WATTHOUR METERS

Watthour meters are classified into two kinds; one is for single phase use and for measuring the domestic power consumption, the other for 3 phase use to measure a large power consumption at factories and other consumers of large power demand.

Construction

They are roughly made out of the following components.

1. Base and cover
2. Frame
3. Voltage element
4. Current element
5. Damping magnet
6. Rotor and bearings
7. Register (cyclometer)
8. Terminal box and terminal cover
9. Adjusting devices

Specific features

1. As for the load characteristics, single phase meters must work with the range of the nominal error up to 400% of the rated current, while 3 phase meters up to 200%. They are also capable of standing continuous overload up to 300% for single phase units and up to 200% for 3 phase units.
2. Because of temperature compensation devices, errors due to the ambient temperature difference is very small.
3. Special treatment is given so as to fully stand outdoor service.
4. Very high mechanical factor of merit on account of a small natural constant of meters and large driving torque.
5. The damping magnet, being small in size and light in weight, is made of powerful, precipitation-hardened MK steel magnet, assuring high durability of meters.
6. Large form of characters are used for the letterings of register so as to make them legible.
7. Each adjusting device is made of micrometer system having little mutual interference.
8. Very small power losses of elements.
9. Vibration and shock-proof, both electrically and mechanically sturdy and assured of long life.

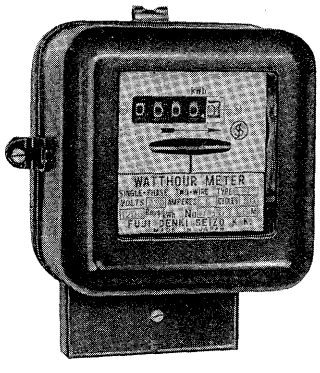


Fig. 1 E-7 Type with metal cover

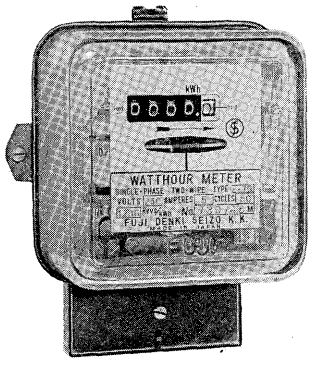


Fig. 1a E-7G Type with glass cover

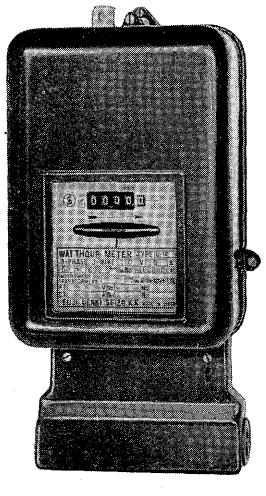


Fig. 2 D-IR Type with metal cover, extended terminal cover and reverse rotation preventing device

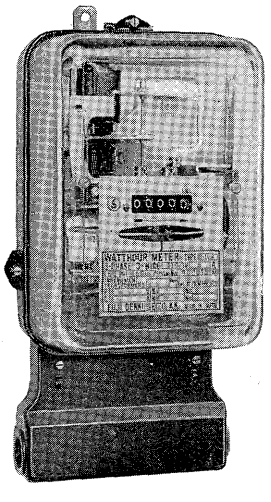


Fig. 2a D-IGR Type with glass cover, extended terminal cover and reverse rotation preventing device

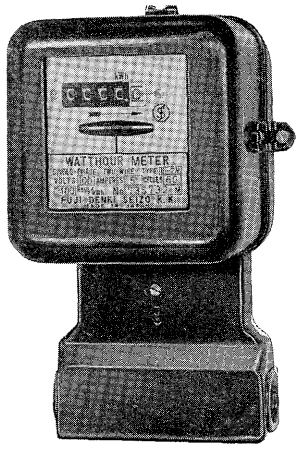


Fig. 3 E-7R Type with metal cover, extended termenal cover and reverse rotation preventing device

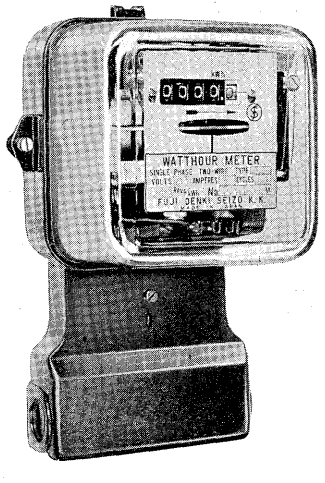


Fig. 3a E-7GR Type with glass cover, extended terminal cover and reverse rotation preventing device

