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## Principle of dynamometer type wattmeter

This is also similar in design and principle to the dynamometer type ammeter and voltmeter. **Pic 1 Construction:** In the dynamometer type instrument is used as a wattmeter, the fixed coil, which is divided into two equal portions, the fixed coils are connected in series with the load and carry the circuit (or load) current, therefore it is also called as current coil. The moving coils is connected across the load and carries the current proportional to the voltage across the circuit. Therefore, it is known as pressure coil or potential coil. A high non-inductive resistance 'R' is connected in series with the moving coil to limit current through it. The magnetic field of the fixed and moving coils react on one another causing the moving coil to turn about its axis. The movement of the coil is controlled by hair springs also lead the current into and out of the moving element. Damping torque is provided by the air friction. **Working:** When the instrument is connected in the circuit as shown in the below fig. the main circuit current  $I_1$  passes through the current coil and the current,  $I_2$  is proportional to the voltage to be measured passes through the pressure coil. Due to the current in the two coils. Mechanical force exists between them. The result is that the moving coil moves causing that pointer to deflect on a graduated scale. The pointer move till deflecting torque is equal to controlling torque. The reversal of current through the fixed and moving coils reverses the field due to both the coil hence, the deflecting torque remains unchanged. Therefore these instruments can be used on A.C power measurements. With neat diagram explain constructional details of dynamometer type wattmeter. Please log in or register to add a comment. **Page 2 Systematic errors:** -  $\rightarrow$  Instrumental Error: These errors are caused due to the mechanical structure of measuring instrument. a) Inherent shortcomings of instruments: Instrument may read too low or too high. b) Improper use of instruments: Improper handling e.g. overloading, overheating, failure to adjust zero, use of high resistance leads. c) Loading effect: cause distortion in original signal.  $\rightarrow$  Environmental Error: These are because of surrounding conditions such as temperature, pressure, humidity, dust, vibrations, or external magnetic fields or electrostatic fields.  $\times$  Observational Error: Parallax errors, incorrect multiplying factor. **Page 3 List the different types of frequency meters.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 4 Define energy.** Write unit of it. asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 5 Compare primary and secondary instruments.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 6 State the significance of power factor.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 7 State any two disadvantages of one wattmeter method of measurement of 3 phase power.** Please log in or register to add a comment. **Page 8 State various types of errors in wattmeter.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 9 State the function of controlling torque in electrical measuring instrument.** Please log in or register to add a comment. **Page 10 Define:** (i) Resolution, (ii) Calibration, with reference to electrical measuring systems. Please log in or register to add a comment. **Page 11 What is meant by energy meter constant?** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 12 List any two applications of CRO.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 13 Methods of providing damping torque in indicating type instruments:** 1) Air friction damping, 2) Fluid friction damping, 3) Eddy current damping. Please log in or register to add a comment. **Page 14 State the range for low and medium resistance.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 15 State the function of controlling torque.** Write two types of it. Please log in or register to add a comment. **Page 16 With neat diagram explain calibration of energy meter by direct loading method.** Please log in or register to add a comment. **Page 17 Explain V- I method of measurement of medium resistance.** Please log in or register to add a comment. **Page 18 1. Vertical amplifier strengthens the input signal applied to vertical depleting plates 2. Trigger circuit gives input to time base circuit 3. The output of time base generator is amplified by horizontal amplifier and then applied to horizontal deflecting plates of CRT 4. CRT consists of electron gun assembly which include thermally heated cathode, accelerating anode, focusing anode 5. The electron beam coming out from electron gun assembly enters to deflecting plates. 6. The screen of CRT internally coated with Phosphors material on which we observe waveform of the input signal. Please log in or register to add a comment. **Page 19 Applications of Function Generator:** 1. To test the bandwidth of audio frequency amplifier 2. It can produce sine wave, triangle wave, saw tooth wave, even arbitrary waveform. 