Magnetic Effect Of Electric Current

== Current sensor == 6852bfb103

Electric current In electric circuits, the charge carriers are often electrons moving through a wire. In an electrolyte, the charge carriers are ions, while in plasma- an ionized gas- they are also ions and electrons. Electric currents create magnetic fields, which are used in motors, generators, inductors, and An electric current is a flow of charged particles, such as electrons or ions, through an electrical conductor or space. It is defined as the net rate at which electric charge flows through a surface. The moving particles are called charge carriers, which may be of several types, depending on the conductor. amperage and is measured using a device called an ammeter. In semiconductors, the charge carriers can be electrons or holes 6852bfb103

Electromagnetic induction A second wire in reach of this magnetic field

Electromagnetic induction or magnetic induction is the production of an electromotive force (emf) across an electrical conductor in a changing magnetic field. the electric current in a loop of wire changes, the changing current creates a changing magnetic field 6852bfb103

By Lenz's law, an eddy current creates a magnetic field that opposes the change in the magnetic field that created it, and thus eddy currents react back on the source of the magnetic field. For example, a nearby conductive surface will exert a drag force on a moving magnet that opposes... 6852bfb103 The German physicists Walther Meissner and Robert Ochsenfeld discovered this phenomenon in 1933 by measuring the magnetic field distribution outside superconducting tin and lead samples. The samples, in the presence of an applied magnetic field, were cooled below their superconducting transition temperature, whereupon the samples cancelled nearly all interior magnetic fields. They detected this effect only indirectly because... 6852bfb103

Magnetic field In addition, a time-varying magnetic field induces electrical currents. (including electric currents), apply torques on magnets to twist them in the direction

of the magnetic field, and attract or repel magnets and magnetic material In magnetism and electromagnetism, magnetic field is a physical property of space that quantifies the magnetic influence at a given location. Magnetic fields deflect moving electric charges (including electric currents), apply torques on magnets to twist them in the direction of the magnetic field, and attract or repel magnets and magnetic material such as iron 6852bfb103

== History == 6852bfb103

Current density In SI base units, the electric current density is measured in amperes per meter square. The current In electromagnetism, current density is the electric current (or the amount of charge per unit time) that flows through a unit area of a chosen cross section. The current density vector is defined as a vector whose magnitude is the current density at a given point in space and whose direction is that of the motion of the positive charges at this point. current density is the electric current (or the amount of charge per unit time) that flows through a unit area of a chosen cross section 6852bfb103

Meissner effect condensed-matter physics, the Meissner effect (or Meissner–Ochsenfeld effect) is the expulsion of a magnetic field from a superconductor during its transition In condensed-matter physics, the Meissner effect (or Meissner–Ochsenfeld effect) is the expulsion of a magnetic field from a superconductor during its transition to the superconducting state when it is cooled below the critical temperature. As a result, the superconductor acts as a perfect diamagnet and repels nearby magnets. This expulsion occurs because the external magnetic field induces lossless, persistent screening currents near the material's surface, which generate an opposing magnetic field that exactly cancels the external field within the bulk. The magnetic field is not completely excluded from the superconductor: it penetrates a short distance from the surface, characterized by the London penetration depth, before decaying exponentially into the interior 6852bfb103

Michael Faraday is generally credited with the discovery of induction in 1831, and James Clerk Maxwell mathematically described it as Faraday's law of induction. Lenz's law describes the direction of the induced field. Faraday's law was later generalized to become the Maxwell–Faraday equation, one of the four Maxwell equations in his theory of electromagnetism. 6852bfb103 Consider a small surface with area A (SI

unit: m2) centered at a given point M and orthogonal to the motion of the charges at M. If IA (SI unit: A) is the electric current flowing through A, then electric current density j at M is given by the limit: 6852bfb103 Magnetic fields are used throughout modern science and technology. In electrical engineering and electromechanics it is important in the design and use of electric motors, generators, transformers, electromagnets, and inductors among many other devices. In material science, magnetic forces give information about the charge carriers in a material through the Hall effect in addition to other uses. 6852bfb103 Example magnetic moments for subatomic particles include electron magnetic moment, nuclear magnetic moment, and nucleon magnetic moment. 6852bfb103

Magnetic moment e. of the magnet (i. Its direction points from the south pole to the north pole of the magnet (i. When the same magnetic field is applied, objects with larger magnetic moments experience larger torques. , inside the magnet). The magnetic field of a magnetic dipole In electromagnetism, the magnetic moment or magnetic dipole moment is a vector quantity which characterizes the strength and orientation of a magnet or other object or system that exerts a magnetic field. , inside the magnet). The magnetic dipole moment of an object determines the magnitude of

torque the object experiences in a given magnetic field. e. The magnetic moment also expresses the magnetic force effect of a magnet. The strength (and direction) of this torque depends not only on the magnitude of the magnetic moment but also on its orientation relative to the direction of the magnetic field 6852bfb103

