

# LPR Instrumentation

- MS1000** - is a 2-electrode, hand-held corrosion meter with a zero resistance ammeter.
- MS1500L** - is a hand-held, battery-powered, intrinsically safe corrosion data logger that takes LPR probe measurements and stores the data to be downloaded to your computer for analysis.
- MS2500L** - is a loop-powered LPR transmitter which transmits measurements to a receiver.
- MS3011** - is a rack-mount LPR transmitter which measures and transmits data from all types of 3-electrode probes.
- MS3500L** - is a data logger used to continuously monitor LPR probes in remote locations, automatically read the probes at selected intervals, and store the readings in its memory.



# Metal Samples

Corrosion Monitoring Systems

## MS1000 LPR Corrosion Meter

The MS1000 is a hand-held, battery-powered corrosion meter. This versatile instrument measures the instantaneous corrosion rate and electrochemical current between the electrodes of any standard 2-electrode linear polarization resistance (LPR) probe.

Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, instantaneous corrosion rate is calculated from polarization resistance.

The MS1000 is designed to calculate the corrosion rate in mils per year (mpy) for carbon steel. Multiplication factors for several common alloys have been included on the front panel of the instrument for quick reference. Multiplication factors for other alloys can be easily calculated using the formulas supplied in the operation manual.

The MS1000 also offers a high precision zero resistance ammeter (ZRA) for measuring the electrochemical current between electrodes. This function may be used to measure the galvanic current between electrodes of dissimilar alloys.

The MS1000 has a simple function key interface, using a 4-key keypad and a 4-line LCD display. The instrument also offers low-battery detection and an auto-shutoff feature to conserve battery life.



*Probe shown in photo not included with corrosion meter*

# Technical Specifications

## Model

MS1000 - LPR Corrosion Meter (Ordering # IN1000)

## Physical Data

Instrument Weight:	0.84 lb. (0.38 Kg)
Total Weight w/ Carrying Case and Accessories:	5.20 lb. (2.36 Kg)
Instrument Dimensions:	7.63"H x 4.15"W x 1.3"D (19.38cm x 10.54cm x 3.30cm)
Carrying Case Dimensions:	10"H x 11.75"W x 5.4"D (25.40cm x 29.85cm x 13.72cm)
Operating Temperature:	32° to 122°F (0° to 50°C)
Storage Temperature:	-4° to 158°F (-20° to 70°C)

## Performance Data

Measurement Type:	2-Electrode LPR, Galvanic
Range:	2-Electrode: 0-40 mpy Galvanic: 0-80 $\mu$ A
Resolution:	2-Electrode: 0.02 mpy Galvanic: 0.04 $\mu$ A
Cycle Time:	Corrosion Rate: 60 sec ZRA: 30 sec

## Electrical Data

Power Requirements:	One 9V Rechargeable Battery
Maximum Probe Cable Distance:	2000 ft (609.6 m)

## Special Features

- Microprocessor-based electronics
- Function key interface using 4-key keypad and 4-line LCD display
- Low-battery detection
- Portable

## Accessory Items

Carrying Case, 10' Probe Cable, Battery Charger, Lightweight Protective Case, Meter Prover, Operation Manual

## **Metal Samples Corrosion Monitoring Systems**

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## MS1500L Handheld LPR Corrosion Data Logger

The MS1500L is a hand-held, battery-powered, intrinsically safe corrosion meter capable of measuring and storing data from all types of 2- or 3-electrode linear polarization resistance (LPR) corrosion probes. The instrument is light weight, microprocessor-based, and features a simple, menu-driven interface using a 12-key keypad and a 4-line LCD display.

Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, the instantaneous corrosion rate can be calculated from polarization resistance.

The MS1500L incorporates a high-precision zero-resistance ammeter (ZRA) for measuring galvanic current between electrodes. It also offers a high-precision voltmeter for measuring the open-circuit potential between electrodes.

After performing a measurement, the instrument displays the corrosion rate, current, or potential, depending on the mode selected. The reading can then be stored to memory or discarded. All stored readings are automatically time and date stamped, and are protected by a lithium back-up battery. The instrument can store a maximum of 3,000 readings on up to 100 different probes.

