



*Focus on Winning*  
Implement - Execute - Achieve

## **Siemens Canada A&D**

### **Large Drives Applications**

# Medium Voltage Drives For Speed Control

Presented By:

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**Primary Benefit of Speed Control  
is**

**PROFITABILITY**

Other Benefits of Speed Control are

**Flexibility  
Control  
Availability  
Reduced Inrush Current  
Over Speed Capability**



# More than Energy Savings

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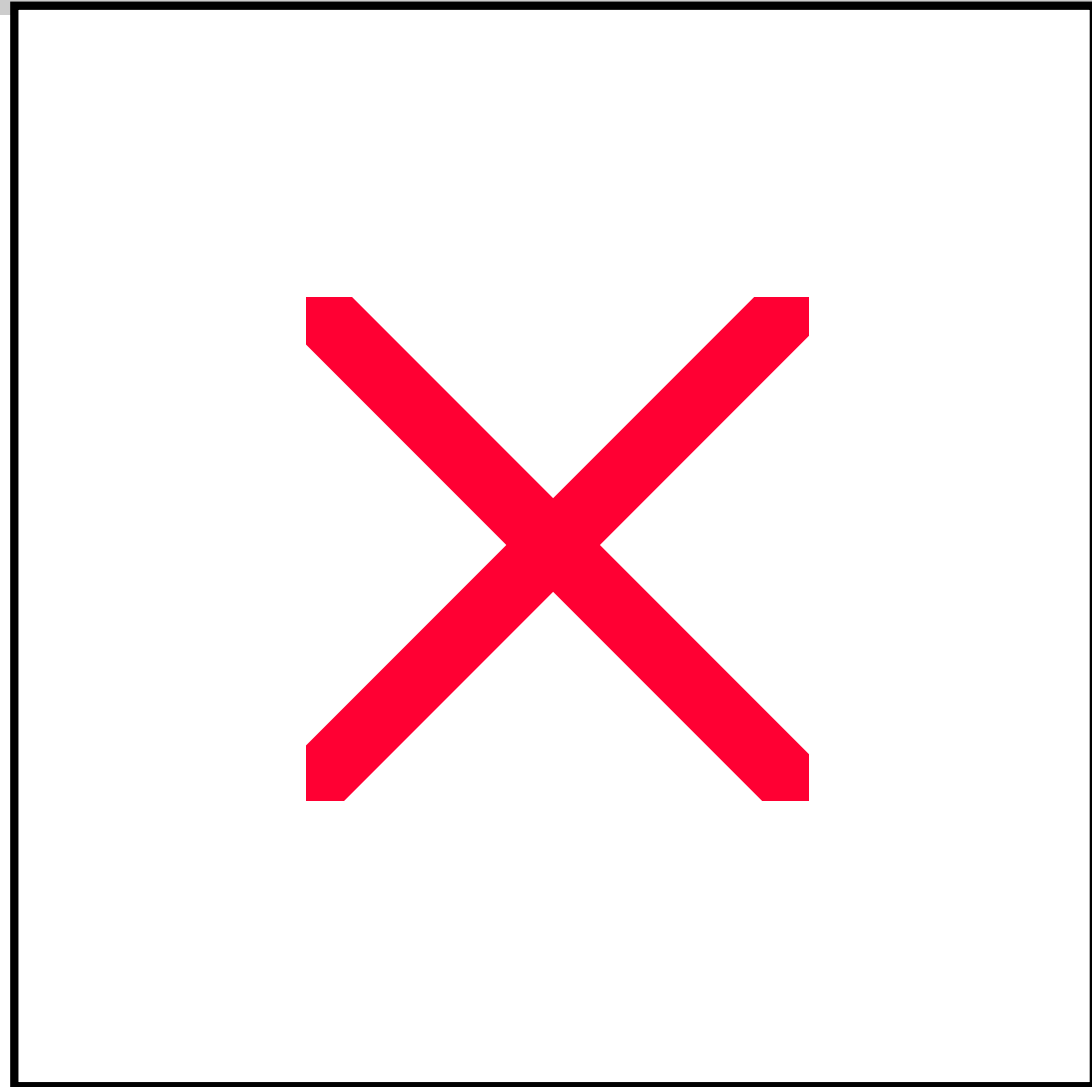
## Impact on mechanical systems

