工程技术英语注释读物

ELECTRICAL ENGINEERING FUNDAMENTALS

电工基础

清华大学外语教研组
英语读物注释小组 编

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编者的话

工程技术英语注释读物按机械、动力、电力、电子、建筑、化工、原子能等不同专业分册出版。文章大部选自原著，力求由浅入深，对其中个别地方作了适当修改。专业内容浅近易懂。附有较详细的注释、参考译文和词汇表，便于读者自学，以培养独立阅读能力。

这本《电工基础》是这套读物电类的第二册之二。第2章至第9章内容选自E. C. 李斯特著《电路和电机》，1975年第5版(E. C. Lister, *Electric Circuits and Machines*, 5ed. 1975)。本校工程力学系热工4班学生参加翻译，该系教师参加审校。

由于编者水平的限制，以及缺乏编写经验，书中肯定存在不少缺点错误，热烈欢迎广大读者提出宝贵的批评意见，以便进一步修改。意见请寄清华大学外语教研室。

编　者

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参考译文

1. ELECTRICAL UNITS

active volt-amperes. Product of the active voltage and the amperes in a circuit, or of the active current (amperes) and the voltage of the circuit; equal to the power in watts. Also termed **active power.**

ampere. MKSA① unit of current flow, such that 1 ampere in two parallel conductors 1 m apart repels itself with a force of 2×10^{-7} newton/m length, the conductors being infinitely thin, long, and in a vacuum.

ampere hour. MKSA unit of charge, equal to 1 ampere passing a point in a circuit for 1 hr.②

ampere-turn. MKSA unit of magnetomotive force, which drives flux through magnetic circuits, arising from 1 ampere flowing round one turn of a conductor. Abbrev.③ **a. t.**

Board of Trade Unit. The commercial unit of electrical energy, equal to 1 kilowatt-hour. Abbrev. **B. T. U.** (Abbrev. **B. O. T.** is obsolete).

calorie. The unit quantity of heat in the CGS system, replaced by the *joule* in the SI④ system. The 15°C calorie (cal_{15}) is the quantity of heat required to raise the temperature of 1 g of water by 1 degree C at

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① **MKSA:** Meter, Kilogram, Second, and Ampere (System) 的缩写。
② **hr:** hour 的缩写，小时。 ③ Abbrev.: Abbreviated 的缩写，缩作。
④ **SI:** 〔法语〕Systeme International d'Unites 的缩写，标准国际单位制。

15°C; this equals 4.1855 J. By agreement the International Table calorie (cal_{IT}) equals 4.1868 J exactly; the thermochemical calorie equals 4.184 J exactly. There are other designations, e. g.,① gramme calorie, mean calorie, and large or kilocalorie (=1000 cal; used particularly in nutritional work). This proliferation in nomenclature has occasioned the call for the abandonment of the calorie in favour of the joule.

coulomb. MKSA unit of electric charge, realized by 1 amp passing a point in a circuit or across a surface in 1 sec. Symbol **Q**, abbrev. **C.**

dyne. The unit of force in the CGS system of units. A force of one dyne, acting on a mass of 1 g, imparts to it an acceleration of 1 cm/sec². Approximately 981 dynes are equal to 1 g weight. 10^5 dynes=1 newton.

erg. Unit of work or energy. In the CGS metric system, the *erg* is the work done by a force of 1 dyne moving through 1 cm in the direction of force; the SI unit, the *joule*, is equal to 10^7 ergs and is the work done by a force of 1 newton moving through 1 m in the direction of force. The foot-pound force (ft lbf) of the British system = 1.356 joules.

farad. The practical and absolute MKSA unit of electrostatic capacitance, defined as that which, when charged by a p. d.② of one volt, carries a charge of one coulomb. Equal to 10^{-9} electromagnetic units and 9×10^{11} electrostatic units. Symbol **F.** This unit is in practice too large, and the subdivisions, *microfarad* (μF), *nano-*

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① **e.g.** = for example 例如。 ② **p.d.**: potential difference 的缩写，电位差。

farad (nF), and *picofarad* (pF), are in more general use.

gauss. CGS electromagnetic unit of magnetic flux density; equal to 1 maxwell/cm^2, each unit magnetic pole terminating 4π lines.

gilbert. In the CGS electromagnetic system of units, m.m. f.① of an enclosing coil equal to $10/4\pi$ ampere-turn.

