Energy Meter Multiplying Factor from CT and PT Ratios

Multiplying factor of a CT- and PT-operated energy meter from the installed and meter-programmed ratios, and the actual energy from the meter reading difference.

Method: MF = (CT ratio × PT ratio) / ratios set in the meter

Input parameters

Unit system: SI

Parameter	Value	Unit
CT primary current	200.00	A
CT secondary current	5.0000	A
PT primary voltage (equal to secondary if no PT)	11,000	V
PT secondary voltage	110.00	V
CT ratio programmed in the meter (1 = none)	1.0000	
PT ratio programmed in the meter (1 = none)	1.0000	
Meter reading difference	1,500.0	kWh

Calculated results

Parameter	Value	Unit
Installed CT ratio	40.000	
Installed PT ratio	100.00	
Multiplying factor	4,000.0	
Actual energy	6,000,000	kWh

Notes for this case

- If the meter is programmed with the full CT and PT ratios it reads primary energy directly and the factor is 1; check the meter's display settings.

Formula and method

$$k_{CT} = I_1 / I_2, \quad k_{PT} = U_1 / U_2$$

$$MF = \frac{k_{CT}\, k_{PT}}{k_{CT,m}\, k_{PT,m}}$$

$$E = MF \cdot \Delta R$$

Variables

I_1	CT primary current	A
I_2	CT secondary current	A
U_1	PT primary voltage	V
U_2	PT secondary voltage	V
$k_{CT,m}$	CT ratio programmed in the meter	-
$k_{PT,m}$	PT ratio programmed in the meter	-
ΔR	meter reading difference	J
k_{CT}	installed CT ratio	-
k_{PT}	installed PT ratio	-
MF	multiplying factor	-
E	actual energy	J

Method and standards

A transformer-operated meter sees secondary quantities; the multiplying factor restores primary energy. Whatever ratio is already programmed into the meter is divided out.

Assumptions and limits

- Ideal CT and PT ratios; instrument transformer errors not included.

References

- MF = (CT ratio × PT ratio) / ratios set in the meter

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/power/energy-meter-multiplying-factor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.