3. Function generator has a very wide frequency range, it is an indispensable universal signal source 4. Function generators can be used for production, testing, equipment maintenance and laboratory testing 5. It is also widely used in other areas of science and technology, such as medicine, education, chemistry, communication, earth physics, industrial control, military and aerospace etc. 6. Used for troubleshooting of different analog and digital circuits 7. Acts as source for alignment of receivers. **Page 20 Construction & Working of Attraction Type M.I. Instrument:** Construction: It consists of a coil which is mounted vertically near the spindle carrying an oval shaped soft iron disc, called moving iron. The spindle also carries pointer, balance and control weights, airdamping vane etc, as shown in figure. **Working:** When the instrument is connected in circuit, an operating current flows through the coil, this current sets up magnetic field and oval shaped moving iron is so magnetized that force is exerted on it by which it moves from the weaker field outside the coil to the stronger field inside the coil or in other words the moving iron is attracted in, resulting the movement of pointer on the scale from zero position to give the reading. The controlling torque is provided by spring and damping torque is provided by air friction damping with the help of light aluminium piston. Whatever may be the direction of current, the moving iron is always attracted inside the coil, making the instrument suitable for measurement of both DC as well as AC quantities. The force of attraction is proportional to the square of current in the coil. **Page 21 Explain working of Weston type frequency meter.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 22 Explain spring control method with neat diagram.** asked Sep 5, 2018 by anonymous Please log in or register to add a comment. **Page 23 Procedure for Calibration of Ammeter:** In this method, DC potentiometer is used for measurement of voltage across a standard low resistance.  $\bullet$  Connect the circuit as shown in the figure, the ammeter to be calibrated is connected in series with standard resistance and regulating resistance  $R_g$ .  $\bullet$  By varying  $R_g$ , voltage across potentiometer (S) is measured. Before measurement potentiometer is required to be standardized. At the same time current through ammeter is also measured (I). i.e. reading of ammeter under calibration. The sub-standard or calibrated meter and meter under test are connected in series and readings are noted for corresponding currents.  $\bullet$  At each step, true value of ammeter is calculated as, where,  $V_s$  = Voltage across potentiometer S = resistance of potentiometer And the currents are compared for finding out error in ammeter. **Page 24 Explain construction & working of electro-dynamometer type wattmeter.** Please log in or register to add a comment. **Page 25 List the different errors in wattmeter & explain compensation for it.** Please log in or register to add a comment. **Page 26 How range of A.C. ammeter & A.C. voltmeter is extended?** Draw suitable diagram. Please log in or register to add a comment. **Wattmeter is an electric instrument which is used to measure the electric power of various electric circuits.** It consists of a current coil and a voltage coil. These instruments are widely used in transmission and distribution of electric power and these are also used for protection purposes. Wattmeters measures power of various electric circuits. It works on power formula The exact wattmeter reading formulas are given below: **Wattmeter Reading in Single Phase = Power in load ( $V I \cos \phi$ ) + power in current coil ( $I^2 R$ )** **Wattmeter Reading in Single Phase =  $V I \cos \phi + I^2 R$**  **Three Phase Wattmeter Reading =  $\sqrt{3} (V I \cos \phi + I^2 R)$**  Wattmeters are of two types given below: **Dynamometer Type Wattmeter** **Electro-dynamometer /Dynamometer Type Wattmeter Working Principle** **Dynamometer Type Wattmeters** are moving coil instruments and their operating field is produced in by another fixed coil. These instruments consist of a fixed coil having two equal sections which are parallel to each other. These two fixed coils are air-cored to avoid from hysteresis losses. When alternating current passes through the fixed coil, it produces magnetic effect and moving coil starts moving and a pointer is attached to the moving coil with a spring and it starts moving when moving coil moves. Advantages of Dynamometer Type Wattmeter These instruments are made to give very high accuracy and these are used as a standard for calibration purposes. These instruments provide full accuracy on direct current (DC). Disadvantages of Dynamometer Type Wattmeter These instruments cannot provide full accuracy on alternating Current (AC). These instruments cause errors at low power factor. **Working Principle Induction Type Wattmeter** These instruments are used on both AC and DC supplies. These wattmeters provide accurate readings only when frequency and supply voltages are constant. These wattmeters consists of two laminated electro magnets and one of them is excited by the current with exciting winding. This winding is connected in series of the circuit. The other magnet is excited by the current which is proportional to the current. Its exciting coil is connected in parallel with the circuit. The winding of first magnet carries line current and the other coil carries voltage and is highly inductive. This coil is connected to the supply and the flux lags 90 behind the voltage. The torque is produced and is proportional to the power in the load circuit. The torque acts on the disc and force is produced in the disc. The disc starts moving and the pointer is attached on it with a spring and it shows reading on its scale. These wattmeters are used in various laboratories, industries for specific purposes. These wattmeters plays an important role in measurement of power in distribution and transmission of power. **Image Source****

working principle of dynamometer type wattmeter. construction and working principle of dynamometer type wattmeter. basic principle of dynamometer type wattmeter



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