- **Mechanical wear reduced**
  - Longer life of gear
  - Less frequent rebuilds
  - Water-hammer / shock loading reduced
  
- **Overspeed possible**
  
- **Synch transfer (one VFD starts/operates multiple motors)**
  - Various HP's o.k.
  - MV only



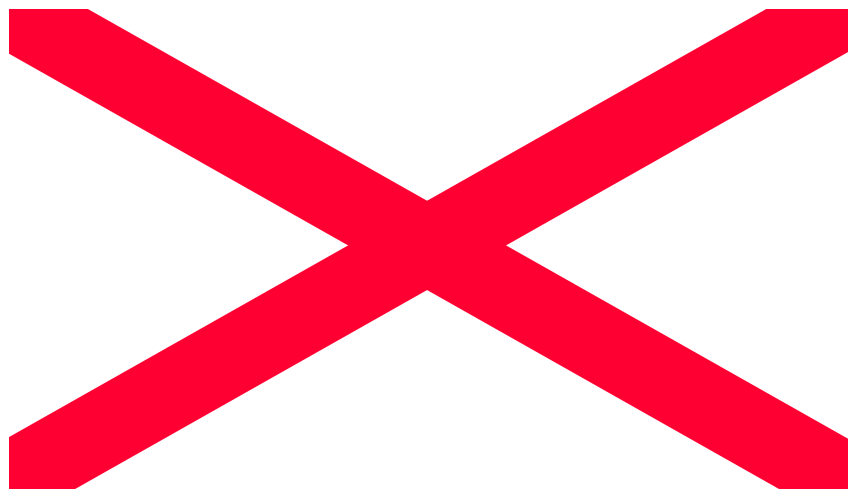
# Speed-torque Curve – Full Voltage, 60 Hz. Line-start

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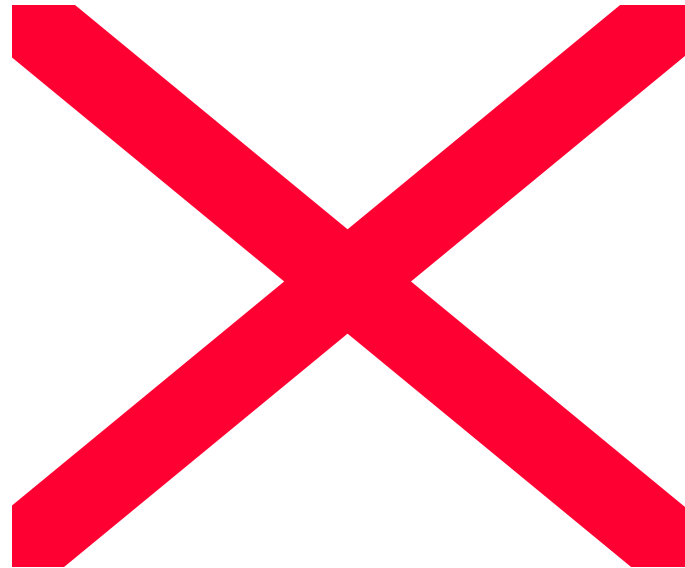
# Induction Motor Starting Options





