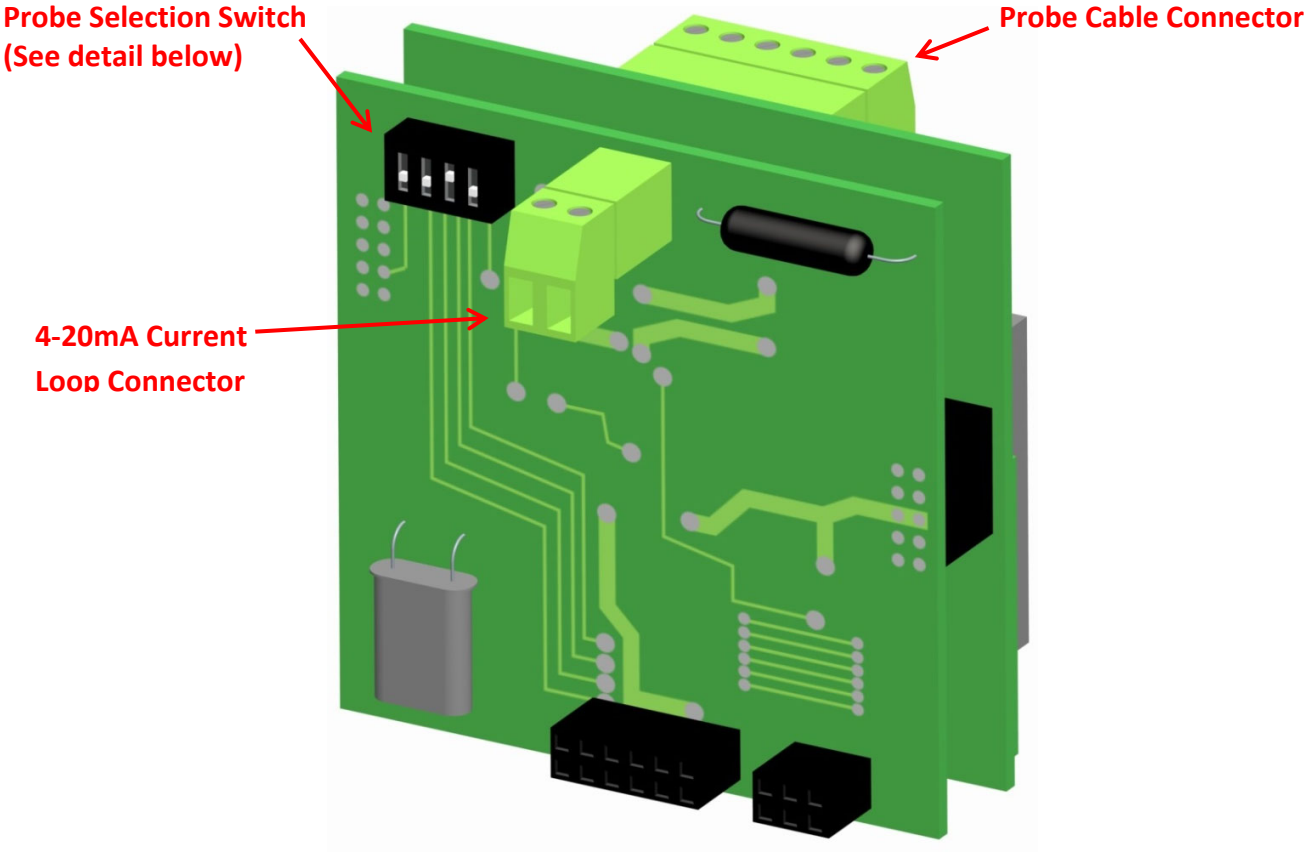
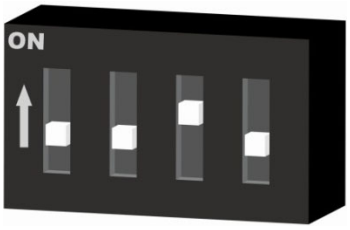


Figure 5. Connector and Switch Details



	Setting	Switch 1	Switch 2	Switch 3	Switch 4
Operating Positions	Wire Loop	Off (↓)	On (↑)	On (↑)	Off (↓)
	Tube Loop/Flush	On (↑)	Off (↓)	On (↑)	Off (↓)
	Cylindrical*	Off (↓)	Off (↓)	On (↑)	Off (↓)
	HS Probes	Off (↓)	Off (↓)	Off (↓)	Off (↓)
Test Positions	4mA Output	On (↑)	On (↑)	Off (↓)	Off (↓)
	20mA Output	Off (↓)	On (↑)	Off (↓)	Off (↓)
	4-20mA Sweep	On (↑)	Off (↓)	Off (↓)	Off (↓)

Table 2. Probe Switch Settings

**Cylindrical probe setting is illustrated.*

b. Testing the Current Loop

i. Calibration

The MS2900E is fully calibrated when shipped from the factory. The calibration settings are fixed to avoid accidental change which could result in erroneous data. In general no field calibration is required. However, it is important to test the MS2900E upon installation, and during periodic maintenance inspections, to ensure the unit is operating properly. Follow the procedure as below, if calibration becomes absolute necessary.

Note1: Note down the switch settings before proceeding to the below procedure.

1) 4 .00 mA Calibration
    a. Power down the instrument
    b. Turn Off Switch 1 ,2 and 3
    c. Turn On Switch 4
    d. Connect meter in series to the instrument to measure current in mA.
    e. Power-up the instrument
    f. Check the Loop Current, No calibration necessary if the meter reads 4.00 mA, if not proceed below.
    g. To increase the loop current in steps of 0.025 mA , toggle the Switch - 2 to Up and Down . Each Toggle will increase loop current by 0.025mA
    h. To decrease the loop current in steps of 0.025 mA , toggle the Switch - 3 to Up and Down . Each Toggle will decrease loop current by 0.025mA
    i. Ensure current reading is equal to 4.00 mA.
    j. Turn Off Swithc-4. Wait for a second
    k. Turn off the Power.

2) 20 .00 mA Calibration
    a. Power down the instrument
    b. Turn Off Switch 2 and 3
    c. Turn On Switch 1 and 4
    d. Connect meter in series to the instrument to measure current in mA.
    e. Power-up the instrument
    f. Check the Loop Current, No calibration necessary if the meter reads 20.00 mA, if not proceed below.
    g. To increase the loop current in steps of 0.025 mA , toggle the Switch - 2 to Up and Down . Each Toggle will increase loop current by 0.025mA
    h. To decrease the loop current in steps of 0.025 mA , toggle the Switch - 3 to Up and Down . Each Toggle will decrease loop current by 0.025mA
    i. Ensure current reading is equal to 20.00 mA.
    j. Turn Off Swithc-4 and wait for a second
    k. Turn off the Power.

