615-4130 (10-235) Variable Inductance Kit

Introduction: Inductance is an electrical phenomenon. It is the property in a circuit where a change in the current flowing through that circuit produces and electro-motive force. This EMF opposes the change in current, in accordance with Lenz' law.

The reason for this has to do with the close relationship between electricity and magnetism. All electrical circuits generate magnetic fields and hence a magnetic flux. When the electricity in the circuit changes, this magnetic flux opposes changes in the flux by generating a voltage that counters or reduces the change in the magnetic flux. This is necessary to preserve conservation of energy. The ratio of the magnetic flux to the current is called inductance.

One practical application of this is the fact that this property can be used to "transfer" a current from one circuit to another. This is how it works: two circuits are placed in close proximity to each other. One is charged. As the current in the first circuit changes, it produces a magnetic field. A fundamental property of electricity is that a conductor moving through a magnetic field will experience a current. Thus, as the first circuit generates a magnetic flux, the second experiences an induced current.

It is possible to build a circuit that is capable of *variable inductance*. This is a more complicated setup, but follows the same laws. Some applications, such as RF transmitters, are dependent on variable inductance.

Description: Your variable inductance kit consists of a copper coil, a steel core, a crank to slide the core in and out of the coil, inputs for a low voltage power supply, a scale on the top, and a study acrylic housing. The unit is CE certified.

The scale is marked in two ways. The first is centimeters, denoting the distance the steel core is inside the coil. The second scale is marked in Henries. A Henry is the SI unit for inductance, named after Joseph Henry, an American who discovered inductance about the same time as Michael Faraday.

For the first experiment, attach the unit to a low voltage power supply. You will also need some copper wire and a light bulb. First, connect the power supply to one jack on the coil. Next, connect a length of wire to the other jack. It helps to have wire ending in a banana plug, but bare wire will do. After you have connected the wires to the jacks, connect the end of the free wire to an incandescent light bulb. You may want to use a lamp holder with sockets for the wires for this purpose. After you have connected the wire from the coil to a lamp holder, run a wire from the lamp holder back to the power supply.

After completing this setup, it is time to begin the demonstration. Twist the crank until the steel core has been entirely ejected from the coil. Apply voltage to the unit. You should supply just enough voltage for the bulb to glow at maximum brightness. Do not subject the bulb to more electricity than this, as it can be damaged.

When the core is slid into the coil, the bulb will dim. The further the core enters the coil, the dimmer the bulb will become. This is because of a property known as *inductive reactance*. Lenz's law states that "an induced current is always in such a direction as to oppose the motion or change causing it". This means that when the steel core is surrounded by a coil of energized wire, a current is induced inside it. In accordance with Lenz Law, this induced current flows in an opposite direction compared top the current in the coil. This imparts a kind of electromagnetic drag on the current, which in turn causes an energy loss. Inductive reactance and resistance are hard to distinguish from one another.

Instead of using a light bulb, a multimeter can be used to measure the power loss due to inductive reactance.

Warranty and Parts:
We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain lead or small parts that can be choking hazards. Adult supervision is required