Stored data can be uploaded to any IBM compatible PC as a comma-delimited ASCII text file. Because the data is in ASCII text format, it can be imported into any standard data analysis program such as Microsoft Excel, Lotus 123, or Corel Quattro Pro. Data can also be reviewed on the instrument's LCD display for quick reference.

The MS1500L may also be used as a data transfer unit (DTU) for the [MS3500L](#) Remote Data Logger. Data may be transferred from multiple MS3500L field-based units to the MS1500L, then later transferred to a PC for analysis.



*Probe shown in photo not included with corrosion meter*

# Technical Specifications

## Model

MS1500L - Handheld LPR Corrosion Data Logger (Ordering # IN1500L)

## Physical Data

Instrument Weight: 1.4 lb. (0.64 Kg)  
Total Weight w/ Carrying Case and Accessories: 5.26 lb. (2.39 Kg)  
Instrument Dimensions: 7.63"H x 4.15"W x 2.0"D (19.38cm x 10.54cm x 5.08cm)  
Carrying Case Dimensions: 10"H x 11.75"W x 5.4"D (25.40cm x 29.85cm x 13.72cm)  
Operating Temperature: 32° to 122°F (0° to 50°C)  
Storage Temperature: -4° to 158°F (-20° to 70°C)

## Performance Data

Measurement Type	Range	Resolution
2-Electrode	0 to 200 mpy	0.01 mpy
3-Electrode	0 to 150 mpy	0.01 mpy
Galvanic	± 999 µA	1 µA
Potential	± 999 mV	1 mV

## Electrical Data

Power Requirements: One 9V Battery  
Maximum Probe Cable Distance: 6 ft (1.83 m)  
Output Specifications: RS-232 Output in Comma-Delimited ASCII Text Format  
Intrinsic Safety: Class I, Division 1



Groups A, B, C, and D  
Temperature Code T2D  
Class I, Zone 0,  
Group IIC, T2D  
Conforms to ANSI/UL Std. 913

## Special Features

- Microprocessor-based electronics
- Data storage capacity of 3,000 readings on 100 different probes, with battery backup
- Menu-driven interface using a 12-key keypad and a 4-line LCD display
- Low-battery detection
- Portable

## Accessory Items

Carrying Case, 6' Probe Cable (attached), Meter Prover, 6 to 5-Pin Adapter, Galvanic Adapter, Communications Cable and Connector, Operation Manual, Corrosion Data Management Software

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# Metal Samples

Corrosion Monitoring Systems

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## MS2500L Loop-Powered LPR Transmitter

The MS2500L is a corrosion transmitter capable of measuring and transmitting data from all types of 3-electrode linear polarization resistance (LPR) corrosion probes.

Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, instantaneous corrosion rate is calculated from polarization resistance.

Another feature of the MS2500L is its high-precision voltmeter. This is used to measure the open-circuit potential between electrodes.

Measurements are transmitted via 4-20mA current loop. Since current loop signals are not as sensitive to line loss as other types of data signals, the MS2500L may be located up to ten miles away from the data receiver under proper conditions.

The MS2500L is completely loop-powered, so installation is simple. A two-wire connection is all that is required for both instrument power and data transmission. Setup is also simple, using a set of switches to select the measurement function (corrosion rate or electrode potential).

The MS2500L is housed in a NEMA rated explosion-proof and weather-proof enclosure, and the probe cable is connected through a water-tight, explosion-proof cable gland. This makes the MS2500L suitable for use in almost any indoor or outdoor environment.