Now the new calibration values registered in the non-volatile memory.

Note2: Set the Switch with respect to probe connected to the instrument before put into service.

ii. Testing loop output zero (4mA) and span (20mA)

The MS2900E Probe Selection Switches (page 9) offer three test settings that allow the unit to be placed into various diagnostic modes as follows:

1) 4mA Output – Forces a constant 4mA output on the current loop.
2) 20mA Output – Forces a constant 20mA output on the current loop.
3) 4-20mA Sweep – Causes the output to continually cycle from 4mA up to 20mA.

These test modes can be useful when troubleshooting problems with the current loop wiring and DCS/SCADA system.

iii. Testing the MS2900E with the Meter Prover

A Meter Prover is provided to allow routine checks of the MS2900E. The Meter Prover simulates a Wire Loop type probe at a fixed value. To test the MS2900E with the Meter Prover:

1) Disconnect power.
2) Disconnect the MS2900E from the probe (or if the MS2900E is remote-mounted, disconnect the probe extension cable from the probe.)
3) Connect the Meter Prover to the MS2900E probe connector stem (or to the probe extension cable if the MS2900E is remote-mounted.)
4) Loosen the MS2900E Enclosure Lock Screw.
5) Unthread and remove the MS2900E cover.
6) Change the Probe Selection Switches to the Wire Loop position (see page 9.)
7) Reconnect power and allow the instrument to measure for several minutes to stabilize.
8) After several minutes observe the transmitter output. The output should closely match the value printed on the Meter Prover label.

If the transmitter output matches the Meter Prover value, you may return the Probe Selection Switches to their previous setting and reconnect the MS2900E to the probe. If the transmitter output shows a significant difference compared to the Meter Prover value, further troubleshooting may be required. Refer to page 14 for troubleshooting or contact the factory for further assistance.

Be sure to reinstall the enclosure cover and tighten the Lock Screw when putting the MS2900E back into service.

c. Interpreting Data

i. Metal Loss

The MS2900E measures the Metal Loss of an ER probe and converts that value to a linearized 4-20mA current loop output. The 4-20mA output is directly proportional to the cumulative Metal Loss of the ER probe at any given time. The overall span of the 4-20mA output is proportional to the life of the probe in use, so for DCS/SCADA programming the 4-20mA signal can be scaled as follows:

4mA = 0 mils (0% Metal Loss)
20mA = Probe Life in mils (100% Metal Loss)

The Probe Life can be found in Table 1 and is also listed on the Metal Samples probe tag (as the "Multiplier".)

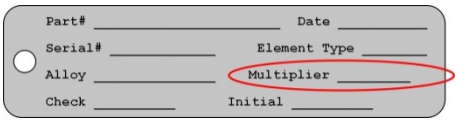


Figure 6. Metal Samples Probe Tag

Figure 7 illustrates the relationship between Loop Current and Metal Loss. In this example a probe with a 10-mil life is assumed. However, the X axis could be changed to represent any Probe Life.

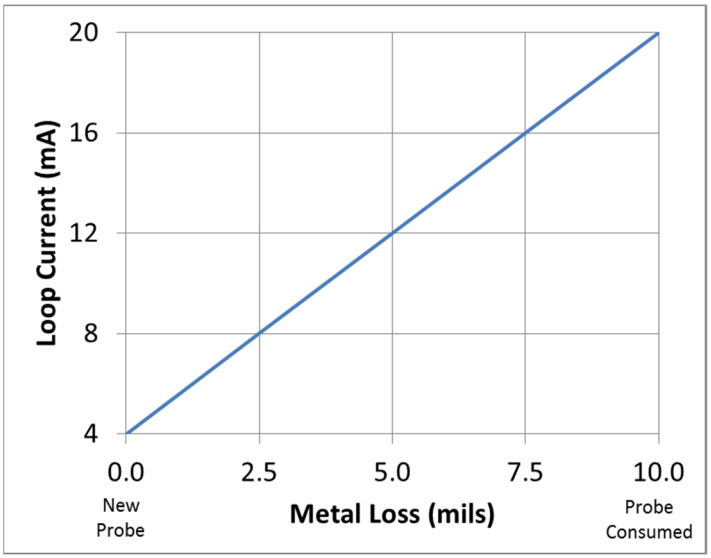


Figure 7. Output Relationship

As seen here, the transmitter output begins at 4mA for a new probe (zero Metal Loss) and increases as the probe element corrodes, eventually reaching a maximum of 20mA when the probe sensing element has been completely consumed by corrosion (in this case, 10 mils of Metal Loss.) At this time the probe has reached its end-of-life and must be replaced.

ii. Calculating Corrosion Rate

As explained previously, ER probes and instruments report *Metal Loss*. However, the value that is of ultimate interest is Corrosion Rate. The Corrosion Rate is essentially Metal Loss over time, so the Corrosion Rate can be calculated using the following formula:

$$\text{Corrosion Rate(mpy)} = \frac{\Delta\text{Loop Current(mA)}}{16} \times \frac{365}{\Delta\text{Time(days)}} \times \text{Probe Life(mils)}$$

where:

ΔLoop Current(mA) is the difference between two readings

ΔTime(days) is the time difference between those two readings

It is a common practice to program this formula into the control (DCS/SCADA) system and have it calculate Corrosion Rate on a continual basis from the Metal Loss data. The challenge in doing this is selecting an appropriate time interval. Using an interval that is too short may give erratic results, while selecting an interval that is too long may give results that are insensitive to system upsets. The ideal time period depends on many factors, and will vary from system to system. It may take some trial and error to settle on the best time period for your installation.

In some cases it may be necessary to review the raw Metal Loss data and manually apply the Corrosion Rate formula to periods of interest. For example, look at the graph below and see how much the calculated Corrosion Rate can vary depending on the time period used.