Specification :

Single-phase Two Wire and Three-phase Three wire Watthour Meters

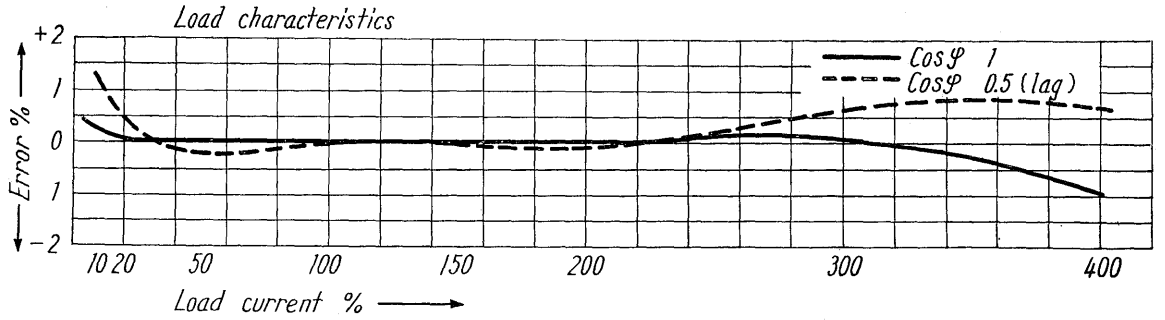
Rated value			Constant of meter Rev/kWH		Reading of counting board kWH		Gear ratio	
Voltage (V)	Current (A)	Frequency (c/s)	Single phase	Three phase	Single phase	Three phase	Single phase	Three phase
100—110	5	50, 60	2400	2000	0000.0	0000.0	50/1×80/10×60/10	50/1×80/10×55/11
	10		1200	1000	0000.0	0000.0	50/1×72/18×60/10	50/1×72/18×55/11
	20		600	500	0000.0	0000.0	50/1×60/30×60/10	50/1×60/30×55/11
	30		400	333⅓	0000.0	0000.0	50/1×52/39×60/10	50/1×52/39×55/11
200—220	5	50, 60	1200	1000	0000.0	0000.0	50/1×72/18×60/10	50/1×72/18×55/11
	10		600	500	0000.0	0000.0	50/1×60/30×60/10	50/1×60/30×55/11
	20		300	250	00000	00000	50/1×80/ 8 ×60/10	50/1×80/ 8×55/11
	30		200	166⅔	00000	00000	50/1×80/12×60/10	50/1×80/12×55/11

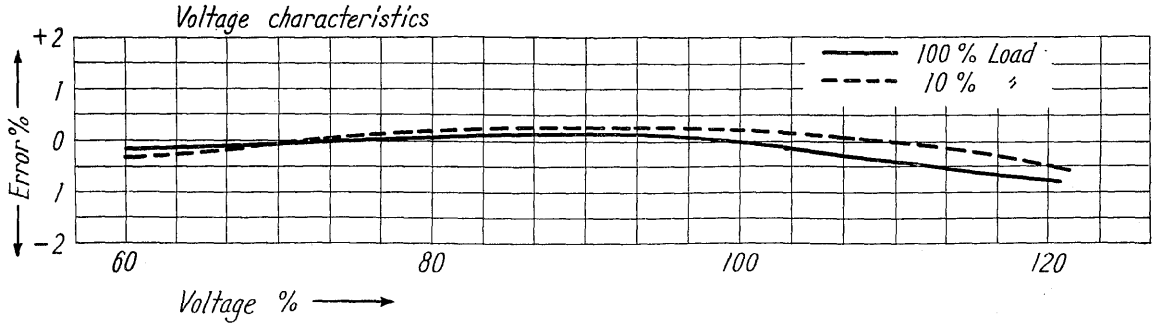
Item	Single phase	Three phase
Starting current	Start and continuously run at below 0.5% of the rated current	Same as left
Voltage creep	None at the voltage over 110% of the rated voltage	,,
Overload	200% continuously, but in case of up to 20A	,,
Full-load torque (T)	4.0 gr.—cm	8.0 gr-cm
Rotor weight (W)	22 gr.	59 gr
Torque/rotary part weight	0.182	0.135
Performance factor $\left(\frac{T}{W\times S}\times 100\right)$	0.91	0.469
Full-load rotating speed (S)	20 r.p.m.	28.86 r.p.m.
Insulation resistance	More than 10 meg. ohm by D.C. 500 V meggar	Same as left
Dielectric strength	Withstandable A.C. 2000 V 1 min.	,,