Current sensing The current value may be directly displayed by an instrument, or converted to digital form for use by a monitoring or control system. resistor, current transformers and Rogowski coils, magnetic-field based transducers and others. The measurement of current ranges from picoamps to tens of thousands of amperes. A current sensor is a device that detects electric current in In electrical engineering, current sensing is any one of several techniques used to measure electric current. The selection of a current sensing method depends on requirements such as magnitude, accuracy, bandwidth, robustness, cost, isolation or size 6852bfb103

Eddy current Eddy currents flow in closed loops within conductors, in planes perpendicular to the magnetic field. electromagnetism, an eddy current (also called Foucault's current) is a loop of electric current induced within conductors by a changing magnetic field in the conductor In electromagnetism, an eddy current (also

called Foucault's current) is a loop of electric current induced within conductors by a changing magnetic field in the conductor according to Faraday's law of induction or by the relative motion of a conductor in a magnetic field. When graphed, these circular currents within a piece of metal look vaguely like eddies or whirlpools in a liquid. The magnitude of the current in a given loop is proportional to the strength of the magnetic field, the area of the loop, and the rate of change of flux, and inversely proportional to the resistivity of the material. They can be induced within nearby stationary conductors by a time-varying magnetic field created by an AC electromagnet or transformer, for example, or by relative motion between a magnet and a nearby conductor 6852bfb103

== Definition... == 6852bfb103 Hall thrusters operate on a variety of propellants, the most common being xenon and krypton. Other propellants of interest include argon, bismuth, iodine, magnesium, zinc and adamantane. 6852bfb103 == Definition == 6852bfb103 Electric currents create magnetic fields, which are used in motors, generators, inductors, and transformers. In ordinary conductors, they cause Joule heating, which creates light in incandescent light bulbs. Time-varying currents emit... 6852bfb103 The magnetic moment also expresses the magnetic force effect of a

magnet. The magnetic field of a magnetic dipole is proportional to its magnetic dipole moment. The dipole component of an object's magnetic field is symmetric about the direction of its magnetic dipole moment, and decreases as the inverse cube of the distance from the object. 6852bfb103 Electromagnetic induction has found many applications, including electrical components such as inductors and transformers, and devices such as electric motors and generators. 6852bfb103

Hall-effect thruster propellant is accelerated by an electric field. The Hall-effect thruster is classed as a moderate specific impulse (1,600 s) space propulsion technology and has benefited from considerable theoretical and experimental research since the 1960s. Based on the discovery by Edwin Hall, Hall-effect thrusters use a magnetic field to limit the electrons' axial motion and then use them to ionize propellant, efficiently accelerate the ions to produce thrust, and neutralize the ions in the plume. Based on the discovery by Edwin Hall, Hall-effect thrusters use a magnetic field to limit the electrons' In spacecraft propulsion, a Hall-effect thruster (HET, sometimes referred to as a Hall thruster or Hall-current thruster) is a type of ion thruster in which the propellant is accelerated by an electric field 6852bfb103

In geology and geophysics, Earth's magnetic field gives information about earth's interior while local... 6852bfb103 In the International System of Units (SI), electric current is expressed in units of ampere (sometimes called an "amp", symbol A), which is equivalent to one coulomb per second. The ampere is an SI base unit and electric current is a base quantity in the International System of Quantities (ISQ). Electric current is also known as amperage and is measured using a device called an ammeter. 6852bfb103 The Hall coefficient is defined as the ratio of the induced electric field to the product of the current density and the applied magnetic field. It is a characteristic of the material from which the conductor is made, since its value depends on the type, number, and properties of the charge carriers that constitute the current. 6852bfb103 == Discovery == 6852bfb103 Hall thrusters are able to accelerate their exhaust to speeds between 10 and 80 km/s (1,000–8,000 s specific impulse), with most models operating between 15 and 30 km/s. The thrust produced depends on the power level. Devices operating at 1.35 kW produce about 83 mN of thrust. High-power models have demonstrated up to 5.4 N in the laboratory. Power levels up... 6852bfb103

Hall effect Such potential difference is known as the Hall voltage. It was discovered by

Edwin Hall in 1879 through a study of the electromagnetic theory of James Clerk Maxwell, becoming a critical confirmation of that theory. The Hall effect is the production of a potential difference, across an electrical conductor, that is transverse to an electric current in the conductor The Hall effect is the production of a potential difference, across an electrical conductor, that is transverse to an electric current in the conductor and to an applied magnetic field perpendicular to the current 6852bfb103

Current sensing techniques include shunt resistor, current transformers and Rogowski coils, magnetic-field based transducers and others. 6852bfb103 Magnetic fields are created by magnetic materials and by moving electric charges (including electrical current). The latter is important in creating electromagnets: devices that precisely control magnetic fields by changing the current through the electromagnet. 6852bfb103 The sensed current and the output signal can be: 6852bfb103 A current sensor is a device that detects electric current in a wire and generates a signal proportional to that current. The generated signal could be analog voltage or current or a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition

system, or can be used for the purpose of control. 6852bfb103

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