# Varying the Motor Voltage AND Frequency

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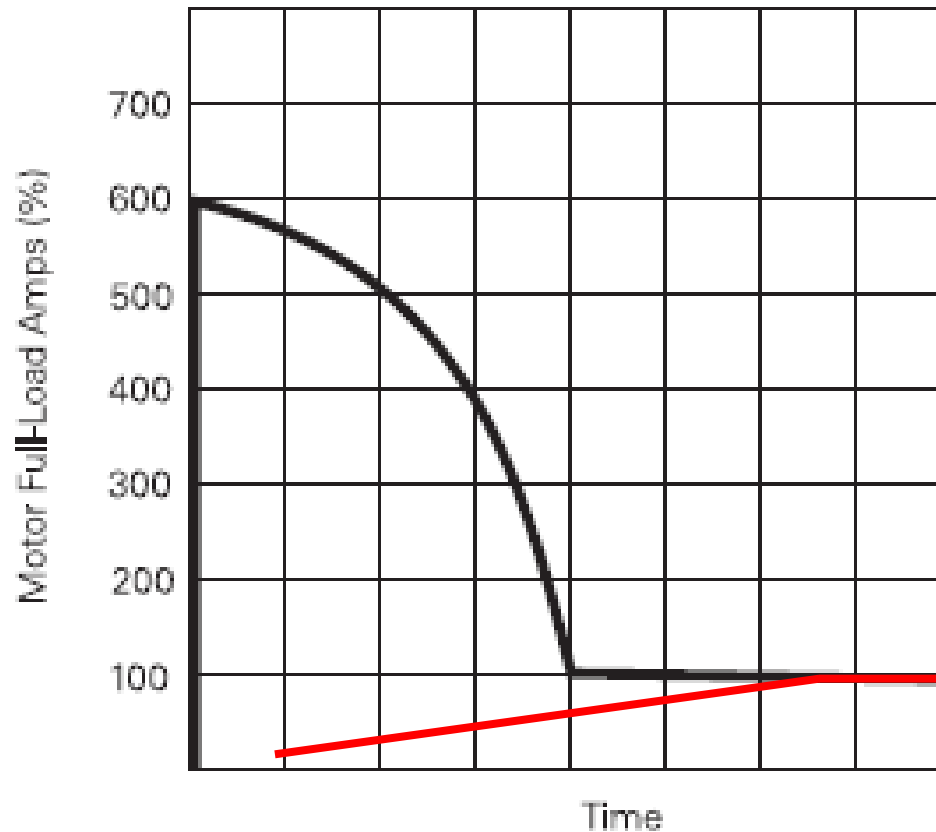


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## Impact on plant electrical system

- VFD is best soft-start available
- 6x current inrush eliminated
- No system voltage dip



**Motor and Power System never “see” more than 100% motor current**



# Product overview Variable Speed Drives

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MICRO MASTER 4	SINAMICS G120	Loher Dynavert	SINAMICS G / S	MASTER DRIVES	SINAMICS GM150	SINAMICS SM150	Robicon Perfect Harmony	SIMOVERT S
0,12-250 kW	0,12-90 kW	4- 3800 kW	75-4500 kW	45-6000 kW	0,6-28 MVA	5-28 MVA	0.4-80 MVA	2,5-70 MVA
Low Voltage 110 - 600 V	Low Voltage 400, 690 V	Low Voltage 400V - 690 V	Low Voltage 380 - 690 V	Low Voltage 380 - 690 V	Medium Voltage 2,3 kV / 3,3 kV / 4,16 kV / 6 kV / 6,6 kV / 7.2 kV	Medium Voltage 3.3 kV	Medium Voltage 2.3 - 13.8 kV	Medium Voltage 1.8 - 13.4 kV
Voltage Source Inverter	Voltage Source Inverter	Voltage Source Inverter	Voltage Source Inverter	Voltage Source Inverter	Voltage Source Inverter	Voltage Source Inverter	Multi Cell Voltage Source Inverter	Load Commutated Inverter Thyristor
LV-IGBT	LV-IGBT	LV-IGBT	LV-IGBT	LV-IGBT	HV-IGBT IGCT	IGCT	LV-IGBT HV-IGBT	
Air-cooled	Air-cooled	Air-cooled	Air-cooled	Air-/Water-cooled	Air-/Water-cooled	Water-cooled	Air-/Water-cooled	Air-/Water-cooled