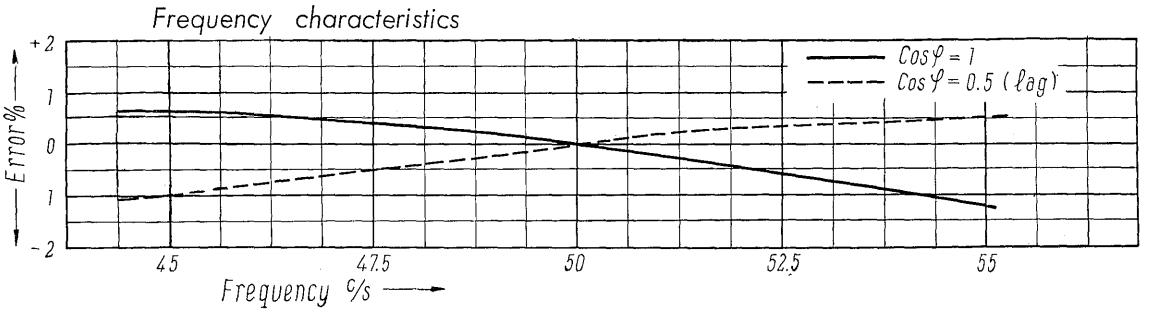
	Rating	Voltage circuit								Current circuit							
		Single phase				Three phase				Single phase				Three phase			
		100/110V		200/220V		100/110V		200/220V									
		50~	60~	50~	60~	50~	60~	50~	60~	5A	10A	20A	30A	5A	10A	20A	30A
Constant for Electric Circuit	Apparent power (VA)	3.1	2.7	3.7	3.1	3.0	2.6	3.6	3.0	0.88	0.81	0.75	0.76	0.94	0.85	0.78	0.78
	Exciting current (mA)	31	27	18.5	15.5	30	26	18	15	—	—	—	—	—	—	—	—
	Watt loss (W)	0.8	0.75	0.8	0.75	0.8	0.75	0.8	0.75	0.75	0.75	0.85	0.85	0.85	0.85	0.85	0.85
	Voltage drop (V)	—	—	—	—	—	—	—	—	0.18	0.081	0.038	0.026	0.19	0.085	0.039	0.029
	Resistance (Ω)	390	390	1260	1260	390	390	1260	1260	0.016	0.0045	0.0041	0.00062	0.024	0.0068	0.0015	0.00064