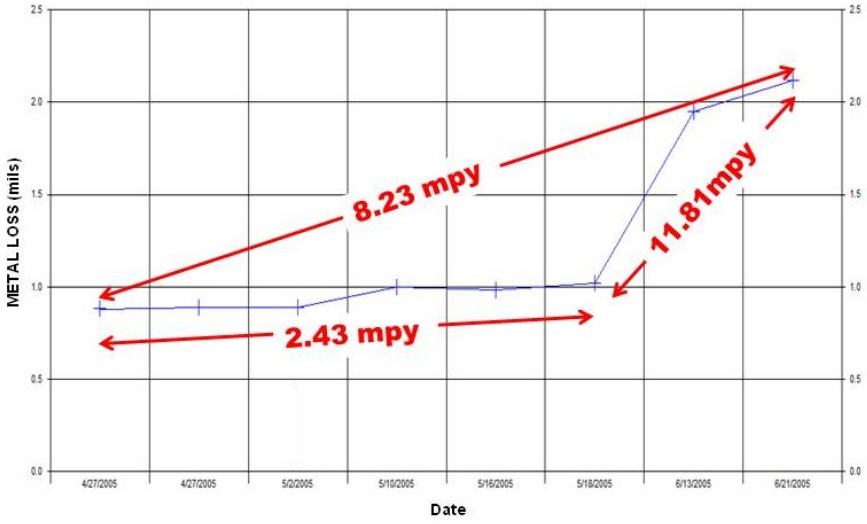


Figure 8. Corrosion Rates calculated from Metal Loss data

While each of the results is valid for the selected time period, the one of most interest is the value of 11.81 mpy which represents some type of system upset. When the Corrosion Rate is calculated automatically on a pre-selected time period, there is no guarantee that the selected time period will always coincide with system upsets such as this. That is why manual review and interpretation of Metal Loss data is also helpful.

II. Alarm limits and Current Ranges

A guaranteed linear over-range is provided. Device malfunction can be indicated by up-scale current. Current values are shown in the table below.

	Direction	Values (percent of range)	Values (mA or V)
Linear over-range	Down	-0.6% ± 0.1%	3.89 to 3.92 mA
	Up	+105.0% ± 1.0%	20.64 to 20.96 mA
Device malfunction indication	Down: less than	-1.8%	3.70 mA
	Up: greater than	+115.0%	22.50 mA
Maximum current		+115.0%	22.50 mA
Multi-Drop current draw			4.0 mA

d. Commissioning

Once the MS2900E has been installed, tested, and properly configured for the probe in use, it can then be closed and put into service. First, perform one last visual inspection to ensure that all electrical connections are secure, and that the enclosure o-ring is in place and is in good condition. Then thread the enclosure lid onto the base fully. Once the lid has been threaded into place, tighten the Lock Screw to prevent unauthorized tampering.

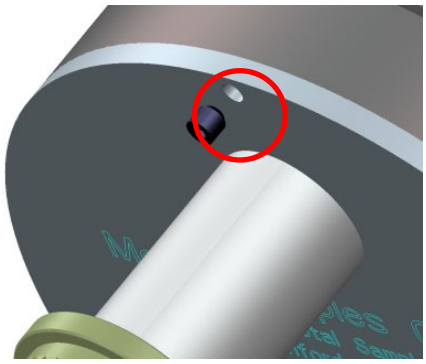


Figure 9. Enclosure Lock Screw

CAUTION: *The Lock Screw on the instrument base must be tightened securely to prevent unauthorized personnel from opening the MS2900E and ensure that the intrinsic safety is not violated. Only qualified personnel should be allowed to install, operate, and maintenance the MS2900E.*

C. Maintenance

Once installed, the MS2900E requires little maintenance. However, it is important to verify the following items periodically to ensure continued safe operation.

CAUTION: *Before performing any tests or maintenance on the MS2900E, ensure that all hazardous area requirements are met.*

Inspection Item	Frequency
Inspect the enclosure o-ring for any signs of damage. Replace as necessary.	Annually
Inspect the probe connector o-ring for any signs of damage. Replace as necessary.	Annually
Inspect the external electrical connections for signs of corrosion, mechanical damage, or foreign matter that could cause damage or cause an electrical short. Clean as necessary.	Annually
Ensure that the locking screw is in place and is secure	Annually
The MS2900E enclosure is made of corrosion-resistant 316 stainless steel. However, it should still be checked periodically for any signs of corrosion.	Annually
Check for any signs of moisture ingress within the enclosure.	Annually

Contact Metal Samples for replacement parts or if instrument repair is necessary.

D. HART COMMUNCIATION AND DEVICE DESCRIPTOR

MS2900E corrosion transmitter monitor, detect and report the metal loss as device variable. The probe life, probe type, Access password, alarm mode and other parameters can be set using HART Communication.

Manufacturer Name: Metal Samples Company

Manufacture ID Code: 610C

Model Name: MS29XXE

Device Type Code: E410

DEVICE VARAIBLES

One Device Variable is implemented.

	Meaning	Units
DV	Loop Current	mA

DYNAMIC VARIABLES

One Dynamic Variable is implemented.

	Meaning	Units
PV	Metal Loss	mils

1. Power-Up

On power up, the transmitter goes through an initialization procedure, which takes approximately 1-2 seconds. During this period, the device will not respond to HART commands, and the analog output is set at 4.0mA.

When the initialization is satisfactorily completed, and the first measurement has been made, the PV value is set, and the analog output moves to a value representing the measurement.

2. ALARM MODE

Alarm mode can be set/configures with different values as below

None

High and Auto

Low and Auto

High and Manual

Low and Manual

3. Device Status

Bit # 4 - More Status Available is set whenever any failure is detected.

Byte	Bit	Description	Class	Device Status bits Set
0	0	PV out of Limits		
	1	Not Used		
	2	Analog Output Saturated		
	3	Analog output Current Fixed		
	4	More status available		
	5	Cold Start		
	6	Configuration Changed		
	7	Device malfunction		
1	0-7	Not Used		
2	0-7	Not Used		
3	0-7	Not Used		
4	0-7	Not Used		
5	0-7	Not Used		

Extended Device Status

Bit # 0 – Maintenance required is set whenever probe failure is detected.

Bit #1 – Device variable alert is set when PV is out of limit.

Byte	Bit	Description	Class	Devie Status bits Set
6	0	Not Used		
	1	Not Used		
	2	Not Used		
	3	Not Used		
	4	Not Used		
	5	Not Used		
	6	Not Used		
	7	Not Used		

Device Operating Mode

"Not used" bits are always set to 0.

Byte	Bit	Description	Class	Devie Status bits Set
7	0	Not Used		
	1	Not Used		
	2	Not Used		
	3	Not Used		
	4	Not Used		
	5	Not Used		
	6	Not Used		
	7	Not Used		

Standardized Status

8	0	Not Used		
	1	Not Used		
	2	Not Used		
	3	Not Used		
	4	Not Used		
	5	Not Used		
	6	Not Used		
	7	Not Used		

4. UNIVERSAL COMMANDS

The following universal commands are supported by this instrument.

