



SWAIN METERS


REVISION 1

APPLICATION

Swain Meters are field-portable non-contact ammeters for corrosion protection, fault location, and quality assurance. They are accurate, convenient, and trouble-free under normal field or factory conditions.

- Anode
- Gas & Oil Pipe
- Concrete & Steel Column
- Find Direction of Current Flow
- Locate Shorts & Interference

MER (MAGNETIC ERROR REDUCTION) MODEL SWAIN METER



The MER (Magnetic Error Reduction) model Swain Meter is a 1% clamp-on DC ammeter for measuring actual line current and direction of flow during normal operation.

MER Meters are faster and simpler to use when measuring direct current on steel pipe, near rebar, or a battery cable on a vehicle. Accuracy is better when measuring a small current because zero offset error due to local magnets is reduced in a new construction. Generally, the short two-step Floating Zero procedure suffices. Offshore platform anode current or transmission line current can be measured at 700 ft. depth or more. MER Clips (to 6" dia.) and Clamps (to 60" dia.) work undersea for a long time when waterproof connectors are provided.

Features:

- Measures direct current without interrupting the circuit.
- Magnetic Error Reduction (MER) type DC Amp Clips™ are generally more accurate for measuring direct current with a non-contact sensor. They are constructed to substantially reduce zero offset error due to non-uniform magnetic fields common on steel pipe, near rebar, or near the battery in cars and trucks. The benefit is usually two or three to one over comparable standard Swain Meters.
- Typical accuracy is $\pm 1\%$ reading, ± 3 digits, $\pm \text{He}^*$. User friendly 3 1/2 digit LCD meter with polarity and 1/2"-high numerals.
- Protected from 300 A overload.
- AC input current is rejected to less than 5 mA change with 10 A input.
- Portable, with auto off, or full on for recorder, 50 hr. typical alkaline internal battery life. Test Battery range provided.



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* He is zero offset sensitivity of the sensor to the earth's magnetic field. The earth field is uniform unless steel is close and distorts it. A strong magnet nearby can also cause zero offset.

Certain models include:

- $\frac{3}{4}$ " Clips to 60" dia. Clamps, which work in a desert, or 500 ft. under water with optional waterproof connectors and extensions.
- 1 mA resolution; 3 ranges to 200 amp.
- Recorder connector with ± 2 V full scale output, plus overrange. Optional external battery operation.

AUTO MER (MAGNETIC ERROR REDUCTION) MODEL SWAIN METER



This ammeter combines automatic control with Magnetic Error Reduction (MER). Range and zero are set automatically.

AutoMer clamps on to measure vehicular battery cable and gas transmission pipeline direct current more accurately and faster.

It has 1 mA resolution, and measures 5 mA to 200 Amp during normal operation and without breaking into the line.

AutoMer works in a desert or 700 ft. underwater with a waterproof extension.

Offshore platform anode current or subsea transmission line current can be measured.

AutoMer Clips (to 6" dia.) and clamps (to 60" dia.) work in salt water for a long time.



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Features:

- Measurement range is selected automatically – typically 2, 20, or 200 A., within seconds of a change of input current. Zero is also automatically and precisely set.
- AutoMer model DC Amp Clips are generally more accurate. They are constructed to substantially reduce zero offset error due to residual magnetism in transmission line pipe, or magnets in vehicles. The benefit is usually two or three to one over comparable standard Swain Meters.
- Polarity (direction of flow) of measured current is shown both on the LCD meter and also at the output terminals.
- AutoMer is fully portable, with 50 hr. battery and "Low Batt" icon.
- In "Auto", Range selection, Zero adjustment, and also battery OFF are automatic.
- In "Manual", Range is selected and Zero is set by hand. Battery power stays on.
- External Battery is optional.
- Clips from 3/4" to 6" and Clamps to 13" have 1 mA resolution. Clamps with 24" to 60" inside diameter have 10 mA max. resolution.
- Typical accuracy is $\pm 1\%$ reading, ± 3 digits, \pm zero offset due to magnetism. The LCD meter has 3 1/2 digits with 1/2" high numerals.
- Output for a recorder is ± 2 V at full scale input on any range. Overrange is available. AC input current is rejected to less than 5 mA change with 10 A rms - 60 Hz input.

