HOW TO MEASURE CURRENT

USING A CLAMP METER, FORK METER OR DIGITAL MULTIMETER

While Voltage is the 'pressure' consideration in electricity, current is the 'flow'. Think of PSI, Pounds per Square Inch as pressure and the rate of flow is Gallons per minute as rough equivalents. In a plumbing system, if you measure PSI in a pipe, it could very well be 50 PSI, but unless you have opened a tap, or squeezed a nozzle at the end of a garden hose, no flow or 'work' is occurring. Measure water pressure with a sensor is just like measuring voltage. You can ensure that proper pressure is being maintained, (or not!) as loads change, but you don't know just how much load is being used until you measure the rate of flow (current).

The easiest and safest way to accomplish this in an electrical system is to use a current clamp meter. By simply clamping the sensing head (jaws) around an energised conductor, a value can be measured indicating the amount of current being consumed by a load or loads on that branch circuit. (Of course there has to be some amount of load present to measure any value.)

Two ideas are important, first, you must clamp around just the live conductor, as clamping around the live and neutral will measure a cancellation effect which will read zero amps no matter how many amps are flowing, and, second, you must have an AC and or DC curent rated meter if the current is DC.

Interestingly, on 3 phase systems, clamping around multiple phases, (when possible) results in a cancellation effect due to the inherent 120 phase shifting of current from phase to phase. (Think motor and phase rotation meters.) So, it is important to measure each phase conductor separately.

Fork meters can make this measurement easier by allowing the user to simply slide the jaws over a conductor instead of spreading the jaws open. In crowded panels or where rigid conductors cannot be easily moved out of the way, this can be very helpful. But, there is a 200-amp limit.

This is also a consideration with clamp meters, namely, will it measure the maximum amperage that you expect or that the system is rated to.

This approach, using a clamp or fork meter allows the user to simply place the meter over the conductor without any current flowing through the meter or disturbing the flow of current in any way. It is a passive and isolated way of sensing the total current flowing.

A user can also measure current flow using a properly rated Digital Multi Meter (DMM).

However, this requires a technique known as making a 'series' measurement. Again, it is important to ensure that the meter is properly rated for the known and expected environment, voltage and current values.

To make this measurement, current flows THROUGH the meter, and the meter actually becomes part of the circuit.

If you were to measure the current flow of a light bulb, you would literally have to:

- Turn off the branch circuit
- Lock Out and Tag Out the breaker (to be safe)
- Cut the live conductor in two
- Set the meter up for current by placing the leads in the correct terminals and selecting the proper measurement selection (Amps)
- Attach the leads with alligator clips to the two ends of the cut and stripped live conductor
- Reenergise the branch circuit
- Then read amps. All the way up to 10 amps

Any more current and you would blow the fuse.

This obviously makes no practical or safety sense, but those steps are precisely what would be required. It can be done, but that doesn't mean that it should be done.

A clamp meter is much safer, quicker, and provides isolation as no current actually flows through it. It simply detects the electromagnetic field strength created around a conductor when current is flowing.

So why have current capability of a DMM? Early versions of DMM's that predated clamp meters could be used in conjunction with a current transducer (CT).

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Think of just the head of a clamp meter, but no digital display. This could be clamped around a conductor and the output signal could be connected to a DMM.

The early versions had an output signal of current. 1 amp flowing through the sensor head caused a 1 mA AC signal to be sent to the meter. The user would then convert 1 mA (in their head) and know that meant 1 amp. 887 mA of course meant 887 amps and so on.

So, DMM's have had an input for current from a very early point in their evolution. And while the need for current measurements using a DMM by an electrician has gone away, the need for current for electronic technicians has not. Technicians of course make current measurements at much lower voltages and making series measurements is much easier.

Safety - A fork meter allows you to measure AC or DC current (depending on the model) by positioning the fork around a conductor, which is much safer than making direct contact with a live circuit.

Productivity - During a measurement, it is not necessary to shut off the circuit carrying current, which improves productivity.

Limited to 200A AC/DC Measurement

No Fuse Protection required

Safety - A clamp meter allows you to measure AC or DC current (depending on the model) by positioning the clamp jaw around a conductor, which is much safer than making direct contact with a live circuit.

Productivity - During a measurement, it is not necessary to shut off the circuit carrying current, which improves productivity. This allows isolation of a conductor being tested in a bundle of conductors.

Limited to 2000A AC/DC Measurement (Hard Clamp)

No Fuse Protection required

Multimeters measure current differently than a fork or clamp meter.

<u>To measure current with a multimeter:</u>

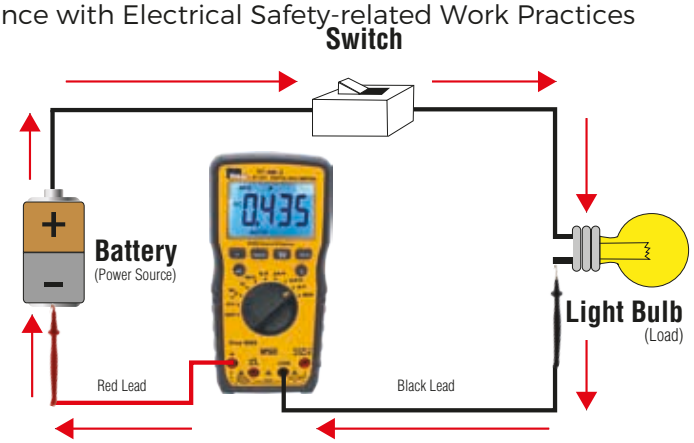
- You must insert the multimeter into the circuit to get the current to flow THROUGH the meter and are making direct contact with the live circuit.

To properly conduct a current measurement in accordance with Electrical Safety-related Work Practices (ESWP) you must:

- de-energise the circuit, disconnect the circuit, insert the meter into the circuit, re-energise the circuit to test current
- AND THEN… repeat the whole process again to "remove" the meter from the circuit after the test.

Limited to 10A AC/DC Measurement

Fuse Protection required (due to current pass-through)



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