

Site: _____

Location: _____

Date: _____ Time: _____

Engineer: _____

Measurement Point	ZM-100 Mode	Voltage V(source)	Impedance Z(s)	Short Circuit Current - I(sc)	Measurement Voltage - V(m)
L1-L2	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L2-L3	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L3-L1	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L1-N	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L2-N	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L3-N	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					
L1-G	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
	<input type="checkbox"/> <input type="checkbox"/>	VAC	Ω	kA	VAC
Average					

Notes

1. Multiple readings may be required due to facility voltage flicker or instability
2. Line Neutral readings should only be made on Wye Systems (optional)
3. Line-Ground readings may apply dangerous voltages to earth (optional)
4. To determine transformer impedance, make one set of primary measurements and one set of secondary measurements

Determining Current Capacity from KVA (Single Phase)

1. Identify Source KVA	KVA	15 KVA
2. Identify Nominal Voltage	Volts	240 VAC
3. Calculate Current	$KVA \times 1000 / Volts = Amps$	$15 \times 1000 / 240 = 62.5 Amps$

Determining Current Capacity from KVA (Three Phase)

1. Identify Source KVA	KVA	112.5 KVA
2. Identify Nominal Voltage	Volts	480 VAC
3. Calculate Current	$KVA \times 1000 / (Volts \times 1.732) = Amps$	$112.5 \times 1000 / (480 \times 1.732) = 135.3 Amps$

Determining Voltage Drop

1. Measure Mains Impedance	Ohms	0.150 Ω
2. Identify Current Capacity or Demand	Amps	30 Amps
3. Calculate Voltage Drop	$Ohms \times Amps = Volt Drop$	$0.150 \Omega \times 30 = 4.5 Volts$
4. Calculate Percentage Voltage Drop	$Volt Drop / Nominal Voltage$	$4.5 Volts / 208 VAC = 0.0216 = 2.16\%$

Normalizing Impedance

Calculating impedance drops is much easier if you convert all measured impedances (ohms) to the same voltage level. In most cases, using the load voltage makes the most sense. This is commonly used to determine the impedance of a step-up or step-down transformer.

1. Measure Mains Impedance at Source	Ohms	0.150 Ω @ 480 VAC
2. Identify Source Voltage	Volts	480 VAC
3. Identify Load Voltage	Volts	208 VAC
4. Normalize Impedance	$Source Impedance \times Load Voltage^2 / Source Voltage^2$	$0.150 \Omega \times 208^2 / 480^2 = 0.028 \Omega @ 208 VAC$

Transformer Impedance

Transformer impedance is usually listed on the nameplate. However, this impedance is usually based on maximum temperature and load conditions (worst-case). Actual impedance, measured on site and with specific application load current and temperature, is generally less than the nameplate rating.

1. Identify Transformer KVA	KVA	150 KVA
2. Identify Primary Voltage	Volts	480 VAC
3. Identify Secondary Voltage	Volts	208 VAC
4. Measure Primary Impedance	Ohms	0.050 Ω
5. Measure Secondary Impedance	Ohms	0.034 Ω
6. Normalize Primary Impedance	$Primary Impedance \times Sec Voltage^2 / Pri Voltage^2$	$0.050 \Omega \times 208^2 / 480^2 = 0.0094 \Omega @ 208 VAC$
7. Determine Transformer Impedance in Ohms	$Secondary Impedance - Primary Impedance$	$0.034 \Omega - 0.0094 ohms = 0.0246 \Omega @ 208 VAC$
8. Calculate Transformer Secondary Current	$KVA \times 1000 / (Sec. Volts \times 1.732)$	$150 \times 1000 / (208 \times 1.732) = 416.4 Amps$
9. Calculate Transformer Voltage Drop	$Transformer Ohms \times Secondary Current$	$0.0246 \Omega \times 416.4 Amps = 10.24 Volts$
10. Calculate Transformer Impedance	$\% Impedance = Transformer Voltage Drop / Sec Voltage$	$10.24 Volts / 208 Volts = 0.0492 = 4.92\%$