0	Read Unique ID
1	Read Primary Variable
2	Read Current Percentage
3	Read Device Variable
6	Write Polling address
7	Read Loop Configuration
8	Read Dynamic Variable class
9	Read Dynamic Variable with Status
11	Read UID Associated with Tag
12	Read Message
13	Read Tag Descriptor, Date
14	Read Transducer Information
15	Read Device Information
16	Read Final Assembly Number
17	Write Message
18	Write Tag Descriptor Date
19	Write Final Assembly Number
20	Read Long Tag
21	Write UID associated with Tag
22	Write Long Tag
38	Reset Configuration changed flag
48	Read Additional device status.

5. COMMON PRACTICE COMMANDS

The following common-practice commands are implemented:

33	Read Device Variable
35	Write PV Range Values
40	Enter/Exit Fixed Current Mode
42	Master Reset Device
44	Write PV Units
45	Trim Loop Zero
46	Trim Loop Gain

Fixed Current Mode

Fixed current mode is implemented, using Command 40. This mode is cleared by power loss or reset.

Burst Mode

This field device does not support Burst mode.

Reset

Command 42 ("Device Reset") causes the device to reset its microprocessor. The resulting restart is identical to the normal power up sequence.

6. DEVICE SPECIFIC COMMANDS

MS2900E supports the following device specific commands. These commands are specific to MS2900E, and these are included in the Device Description. (DD).

190	Write Probe Type
191	Read Probe Type
192	Write Probe Life
193	Read probe Life
195	Enter Access Password
196	Write New Access Password
197	Disable Password
198	Write Alarm Mode
199	Read Alarm Mode
200	Write HART Serial Number
201	Write Serial Number
202	Read Serial Number
203	Read Commission date
204	Write Commission Date
210	Factory Defaults

DD FILE

EDD Files will describe the features and capabilities of the instrument with the all-device variable names and dynamic variables as defined above.

Command 190 - Write Probe Type

This command allows to set the Probe Type into the slave device.
(1- Wire, 2 – Tube, 3 – Cylinder, 4 - Small Flush, 5 - Large Flush ,6 – Spiral, 7 – Strip, 8 - HS)

- Level 1 / Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0	Unsigned Char	Probe Type

Response Bytes

Byte	Format	Description
0	Unsigned Char	Probe Type

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
7	Error	Write Protection
11	Error	Entered Value not Valid

Command 191 - Read Probe Type

This command allows the master to request to read the Probe Type from the slave
(1- Wire, 2 – Tube, 3 – Cylinder, 4 - Small Flush, 5 - Large Flush ,6 – Spiral, 7 – Strip, 8 - HS)

Request Bytes

Byte	Format	Description
-	-	

Response Bytes

Byte	Format	Description
0	Unsigned Char - 8	Probe Type

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

Command 192 - Write Probe Life

This command allows to set the Probe Life into the slave device. (0-1000 mils maximum)

- Level 1 / Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0-3	Float 32 (Little endian)	Probe Life Value

Response Bytes

Byte	Format	Description
0-3	Float 32	Probe Life Value

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection
11	Error	Entered Value not Valid

Command 193 - Read Probe Life

This command allows the master to read the Probe Life from the slave. (0-1000 mils maximum)

Request Bytes

Byte	Format	Description
-	-	Command

Response Bytes

Byte	Format	Description
0-3	Float 32	Probe Life Value

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

Command 195 – Enter Access Password

This command allows the master to enter the level 1 and level 2 password.
(0 level – no password; 1st level – user password; 2nd level - Master password)
(Level 1 default Password: 'managers')

Request Bytes

Byte	Format	Description
0-7	Unsigned Char – 8 (As ASCII)	Password

Response Bytes

Byte	Format	Description
None	Unsigned Char – 8 (As ASCII)	Password

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
16	Error	Access Restricted

Note: Default Value @@@@@@@@

Command 196 - Write New Access Password

This command allows the master to enter new password for Level 1. Level 1 password can be changed from Master.

- Level 1 / Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0-7	Unsigned Char – 8 (As ASCII)	Level 1 Password

Response Bytes

Byte	Format	Description
-	Unsigned Char – 8 (As ASCII)	Level 1 Password

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Note: Default Value @@@@@@@@

Command 197 - Disable Password

This command allows the master to reset / disable the password entry.

Request Bytes

Byte	Format	Description
0	Unsigned Char – 1 (As ASCII)	Disable Password 0- Password access Level 1-Disable password

Response Bytes

Byte	Format	Description
0	Unsigned Char – 1 (As ASCII)	Access Level

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Command 198 - Write Alarm Mode

This command allows the master to write alarm mode condition to slave.

(0 = None, 1 = High and Auto, 2= Low and Auto, 5= High and Manual &A= Low and Manual)

- Level 1 / Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0	Unsigned Char	Alarm Mode

Response Bytes

Byte	Format	Description
0	Unsigned Char	Alarm Mode

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Note: Default Value =0

Command 199 - Read Alarm Mode

This command allows the master to Read alarm mode setting from slave.

(0 = None, 1 = High and Auto, 2= Low and Auto, 5= High and Manual & A= Low and Manual)

Request Bytes

Byte	Format	Description
-	-	Command

Response Bytes

Byte	Format	Description
0	Unsigned Char	Alarm Mode

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
16	Error	Access Restricted

Command 200 - Write HART Serial Number

This command allows the master to enter HART Board Serial Number. First 3 bytes consists of serial number and 4th byte consists of hardware revision level.

- Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0 - 3	Unsigned Char	HART Serial Number

Response Bytes

Byte	Format	Description
0 - 3	Unsigned Char	HART Serial Number

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Note: Default Value ####

Command 201 - Write MS Serial Number

This command allows the master to write serial number to the slave device.

Maximum length 14 digits.

- Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0 - 13	Unsigned Char	MS Serial Number of the unit

Response Bytes

Byte	Format	Description
0 - 13	Unsigned Char	MS Serial Number

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Note: Default Value = ###############

Command 202 - Read MS Serial Number

This command allows the master to read serial number to the slave device.

Request Bytes

Byte	Format	Description
-	--	MS Serial Number

Response Bytes

Byte	Format	Description
0 - 13	Unsigned Char	MS Serial Number

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

Command 203 - Write Commission Date

This command allows the master to write commissioning date.

- Level 2 password entry is required.

