



EM120A

High Resolution dc/ac mA Current Probe For Oscilloscopes & Automotive Uses

INTRODUCTION

The Probe is a specially designed high resolution clamp-on dc/ac mA current probe which will allow your oscilloscope / multimeter to measure low electrical / electronic current up to 30 A dc/ac with 1 mA resolution and a reading accuracy of 1%. With the clamp, there is no need to break a circuit or to affect the isolation.

The extended measurement jaws allow performing measurements in a narrow space. When measuring dc current, a simple thumbwheel on the probe is designed for zero adjustment.

For troubleshooting the electric or hybrid electric vehicles, current measurement (especially without interrupting the supply from the battery or other current carrying conductors) is more important and effective than voltage measurement from a technical, economical and process point of view.

The more important or essential checking points in electric or hybrid electric vehicles than those of the conventional vehicles are as follows:

- Battery leakage current (normally around 15 mA), when all systems are turned off, which is used as a quality indicator in an Electrical Check Out System for production line quality assurance testing or as a fault identifier for the diagnostic units in large service centers.
- Current drain of the ECU controlling the ISG (or ISA) system, which is as low as 10 mA when ignition is turned off, should be measured without disconnecting the battery cable to prevent the ECU from losing the stored data.

* Basically, the ISG (or ISA) system is made of the following elements:

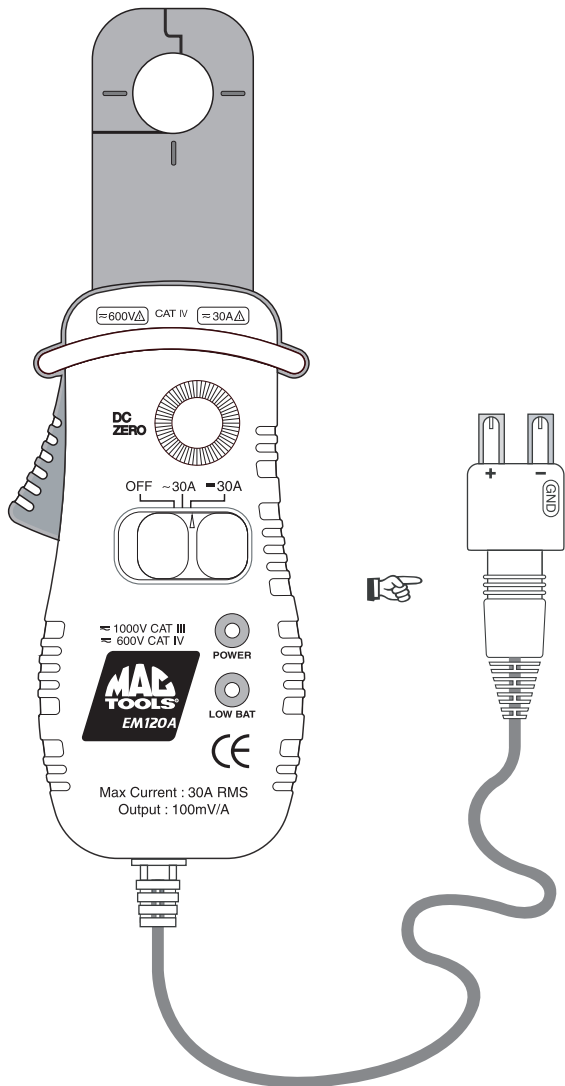
- A 3-Phase ac motor integrated into the internal combustion motor
- An ac/dc converter which rectifies the ac generated by the 3-Phase motor
- A dc/ac converter that provides the required voltages
- The electronics driving the ISG system as a whole
- The energy management system (ECU) controlling the ISG

Rapid waveform tracking is also a key feature of this specially designed low current probe making it useful, for example, for displaying and adjusting currents in electronic fuel injectors. This probe has a frequency range of dc to 20 kHz and a di/dt tracking capability in excess of 20 A/ μ s.

APPLICATION PROCEDURES

Caution!

1. For OSCILLOSCOPES, insert the BNC connector into the CH1 terminal of any OSCILLOSCOPE with a minimum input impedance of 1 M Ω .
For Automotive Uses, insert the detachable banana adapter into the BNC connector first and then insert the black banana plug into the COM jack and the red banana plug into the V- Ω jack of any multimeter with a minimum input impedance of 10 M Ω .
2. Set the power switch from "OFF" to the desired range. The ac 30 A or dc 30 A position. The green LED will light to indicate that the clamp is switched on.
3. When perform dc current measurement, use the DC zero adjustment thumbwheel on the clamp unit, if necessary.



 When inserting the detachable banana adapter into the BNC connector, grasp this neck for making easy connection.