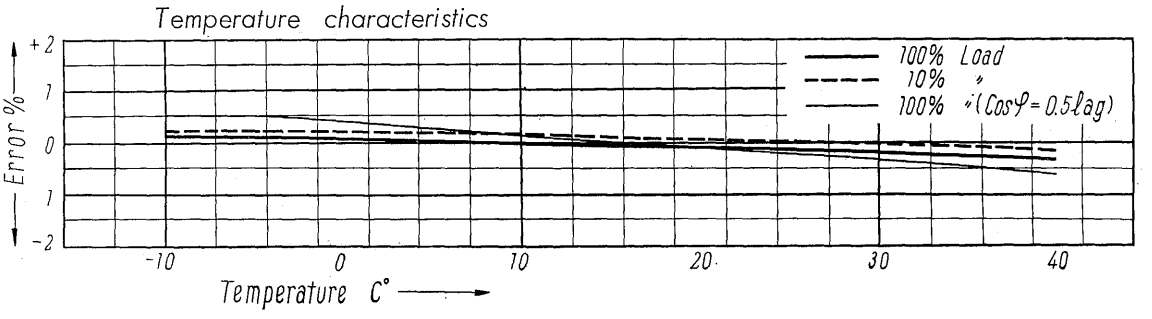
Tables of Various Characteristics

1) Single phase watthour meter

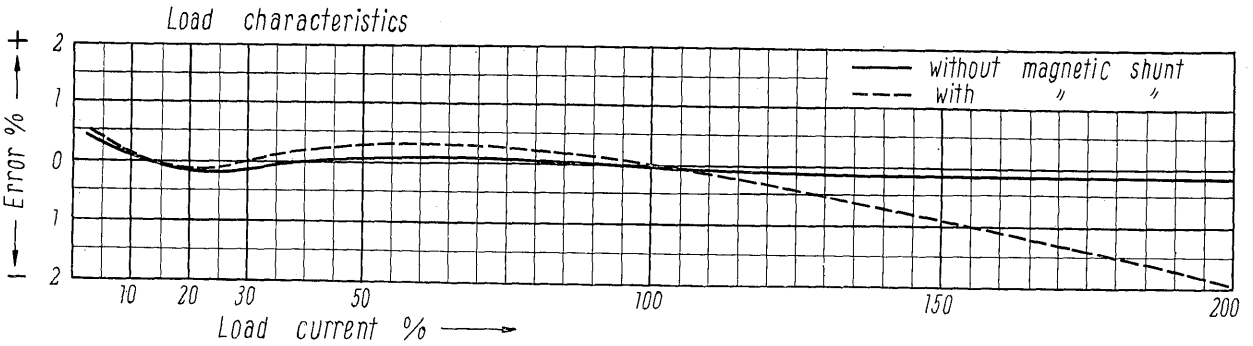


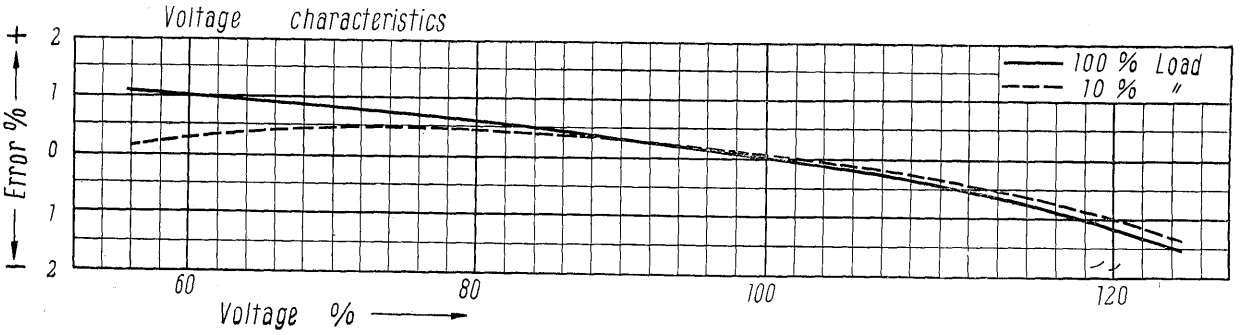


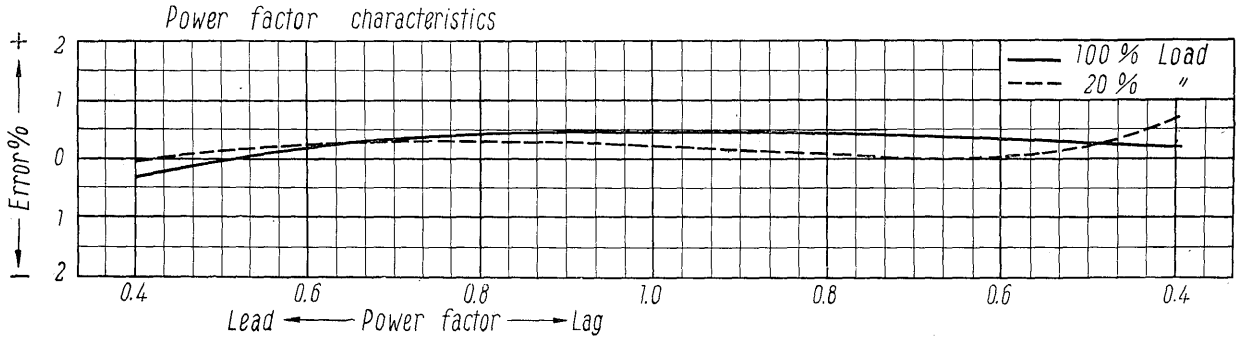


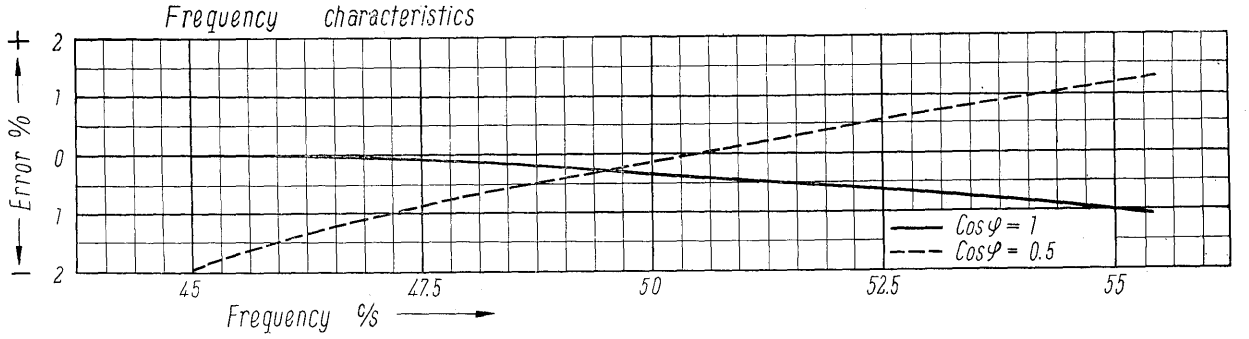


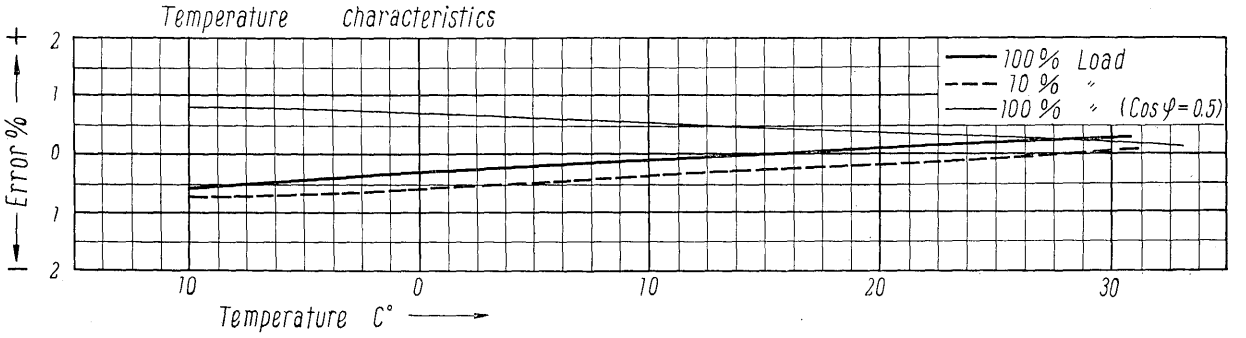
2) Three-phase watthour meter





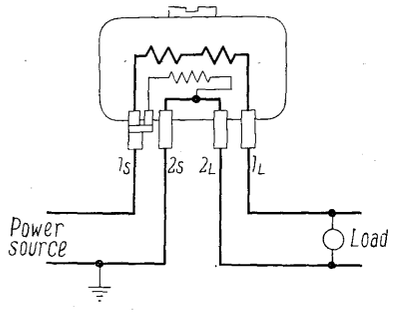




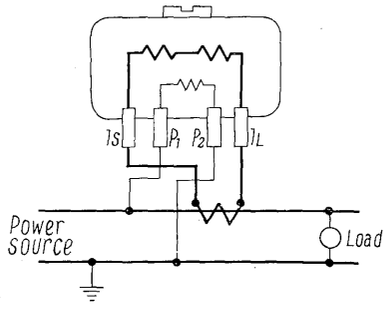


Connection Diagram