Request Bytes

Byte	Format	Description
0 - 2	Unsigned Char	Commission Date

Response Bytes

Byte	Format	Description
0 -2	Unsigned Char	Commission Date

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

Command 204 - Read Commission Date

This command allows the master to read commissioning date from the slave.

Request Bytes

Byte	Format	Description
	--	Commission Date

Response Bytes

Byte	Format	Description
0 -2	Unsigned Char	Commission Date

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
16	Error	Access Restricted

Command 210 - Factory Defaults

This command allows the master to change the slave settings to factory default values.

- Level 1 / Level 2 password entry is required.

Request Bytes

Byte	Format	Description
-		Change Parameters to Factory Defaults

Response Bytes

Byte	Format	Description
-		Change Parameters to Factory Defaults

Command-Specific Response Code

Code	Class	Description
0	Success	No Command-Specific Errors
5	Error	Too few Data bytes Received
7	Error	Write Protection

E. THE HART MODEM

a. HART modem general description

MicroLink 101-0027 USB HART® protocol modem can be used to communicate with MS2900E instrument in safe area. It provides the hardware interface between Highway Addressable Remote Transducer devices (HART) and a Windows® PC with a USB interface. MicroLink is used for commissioning, diagnostics, monitoring, and testing HART field devices.

Virtual serial port drivers allow the USB MicroLink to appear as an RS-232 com port to Windows and your HART software. A rugged design makes MicroLink an ideal choice for field engineers and technicians who service HART devices in an industrial environment. Microlink is compatible with all registered HART devices and all leading HART configuration and monitoring software.

b. Driver pre-installation

The USB drivers should be installed before the MicroLink HART modem is connected to the PC's USB port. After the drivers are installed, Windows will automatically detect the modem when it is connected to the USB port and complete the setup.

Important!

Install USB driver before connecting to the USB port.

To pre-install the drivers, run **Msetup.exe** from the included CD. The CD will auto-run this file if the Windows autorun feature is enabled for your CD drive.

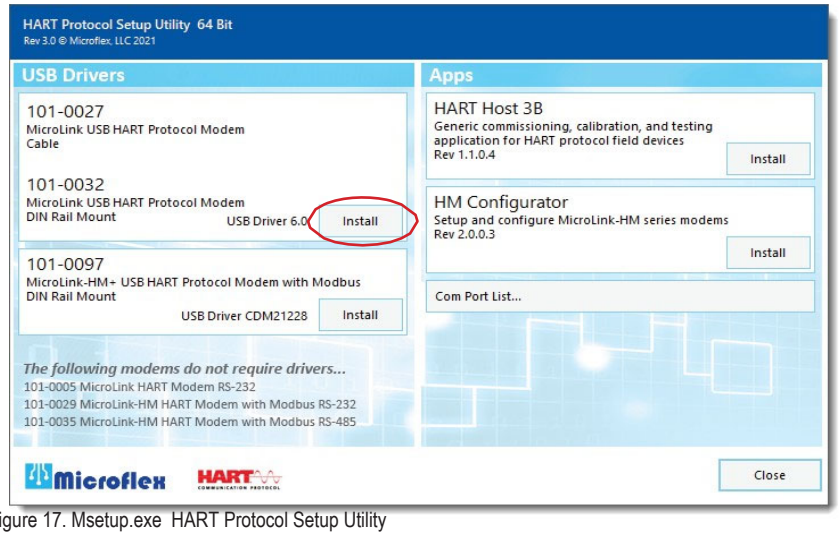


Figure 17. Msetup.exe HART Protocol Setup Utility

Click the Install button in the 101-0027 window to pre-install the USB drivers. The driver installer will guide you through the setup process. Installers can also be run manually from the CD, without running Msetup, by running \x86\dpinst.exe file for 32 bit operating systems or x\64\dpinst.exe for 64 bit operating systems.

Don’t have a CD drive?

Download the HART Protocol CD image from www.microflx.com/pages/support. Running the file will self-extract the compressed files and start the Msetup.exe HART Protocol Setup Utility.

c. Driver inf file - manually installed

To manually install the driver inf file:

1. Connect the Converter to the USB port.
2. Open the Windows Device Manager.
3. The New Device Wizard will have added the converter under Ports (COM & LPT) and will appear as MicroLink HART Protocol Modem (COMx). Right click the device and select Update Driver Software...
4. Choose to Browse for the driver software and browse to the CD or the location of the MxHART.inf file.
5. Follow the wizard prompts to complete the driver setup.

a. Uninstalling the USB drivers

If needed, use Windows Device Manager to uninstall the driver from your system. With the modem connected to the USB port, locate the MicroLink modem in the Device Manager hardware tree under Ports (COM & LPT). Right click on MicroLink HART Protocol Modem and select Uninstall from the pop-up menu. When the process has finished, unplug the modem from the USB port.

b. Finding the assigned COM port number

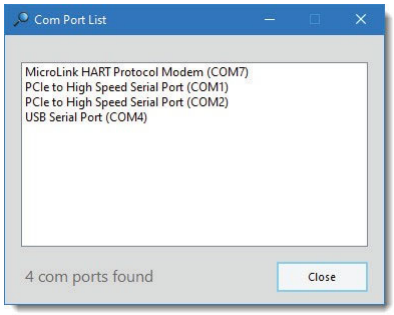
When Windows installed the serial port driver the next available COM port number was assigned to the converter. The software you use with the converter must be set to use the same COM port number. To find the number assigned to your converter run Msetup.exe from the CD and click the Com Port List... button to show a list of found devices and assigned COM port numbers.

To use the list...

Unplug the modem from the USB port and it will be removed from the Com Port List.

Plug the modem into the USB port and it will be added to the Com Port List.

Set your HART software to use the same COM number assigned to your modem.



MicroLink modem is assigned to COM 7

c. Using Windows device manager

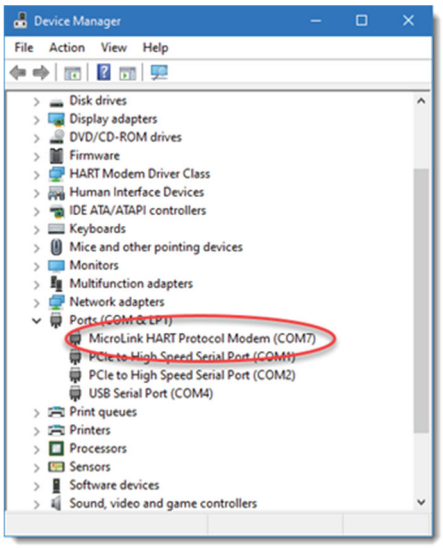
The assigned COM port number can be found using Windows Device Manager. Open Device Manager and select View > Devices by Type.