*Probe shown in photo not included with corrosion transmitter*

# Technical Specifications

## Model

MS2500L - Loop-Powered LPR Transmitter (Ordering # IN2500L)

## Physical Data

Instrument Weight: 5.02 lb. (2.28 Kg)  
Total Weight w/ Accessories: 7.08 lb. (3.21 Kg)  
Instrument Dimensions: 5.81"H x 4.5"W x 4.81"D (14.76cm x 11.43cm x 12.22cm)  
Case Specifications: Explosion Proof (FM, CSA, CENELEC, UL)  
Class I, Groups B, C, D, Class II, Groups E, F, G, Class III,  
CENELEC: Eexd IIC  
NEMA 4, 7BCD, 9EFG  
Mounting Specifications: 0.728"H x 1.756"W (1.85cm x 4.46cm) Bolt Pattern with 1/4-20  
Tapped Mounting Holes, or May Be Mounted on a 1/2" to 2" (1.27cm  
to 5.08cm) Pipe Using Supplied Hardware  
Operating Temperature: 32° to 158°F (0° to 70°C)  
Storage Temperature: 32° to 158°F (0° to 70°C)

## Performance Data

Measurement Type: 3-Electrode LPR, Potential  
Range: 3-Electrode: 0-100 mpy Potential: ± 1V  
Cycle Time: 0.1 to 99.9 minutes

## Electrical Data

Power Requirements: 11 to 35 VDC  
Maximum Probe Cable Distance: 10 ft (3.05 m)  
Output Specifications: 4-20mA Current Loop Output

## Special Features

- Switch selectable measurement type and cycle time
- Loop powered

## Accessory Items

10' Probe Cable (attached), Meter Prover, Mounting Hardware, Operation Manual

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# Metal Samples

Corrosion Monitoring Systems

## MS3011 Rack-Mount LPR Transmitter

The MS3011 is an automatic corrosion transmitter capable of measuring and transmitting data from all types of 3-electrode linear polarization resistance (LPR) corrosion probes.



Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, instantaneous corrosion rate is calculated from polarization resistance.

The instrument offers measurement ranges as low as 0 to 0.5 mpy, and as high as 0 to 1000 mpy. The measurement cycle time is also adjustable. Both values are set using switches on the front panel of the instrument. This allows the instrument to be configured to almost any application.

Corrosion Rate is transmitted via current loop. This feature allows data from the instrument to be fed directly to any industrial process computer that accepts analog inputs. The current loop output has a switch-selectable range, making it compatible with most systems.

The MS3011 also offers a programmable alarm circuit. The alarm set-point is adjusted as a percentage of full scale, using a switch on the front panel. The alarm is capable of switching up to 115VAC at 5A, and offers normally-open and normally-closed contacts.

The instrument can be mounted in a standard 19-inch rack, using optional hardware. There is also an optional NEMA-12 weather-proof housing for field-mounting of the instrument.



# Technical Specifications

## Model

MS3011 - Rack-Mount LPR Transmitter (Ordering # IN3011)

## Physical Data

Instrument Weight: 3.36 lb. (1.52 Kg)  
Total Weight w/ Accessories: 4.80 lb. (2.18 Kg)  
Instrument Dimensions: 3.50"H x 13.88"W x 5.38"D (8.89cm x 35.26cm x 13.67cm)  
Mounting Specifications: 3"H x 13"W (7.62cm x 33.02cm) Bolt Pattern,  
0.25" (0.64cm) Bolt Hole  
Operating Temperature: 32° to 158°F (0° to 70°C)  
Storage Temperature: 32° to 158°F (0° to 70°C)

## Performance Data

Measurement Type: 3-Electrode LPR  
Range: Switch Selectable Ranges from 0.2mpy to 1000mpy  
Cycle Time: 0.5 to 50 minutes

## Electrical Data

Power Requirements: 120V/240V AC, 50/60 Hz  
Output Specifications: Current Loop Output  
Range: Switch selectable: 0-40mA, 0-16mA, 0-4mA, 1-5mA,  
4-20mA, or 10-50mA

## Special Features

- Switch selectable measurement range, cycle time
- Alarm output with variable set point

## Accessory Items

Probe Cable, Meter Prover, Operation Manual

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# Metal Samples

Corrosion Monitoring Systems

## MS3500L Remote LPR Data Logger

The MS3500L is a battery-powered, intrinsically safe, remote data-logger capable of measuring and storing data from all types of linear polarization resistance (LPR) corrosion probes. The instrument is microprocessor-based and features a simple, menu-driven interface using a 2-key keypad and a 2-line LCD display.