MER2 Sensors

MER2 Sensors are best for making measurements of actual direct current flowing in magnetized pipe or cable during normal operation, and without interrupting the circuit.

MER2 clamp-on Ammeters have all the advantages of MER Meters for measuring the actual magnitude and direction of flow of current in pipe and cable having local magnetic interference, with the added advantage that zero offset error is generally reduced to less than half that of an equivalent MER Meter.

Offshore platform anode current or transmission line current can be measured at 700 ft. depth or more. MER 2 Clips from 2" to 6" have 1 mA resolution. MER2 clamps up to 60"+ dia. work undersea for years. Optional waterproof connectors are available.

Features:

- MER2 (Magnetic Error Reduction doubled) type DC Amp Clips are generally more accurate for measuring direct current with a non-contact sensor. They are constructed to reduce errors due to non-uniform magnetic fields common on steel pipe, near rebar, or near the battery in cars and trucks. Zero offset error is generally less than one quarter that of comparable standard Swain Meters.
- Typical accuracy is $\pm 1\%$ reading, ± 3 digits, $\pm H_e$. User friendly 3 1/2 digit LCD meter with polarity & 1/2" high numerals.

(H_e is zero offset sensitivity of the sensor to the earth's magnetic field. The earth field is uniform unless steel is close and distorts it. A strong magnet nearby can also cause zero offset.)

- Protected from 300 A overload.



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- AC input current is rejected to less than 5 mA change with 10 A input.
- Portable, with auto off, or full on for recorder. Has a 50 hr. alkaline internal battery.

Certain models include:

- 3/4" Clips to 60"+ dia. Clamps, which work in a desert, or 700 ft. under water with optional waterproof connectors and extensions.
- 1 mA resolution; 3 ranges; to 200 amp.
- Recorder connector with ± 2 V full scale output, plus overrange. Optional external battery operation.

70 mA TESTER FOR DC AMP CLIPS

The 70 mA Tester for DC Amp Clips is a battery powered 70 mA regulated current source designed to verify the accuracy of direct current Swain Meters.

The clip to be tested is easily clamped around the wire loop. A LED is included to show that the battery is providing current. Be sure to remove the plastic covering the switch before using.

Before testing, zero the meter using the zero knob. Put the clip around the wire loop. With the switch depressed, the LED should be on, showing the battery is good. The current is generated as long as the switch is depressed. The direction of current flow is indicated by an arrow on the case. With the arrow engraved on the clip pointing in the same direction as the arrow on the case, the meter reads positive 70 mA \pm 2 mA.

On the other hand, with the clip turned over so that its arrow points opposite to that on the case, the reading on the Swain Meter should be negative 70 mA \pm 3 mA. To be accurate, the wire must not be near the lips or jaws of the clip.

If the Swain Meter does not show 70 mA \pm 2 mA, it is not showing the proper current and may need to be returned to the Swain Co. for repairs.

The 2 "AA" cells should last for at least 4 hours of constant usage, or about 4 months, whichever comes first. It would be advisable to change them at that time.



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700 mA Tester N-10

The 700 mA Tester N-10 drives 70 milliamperes direct current regulated to within ± 1 mA into a 10 turn loop which is 4 1/2" in diameter. The leads are 3" long, so the 70 mA is also available. It is intended to ensure the Swain Meter is functioning properly. The 70 mA current flows in the wire to the 10 turn loop from the red end towards the black end when the button is pushed, provided the LED appears bright.

To use, either the single turn or the 10 turn wire loop is placed in the aperture of the clip or clamp sensor, toward the center, or with a large clamp, along one side, away from the lips. When the wire is close to one side of a clamp, it is likely to read 1% or so higher than the 70 mA in the wire.

The "Zero" adjustment on the indicator may be set so that the meter reads zero before the 70 mA is turned on, but this is not necessary. We often read the meter with the 70 mA off, and then again with it on. The difference between the 2 meter readings should be 70 mA \pm 2 mA for a single turn loop or 700 mA \pm 10 mA for the 10 turn loop, when using a directly calibrated sensor. If not, check the calibration chart shipped with the sensor. Observe the polarity. It should agree with the calibrator.

If the LED is dim, or in any event after 4 hours of continuous use, or 4 months, whichever comes first, the two alkaline AA cells should be changed. The battery voltage must exceed 2.5 Volts when the LED is lit.

