# Using the PQM Power Quality Meter for single-phase three-wire systems

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## Scope

**PURPOSE**

The purpose of this application note is to explain how to use the GE Multilin PQM Power Quality Meter for single-phase three-wire systems.

**SETUP**

The current and voltage inputs to the meter are connected as shown in Figure 1 on page 2.

**METER SETTINGS**

The PQM setpoints are as follows. In the **S2 SYSTEM SETUP ⇨⇩ CURRENT/VOLTAGE CONFIGURATION MENU**, set:

**PHASE CT WIRING**: “PHASES A, B AND C”
**PHASE CT PRIMARY**: “200 A”
**NEUTRAL CURRENT SENSING**: “OFF”
**VT WIRING**: “4 WIRE WYE / DIRECT”
**NOMINAL DIRECT INPUT VOLTAGE**: “240 V”
**NOMINAL SYSTEM FREQUENCY**: “60 Hz”

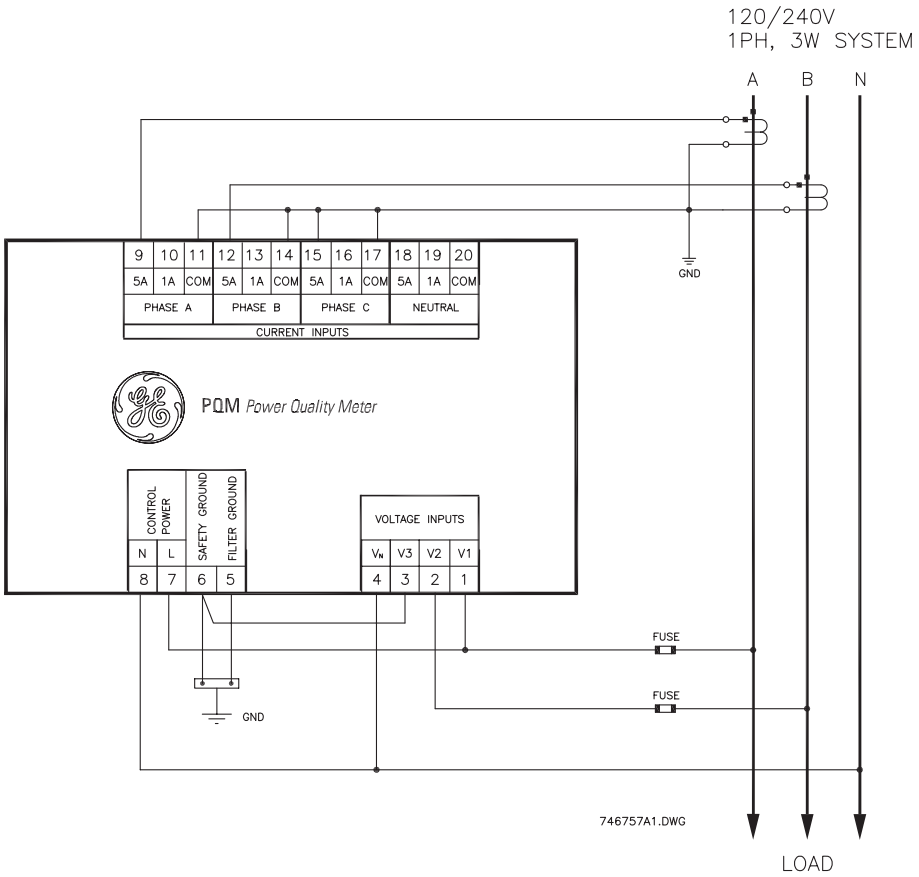


**FIGURE 1. Single-phase three-wire system wiring**

## Power Calculations with an Example

**TOTAL POWER**

For three phase CT and VT wiring, the PQM meter calculates power in individual phases and sums to give total power as follows

$$\begin{aligned} \text{total power} &= P_a + P_b + P_c \\ &= V_{an}I_a\cos\phi + V_{bn}I_b\cos\phi + V_{cn}I_c\cos\phi \end{aligned} \qquad \text{(EQ 1)}$$

**EXAMPLE**

Assume a 240 V single-phase three-wire system with load of 200 A and a power factor angle of 30° lagging. In this case, we have:

$V_{ab}$ = 240 V,
load current = 200 A, and
phase angle ($\phi$) = 30° lagging

The calculated power using the single phase power equation is:

$$\begin{aligned} P &= VI\cos\phi \\ &= 240\ \text{V} \times 200\ \text{A} \times \cos(30°) = 41.568\ \text{kW} \end{aligned} \quad \text{(EQ 2)}$$

To determine the power calculated by meter, we have the voltages measured by meter:

$V_{an}$ = 120 V $\angle$0°
$V_{bn}$ = 120 V $\angle$180°
$V_{cn}$ = 0 V

Assume a CT ratio of 200:5 = 40. The currents measured by meter are:

$I_a$ = 5 A $\angle$–30°
$I_b$ = 5 A $\angle$150°
$I_c$ = 0 A

The power calculated by the meter is:

$$\begin{aligned} \text{total power} &= P_a + P_b + P_c \\ &= V_{an}I_a\cos\phi + V_{bn}I_b\cos\phi + V_{cn}I_c\cos\phi \\ &= 120\ \text{V} \times 5\ \text{A} \times 40 \times \cos 30° + 120\ \text{V} \times 5\ \text{A} \times 40 \times \cos 30° + 0 \\ &= 20.784\ \text{kW} + 20.784\ \text{kW} \\ &= 41.568\ \text{kW} \end{aligned} \quad \text{(EQ 3)}$$