4. Clamp the jaws around the current-carrying conductor and interpret the reading.
5. Multiple the reading displayed on the OSCILLOSCOPE / MULTIMETER by "10" for interpreting the measured current value in mA. For example, if the OSCILLOSCOPE / MULTIMETER reads 10 mV, the measured current is 10x10=100 mA.

APPLICATION NOTES

1. In the case of dc current, the output is positive when the current flows from the upside to the underside of the clamp.
2. When measuring DC amperes more than 15 A using this current probe, if values with a big difference are obtained between two consecutive measurements, zero the current probe and measure the value again then a right value will be obtained.
3. In the case of dc current measurement, a hysteresis effect can occur so that it is impossible to zero the clamp properly. To eliminate this effect, open and close the jaws several times and turn DC zero adjustment thumbwheel. Especially it is impossible to zero the meter properly after having inadvertently measured far more than 30 A dc in the 30 A dc range. In this case, have the jaw clamp the cable in the reverse direction in order to zero the meter properly.

WARNING!

If the equipment is used in a manner not specified by the manufacturers the protection provided by the equipment may be impaired.

To assure continued safety of this probe, inspect this probe before use for cracks or missing portions of insulating cover, or for loose or weakened components. Pay particular attention to the insulation surrounding the clamp jaws and clamp lever. Any probe that fails this inspection should be made inoperative by taping the clamp shut.

OPERATOR SAFETY

1. Do not clamp around conductors with voltages equal to or exceeding 300 V dc or 240 V rms ac.
2. To avoid physical injury, measurements on bare conductors or conductors with cracked or frayed insulator are forbidden.
3. No touch the conductor under test and parts of the jaw.

SPECIFICATIONS



CAUTION!

GENERAL

Captured Conductor Size: 19 mm maximum
 Low Battery Indicator: red LED lighting
 Operating Temperature: 0°C to 50°C
 Storage Temperature: -20°C to + 70°C
 Relative Humidity: 0% to 80%
 Altitude : 0 to 2000 meters
 Battery Type: 9V DC, NEDA 1604, 6F22, 006P
 Battery Life: 100 hours typical with alkaline
 Weight: 300 g
 Output: Coaxial Cable with a BNC connector
 Dimensions: 200mm (H) x 72mm(W) x 38 mm(D)
 Pollution Degree: 2
 Installation Category: CAT IV 600 V and CAT III 1000 V



ELECTRICAL (At 23 ± 5 °C, 70% R.H. maximum)

Effective Frequency Range : dc to 20 kHz (0.5 dB)

System accuracy : Current clamp accuracy + OSCILLOSCOPE / MULTIMETER accuracy

Current Clamp Accuracy (dc to 20 kHz)

Current range : 20 A ac RMS or dc

Measuring range : ± 30 A

Output sensitivity : 100 mV/A

Accuracy : ± (1% of reading + 2 mA)

Maximum Resolution : 1 mA dc/ac

Minimum Measurement : 5 mA dc/ac

di/dt Tracking Capability : > 20 A/μs

Conductor Position Sensitivity : ± 1% relative to center reading

Load Resistance : 10 kΩ typical

Temperature Coefficient : 0.1 x (specified accuracy) per degree C.
 (0°C to 18°C, 28°C to 50°C)

CLEANING

Periodically clean your meter's case using a damp cloth.

Do not use abrasives, cleaning solvents or strong detergents, as they may damage the finish or affect the reliability of the structural component.

SERVICE AND REPLACEABLE PARTS

- Battery IEC 6LR61
- Banana plug : supplied by manufacturer.
- BNC connector : supplied by manufacturer.

BATTERY REPLACEMENT

When the "LOW BAT" LED of this probe is turned on, replace the same type of battery installed within the probe.

Do not clamp the jaw around a conductor and disconnect the output cable from any measurement equipment during battery replacement. Remove the screw of the battery cover of the Meter and lift off the cover of the Meter, Replace the battery. Attach the battery cover to the meter, and reinstall the screws.

SAFETY INFORMATION

The Probe is designed and tested according to EN61010-1 :2002 and EN 61010-2-032 : 2002 (OvervoltageCategory IV), Safety Requirements for Hand-held Current Clamps for Electrical Measurement and Test, and the EMC Directive (EN 61326-1 : 2006 and EN 61326-2-2 : 2006).

The Probe is Designed to Protection Class II, double or reinforced insulation requirements of UL 61010-1, 2nd Edition(2005.07), CAN/CSA-C22.2 No. 61010-1, 2nd Edition (2004.07) and EN 61010-2-032 : 2002, 2nd Edition.



CAUTION (Risk of electric shock.)

No touch the conductor under test and parts of the jaw

International Symbols:

— dc - Direct current

⎓ Both dc and ac



Double insulation



Caution (Refer to accompanying documents)