You may need to expand the Device Manager tree under Ports (COM and LPT)

to see the converter.

In the example shown below, the modem is assigned to COM 7.

The assigned serial COM port number can be changed to any available COM port using Windows Device Manager.



Expand Ports (COM & LPT) in the list to see which port the converter is assigned to.

Right click MicroLink HART Protocol Modem and select Properties from the pop-up menu.

On the Port Settings tab, click Advanced.

Drop down the COM Port Number list and select the desired port number.
Click OK to use the new port number and close the window.
Unplug the MicroLink modem from the USB port and then reconnect it to allow Windows® to update the USB device parameters.
Click OK again to close the Properties window.

d. Software setup

Make sure your HART software is set to use the same serial COM port number that the MicroLink modem is assigned to.

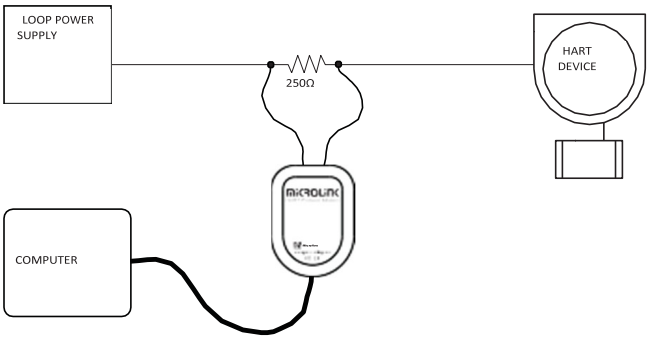
There are no hardware settings required by the MicroLink modem and modem power is provided by the USB port. All other settings, such as BAUD rate and parity, are taken care of by your HART software.

e. Connecting to the HART device

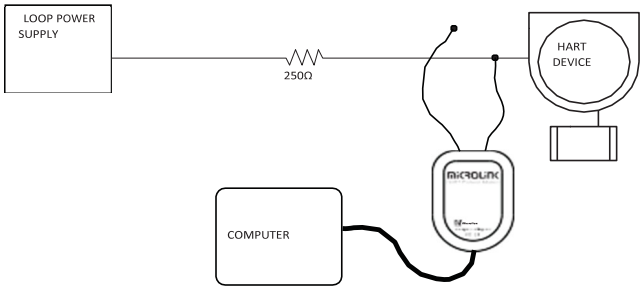
Connect the two mini-clips to the HART device or HART loop. MicroLink provides electrical isolation between the HART loop and the PC. It is safe to ignore grounding and polarity issues when making the HART connections.

The HART protocol requires a loop resistance of 230 to 600 ohms, typically 250 ohms. Refer to your equipment installation instructions for details on connecting a HART protocol modem or configuration device to the loop.

MicroLink HART modem connected across the HART device.



MicroLink HART modem connected across the HART device.



F. Troubleshooting

If the MS2900E does not seem to perform as expected, check the following items:

CAUTION: *Before performing any tests or maintenance on the MS2900E, ensure that all hazardous area requirements are met.*

---

1. Ensure that the probe is operational and is not completely corroded. This can be done in two ways.
    a. Test the probe with a portable ER meter if available.
    b. Test the probe with a portable resistance or continuity meter as follows:
        i. Connect one test lead to pin 'A' of the probes 6-pin connector.
        ii. Measure continuity to each of the other pins. There should be continuity (low resistance) to each pin.

    NOTE: Continuity on each pin does not ensure that the probe is good. However, if you find an open circuit on any pins then it is almost certain that the probe is bad and should be replaced.
2. Ensure that the Probe Selection Switches are set correctly for the probe being used. Confirm the probe type, and refer to Table 2 on page 9 to verify the appropriate switch settings.
3. Perform a visual inspection of the circuit boards to look for any signs of mechanical or electrical damage.
4. Ensure that all electrical cables and wiring are in good condition.
5. Ensure that all electrical contacts are secure and free of corrosion.
6. Ensure that there is adequate supply voltage at the 4-20mA Current Loop Connector.
7. Verify that the supply voltage polarity is correct.
8. If there is insufficient supply voltage on the 4-20mA Current Loop Connector, check the safety barrier (if applicable) for a blown fuse or any other failure.
9. Test the MS2900E using the supplied Meter Prover (see page 10.)
10. Test the MS2900E with a local multi-meter or loop calibrator.

These basic checks should indicate the source of any problem (probe, power supply, wiring, etc.…) If it is determined that the MS2900E is malfunctioning, or if you need further assistance in troubleshooting, contact Metal Samples Technical Support.

CAUTION: *If the MS2900E shows any signs of damage remove it from service immediately and consult the factory.*

III. Service and Warranty Information

A. Warranty

Metal Samples warrants that any part of the MS2900E and accessories which proves to be defective in material or workmanship within one year of the date of original shipment to Purchaser will be repaired or replaced, at Metal Samples option, free of charge. This warranty does not cover (1) probe assemblies, (2) items expendable in nature, or (3) items subject to damage from normal wear, misuse or abuse, or failure to follow use and care instructions.

All damaged items are to be shipped at Purchaser's expense to and from Metal Samples which shall have the right to final determination as to the existence and cause of a defect.

The foregoing shall constitute the sole and exclusive remedy of any purchaser of Metal Samples products for breach of warranty and IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL METAL SAMPLES BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES, OR FOR ANY DELAY IN THE PERFORMANCE OF THIS WARRANTY DUE TO CAUSES BEYOND ITS CONTROL.

The technical information and suggestions contained herein are believed to be reliable, but they are not to be construed as warranties since conditions of use are beyond our control.

B. Obtaining Service and Returning the Instrument for Repair

If you experience problems with your instrument, please contact the factory at 256-358-4202 and ask for customer support for instrumentation. Our customer support department will assist you in troubleshooting your instrument.

Most issues can be resolved over the phone, but in some cases, it may be necessary to return your instrument for further evaluation and repair. In this case, please obtain a Return Materials Authorization (RMA) number from the salesperson or support technician. This RMA number will ensure that your instrument is routed to the correct department when it is received at the factory.

After receipt of an RMA number, you may pack your instrument for return. Be sure to pack your instrument in a sturdy box and to pad it sufficiently to avoid damage during transit. Also be sure to complete the "Instrument Repair Form" on the next page and include a copy with your repair. This will ensure that the repair department has sufficient information regarding the problems you are experiencing with your instrument, as well as the billing, contact, and return shipping details for the repair.