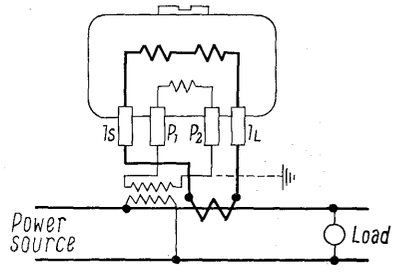
1) Single phase watthour meter



in case of direct connection

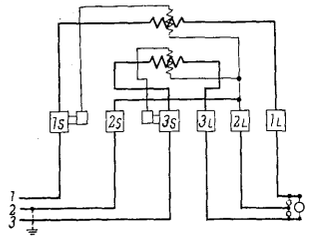


in case current transformer is attached

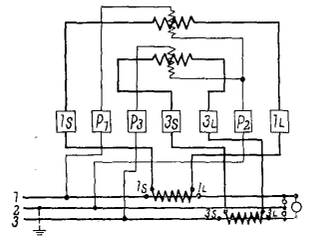


in case voltage and current transformer are attached

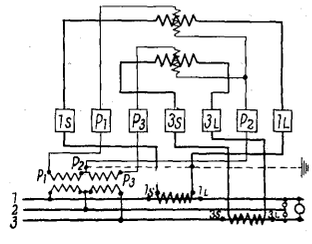
2) Three phase watthour meter



Direct connection



Connection with current transformer



Connection with current and potential transformers