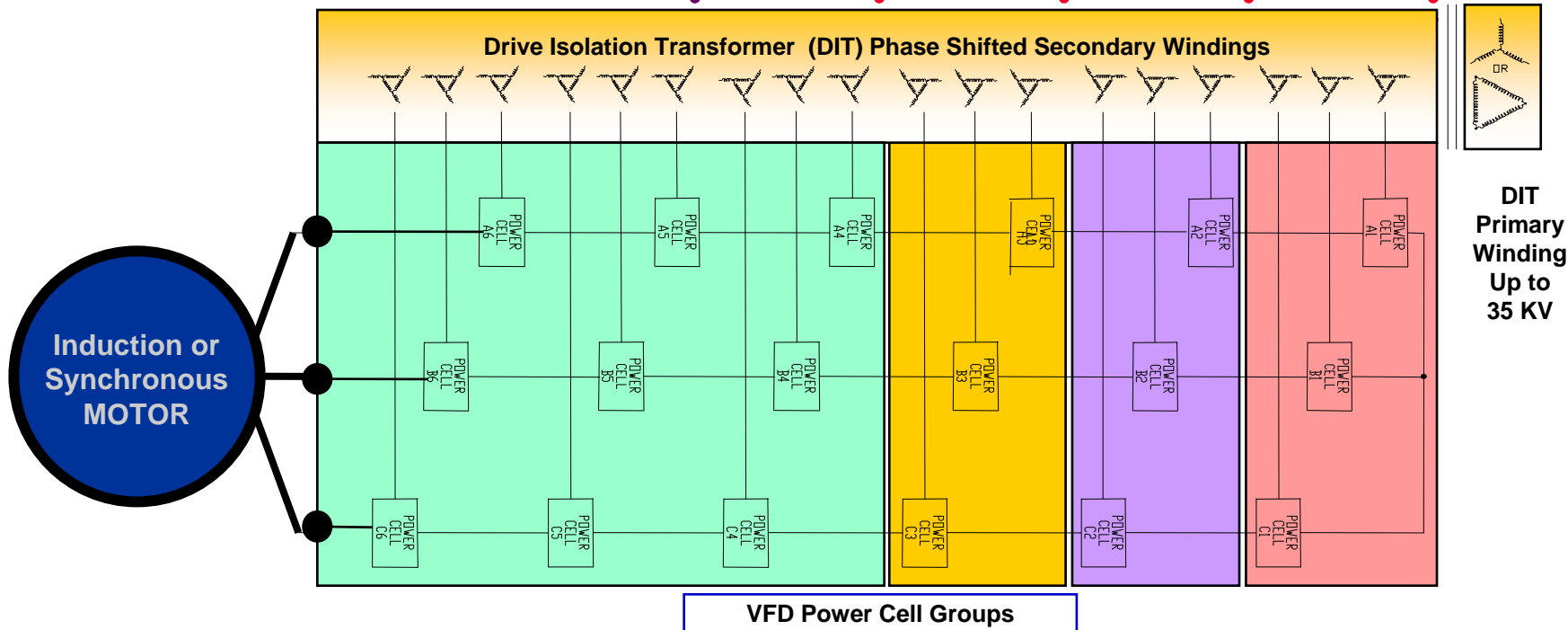




# Perfect Harmony : Modular Power Concept Standard Cell Ratings

Max Single Frame	Cell Voltages	Maximum Motor Voltage				Cell Amps
To 40,000 HP	1375V Cells	7200V	10,000V	12,300V	14,400V	500, 800, 1400
To 4,000 HP	750V Cells	4160V	5500V	6900V	8300V	70, 100, 140, 200, 260, 880, 1250
To 20,000 HP	690V Cells	3600V	4800V	6000V	7200V	315, 375, 500, 660
To 3,500 HP	630V Cells	3300V	4400V	5500V	6600V	70, 100, 140, 200, 260
		18 pulse	24 pulse	30 pulse	36 pulse	