Once you have obtained an RMA number, completed the "Instrument Repair Form", and packed your instrument securely, please ship it prepaid to the following address:

Metal Samples
152 Metal Samples Road
Munford, AL 36268
ATTN: RMA# _ _ _ _ _

NOTE: Be sure to list your RMA number in the attention line (shown as blanks in the example above.)

C. Instrument Repair Form

This form may be photocopied for use when returning an instrument to Metal Samples for repair. Please fill in all known information and enclose a copy of the completed form with the instrument.

General Information

Model Number		**Serial Number**	
RMA Number		**Date of Purchase***	

**If known.*

Contact Information for Repair

Contact Name		**Company**	
Phone Number		**E-mail Address**	

Return Shipping Information

Recipient Name*		**Company***	
Return Address			

**If different than above.*

Reason for Return. (Provide as much detail as possible. Attach additional pages if required.)

Invoice Instructions (For non-warranty repairs)

☐ **Invoice me for the repair** → **Reference PO#**
(Requires an open account with Metal samples.)

☐ **Contact me for credit card information**
(For security purposes, do not list credit card information on this form..)

Appendix A : Revision History

Revision	Date	Changes
0	03/31/2020	Initial Release
A	10/23/2020	Warnings added
B	01/14/2021	Comments in French corrected
C	09/28/2021	Updated Switch Settings. HART modem and DD files added
D	06/20/2022	Updated HART DD Details

Appendix B: Hazardous Area Certification Details

Metal Samples	MS26X0E & MS29X0E Hazardous Area Certification Details	Doc.Number	EXDOC-000019
		Revision	0
		Date	3/31/2020
		Page	1 of 2

Worldwide and Europe

Ex ia [ia] IIC T6 Ga
Ex ia [ia] IIC T130°C Da
-40°C ≤ Ta ≤ +70°C

ATEX Cert. No: ITS17ATEX201833X
IECEx Cert. No: IECEx ETL 17.0020X
X – See special Conditions below

Special Conditions

1. Probe Dielectric rating <500V r.m.s Do Not Exceed.

Hazardous Area Installation

CAUTION : This section provides general guidelines for hazardous area wiring. However, regardless of anything stated here, the MS26X0E / MS29X0E ER transmitter must be installed in full compliance with the control drawing provided Annexure-C and all of the local area requirements.

Entity Parameters

at Probe (common for all models)

Uo:	**8.61V**
Io:	0.305A
Po:	0.377W
Co:	0.1µF
Lo:	60µH

1 When used in Hazardous areas, equipment must be supplied with pre-apporved power supply or approved equipment via certified intriniscially safe barrier or galvaonically isolated barrier with the following maximum input parameters

Ui = 28V , Ii = 93mA and Pi = 0.65 W

CAUTION:

1. When used in non- hazardous areas, equipment must be supplied with pre-apporved power supply or approved equipment with the following maximum input parameters

   Ui = 28V , Ii = 93mA and Pi = 0.65 W

2 The Lock Screw on the instrument base must be tightened securely to prevent opening the MS2600E, and ensure that the intrinsic safety is not violated. Only qualified personnel should be allowed to install, operate,and maintenance the MS2600E.

MONDE ET EUROPE	Ex ia [ia] IIC T4 Ga -40°C ≤ Ta ≤ +70°C ATEX Cert. No: ITS ATEX 27981X IECEx Cert. No: IECEx ITS 14.0010X X - Voir les conditions particulières ci-dessous
USA ET CANADA	Class I, Zone 0, AEx ia IIC T4 Ga Class I, Division 1, Groups A, B, C & D, T4

Installation en zone dangereuse

ATTENTION : Cette section fournit des directives générales pour le câblage en zone dangereuse. Cependant, indépendamment de tout ce qui est indiqué ici, le transmetteur MS26X0E / MS29X0E ER doit être installé en totale conformité avec le schéma de contrôle fourni en Annexe-C et toutes les exigences locales.

Paramètres d'entité

at Probe (commun à tous les modèles)

Uo:	**4.94V**
Io:	66.2 mA
Po:	0.328W
Co:	0.4µF
Lo:	70µH

1 Lorsqu'il est utilisé dans des zones dangereuses, l'équipement doit être fourni avec une alimentation pré-approuvée Fourniture ou équipement approuvé via une barrière certifiée à sécurité intriniscale ou par voie galvanique barrière isolée avec les paramètres d'entrée maximum suivants

Ui = 28V , Ii = 93mA and Pi = 0.65 W

Conditions spéciales

1 Lorsqu'il est installé dans une atmosphère potentiellement explosive de zone 0 nécessitant un appareil EPL Ga, l'équipement doit être installé de telle sorte que même en cas d'incidents rares, une source d'inflammation en raison de chocs ou de frottements entre les alliages d'aluminium, les parties du boîtier sont exclues.

Mise en garde

1 Lorsqu'il est utilisé dans des zones non dangereuses, l'équipement doit être alimenté au préalable Fournir ou équipement approuvé avec les paramètres d'entrée maximum suivants

Ui = 28V , Ii = 93mA and Pi = 0.65 W

2 La vis de verrouillage sur la base de l'instrument doit être fermement serrée pour empêcher l'ouverture du MS26X0E / MS29X0E et assurez-vous que la sécurité intrinsèque n'est pas violée. Seulement qualifié le personnel doit être autorisé à installer, utiliser et entretenir le MS26X0E / MS29X0E

Appendix C: Control Drawing

(Hazardous Area Wiring Diagram)

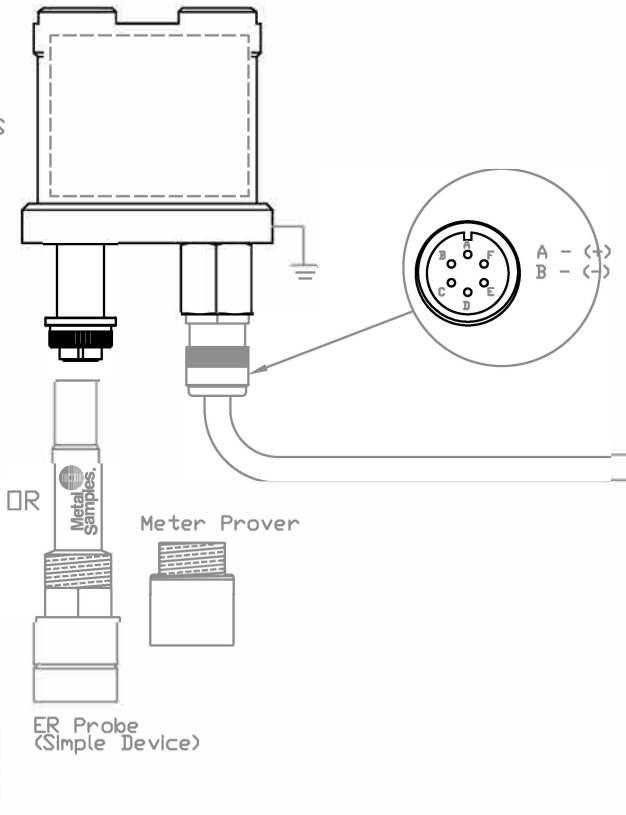
HAZARDOUS AREA

SAFE AREA

NOTE: INSTALLATION OF MS2600E/MS2650E/MS2900E/MS2950E
2-WIRE ER TRANSMITTER
IN GROUP IIC HAZARDOUS LOCATIONS.