henry. MKSA unit of self and mutual inductance, such that electromotive force of one volt is induced in a circuit by current variation of one ampere per second. Symbol **H.**

horse power.② The mechanical engineering unit of power, equivalent to working at the rate of 33,000 ft lb/min, or 42.41 B. t. u./min, or 746 watts. Abbrev. **h. p.**

joule. SI unit of work, energy, and heat, equal to work done when a force of 1 newton advances its point of application 1 m. One joule = 10^7 ergs = 0.2390 calorie.

maxwell. The CGS unit of magnetic flux, the MKSA (or SI) unit being the *weber*. One maxwell = 10^{-8} weber.

mho. Name for the reciprocal of the ohm in the CGS system.

newton. Symbol **N.** The unit of force in the MKS system, being the force required to impart, to a mass of 1 kg, an acceleration③ of 1 m/sec.

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① m.m.f.: magnetomotive force 的缩写，磁(动)势。 ② **horse power:** 这里是指英制马力 (h.p.)。还有一种公制马力 (P.S. 即德语 Pferdestärke 的缩写)，1PS=75 kgw-m/s = 0.7355 kW。1PS=0.9859 h.p. ③ **acceleration:** 加速度，是 impart 的直接宾语，中间隔了间接宾语 mass.

oersted. Unit of field strength in CGS electromagnetic units system, such that 2π oersted is field produced at the centre of a circular conductor, 1 cm in radius, carrying 1 abampere (10 amperes). In the MKSA (or SI) system 1 oersted $= \frac{1000}{4\pi}$ ampere/meter.

ohm. Unit of electrical resistance, such that 1 ampere through it produces a potential difference of 1 volt. Symbol Ω.

reactive volt-amperes. Product of the reactive voltage and the amperes in a circuit, or the reactive current (amperes) and voltage of the circuit; measure of the wattless power in the circuit. Abbrev. **var** *(volt-amperes-reactive).*

var. Abbrev. for **v**olt-**a**mperes **r**eactive. Unit of reactive power. See **reactive volt-amperes.**

volt. MKSA unit of potential difference, electrical potential or e. m. f., such that the pd across a conductor is 1 volt when 1 ampere in it dissipates 1 watt of power. This is 1 joule/sec, or 10^7 erg/sec, a mechanical unit.

volt-amperes. Product of actual voltage (in volts) and actual current (amperes), both r. m. s.,① in a circuit. See **active volt-amperes, reactive volt-amperes.**

volt-ampere-hour. MKSA unit of apparent power, equivalent to the watt-hour.

watt. MKSA unit of electric power, equal to 1 joule/sec or 10^7 erg/sec. Thus, 1 horse-power (h. p.) equals 746 watts. Symbol **W.**

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① r.m.s.: root mean square 的缩写,均方根值。

watt-hour. MKSA unit of electrical energy, being the work done by 1 watt acting for 1 hour, and thus equal to 3600 joules or 3.6×10^{10} erg.

weber. MKSA unit of magnetic flux. An e. m. f. of 1 volt is induced in a circuit through which the flux is changing at a rate of 1 weber per sec. The weber is equal to 10^8 maxwell. It is also used as the MKSA unit of magnetic pole strength. Abbrev. **Wb.**

2. FUNDAMENTAL UNITS

While the exact nature of electricity is unknown, a great deal is known about what it can do. By the mere closing of a switch, buildings are lighted, wheels are turned, ice is made, food is cooked, distant voices are heard, and countless other tasks—ordinary and extraordinary—are performed. Although a great number of uses for electricity have been discovered and applied, the field is by no means① exhausted. Electric machines and devices that have been in use for many years are being improved and are now finding wider fields of application. Extensive research is constantly bringing forth and developing new devices. Much is still to be learned② about electricity.

Electricity is a convenient form of energy. It is well known that when fuels such as coal, oil, and gas are burned, energy is released. A waterfall, whether it is man-made or natural, also possesses energy. Yet, to be of value③, this energy must

① **by no means**: 决没有；决非。 ② **is (still) to be learned**: (仍然)有待于研究。to be learned 是动词不定式 to learn 的被动态。be+ to *-inf.* 表示"打算，将要，就得，应该"等意思。 ③ **to be of value** = in order to be of value: 为了具有价值起见。