Corrosion rate measurements are made using the linear polarization resistance technique. The instrument measures the current required to polarize the electrodes of a probe to a known potential. From the polarization potential and the measured current, polarization resistance can be calculated. Then, using Faraday's law, the instantaneous corrosion rate can be calculated from polarization resistance.



The MS3500L incorporates a high-precision zero-resistance ammeter (ZRA) for measuring galvanic current between electrodes. It also offers a high-precision voltmeter for measuring the open-circuit potential between electrodes.

The MS3500L takes probe readings on a user-programmable logging interval. Readings are time and date stamped as they are taken, then stored to memory. Between readings, the instrument remains in a "sleep" mode to conserve main battery power. The instrument's memory is capable of storing 3,000 readings, and is protected by a lithium back-up battery.

Stored data can be uploaded to any IBM compatible PC as a comma-delimited ASCII text file. Because the data is in ASCII text format, it can be imported into any standard data analysis program such as Microsoft Excel, Lotus 123, or Corel Quattro Pro. Data can also be reviewed on the instrument's LCD display for quick reference.

Stored data can also be uploaded to a Metal Samples model [MS1500L](#) Handheld ER Data Logger for transfer to a PC. This handy feature eliminates the need to remove the MS3500L from its site, or to bring a laptop PC to the site. This can be particularly useful when collecting data from multiple MS3500L Data Loggers. And since both the MS3500L and the MS1500L are intrinsically safe, data can be uploaded from the MS3500L to the MS1500L even in hazardous locations.

The MS3500L also offers an optional 4-20mA current loop output (model MS3510L). This feature allows data from the instrument to be fed directly to any industrial process computer that accepts analog inputs.

The instrument is housed in a NEMA-4 enclosure, and all external connections are weather-proof. This makes the MS3500L suitable for use in almost any indoor or outdoor environment.

# Technical Specifications

## Model

MS3500L - Remote LPR Data Logger (Ordering # IN3500L)

MS3510L - Remote LPR Data Logger w/ 4-20mA Current Loop Output (Ordering # IN3510L)

## Physical Data

Instrument Weight: 11.94 lb. (5.42 Kg)  
Total Weight w/ Accessories: 13.64 lb. (6.19 Kg)  
Instrument Dimensions: 11.50"H x 8.94"W x 4.00"D (29.21cm x 22.71cm x 10.16cm)  
Case Specifications: NEMA-4  
Mounting Specifications: 10.75"H x 6"W (27.31cm x 15.24cm) Bolt Pattern  
0.3" (0.76cm) Diameter Bolt Holes  
Operating Temperature: 32° to 122°F (0° to 50°C)  
Storage Temperature: -4° to 158°F (-20° to 70°C)

## Performance Data

Measurement Type	Range	Resolution	Cycle Time
2-Electrode	0 to 200 mpy	0.01 mpy	1 min to 99 hrs
3-Electrode	0 to 150 mpy	0.01 mpy	1 min to 99 hrs
Galvanic	± 999 µA	1 µA	1 min to 99 hrs
Potential	± 999 mV	1 mV	1 min to 99 hrs

## Electrical Data

Power Requirements: Six 1.5V AA Batteries  
Maximum Probe Cable Distance: 10 ft (3.05 m)  
Output Specifications: RS-232 Output in Comma-Delimited ASCII Text Format  
4-20mA Current Loop Output (MS3510L Only)

Intrinsic Safety:



Class I, Division 1  
Groups A, B, C, and D  
Temperature Code T3  
Class I, Zone 0,  
Group IIC, T3  
Conforms to ANSI/UL Std. 913

## Special Features

- Microprocessor-based electronics
- Data storage capacity of 3,000 readings, with battery backup
- Menu-driven interface using a 2-key keypad and a 2-line LCD display
- Low-battery detection

## Accessory Items

10' Probe Cable, Meter Prover, 6 to 5-Pin Adapter, Galvanic Adapter, Communications Cable and Connector, Current Loop Connector (MS3510L only), Operation Manual, Corrosion Data Management Software

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