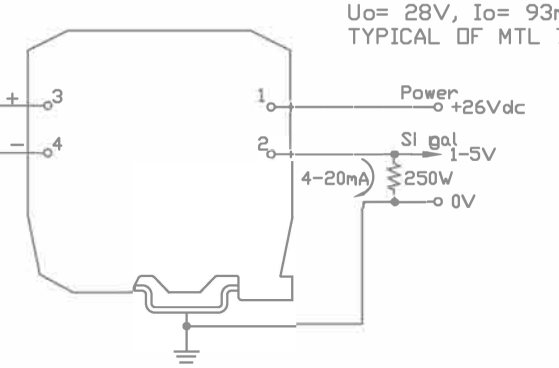
MS2600E/MS2650E/MS2900E/MS2950E HIGH RESOLUTION ER 4-20mA TRANSMITTER

MAXIMUM OUTPUT ENTITY PARAMETERS
AT CN2 - PROBE TERMINALS
Uo = 4.94 Vdc
Io = 66.2 mA
Po = 0.328 W



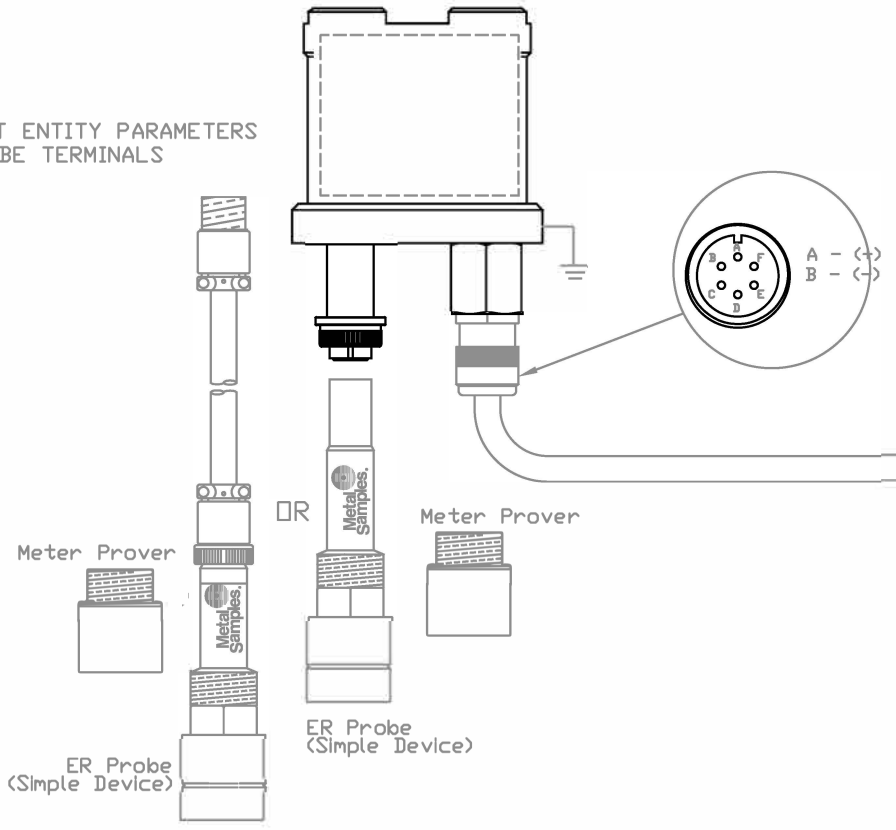
CN1 - INPUT TERMINAL
Ui = 28.0 Vdc
Ii = 0.093 A
Pi = 0.65 W
Ci = 50.42 nF
Li = 27.53 nH

CERTIFIED SAFETY BARRIER (EEx ia) IIC
Uo= 28V, Io= 93mA, Po= 650mW
TYPICAL OF MTL 7787+ Equivalent

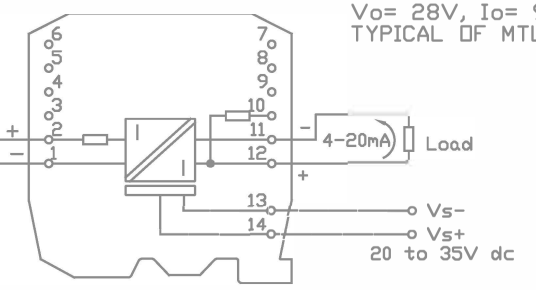


MS2600E/MS2650E/MS2900E/MS2950E HIGH RESOLUTION ER 4-20mA TRANSMITTER

MAXIMUM OUTPUT ENTITY PARAMETERS
AT CN2 - PROBE TERMINALS
Uo = 4.94 Vdc
Io = 66.2 mA
Po = 0.328 W



CERTIFIED 4-20mA REPEATER POWER SUPPLY (EEx ia) IIC
Vo= 28V, Io= 93mA, Po= 651mW
TYPICAL OF MTL 5541 or Equivalent



REV	DATE	DESCRIPTION	BY	CHKD
B	04/15/20	NEW MODELS INCLUDED IN DRAWING	EAN	BP
A	6/25/14	ADDED PROBE CABLE ASSEMBLY DESCRIPTION	EEW	BP

DRAWN IN	DWG TYPE	DATE
	CRT	04/15/20

ENGINEERED BY	DRAWN BY	CHECKED BY	QC BY
BP	EAN	SAK	LWB

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FAX:(256)-358-4515

TITLE
Control Drawing-MS26X0E/
MS29X0E ER Transmitter

SCALE	SHT. NO.	TOT. NO.	DWG. NO.	REV.
	1	1	EXWDB-000078	B