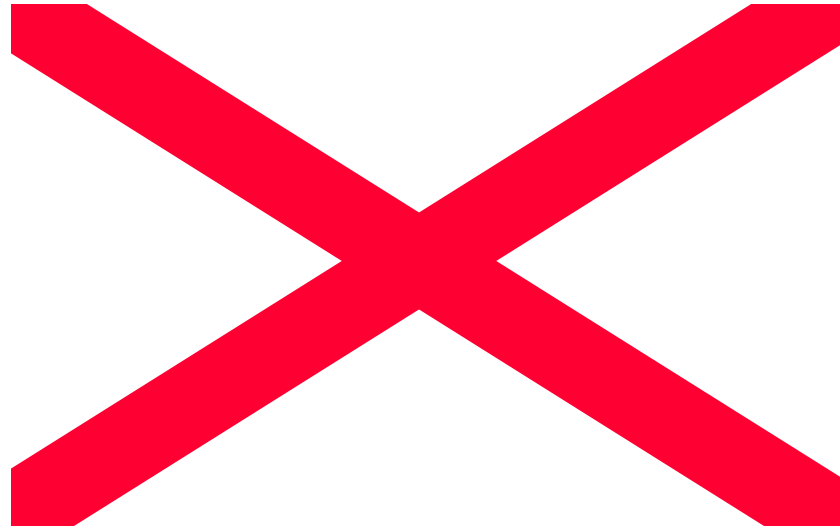
Line Harmonic Performance





# Medium Voltage Drive Performance

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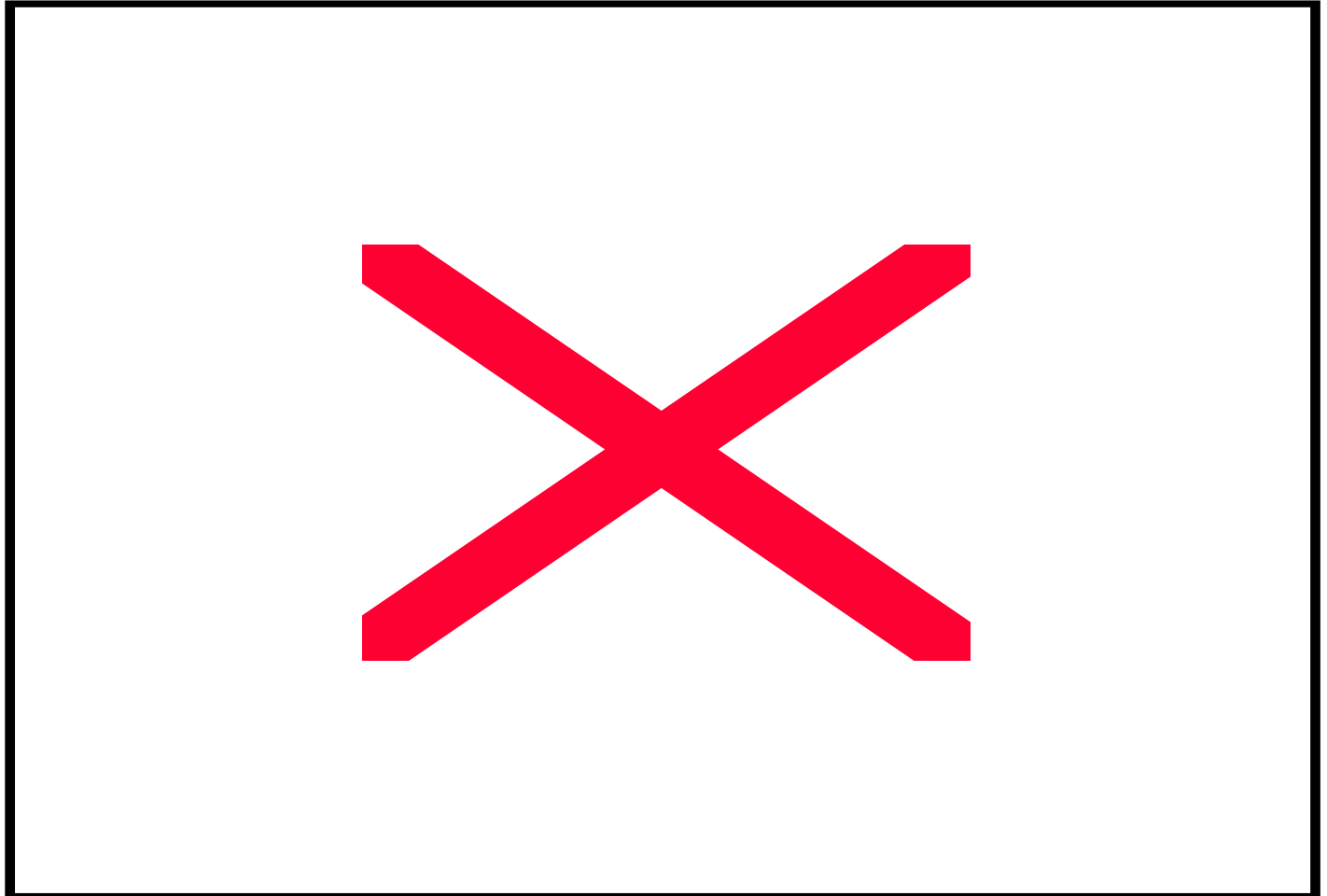




# Results Are Proven From Field Testing

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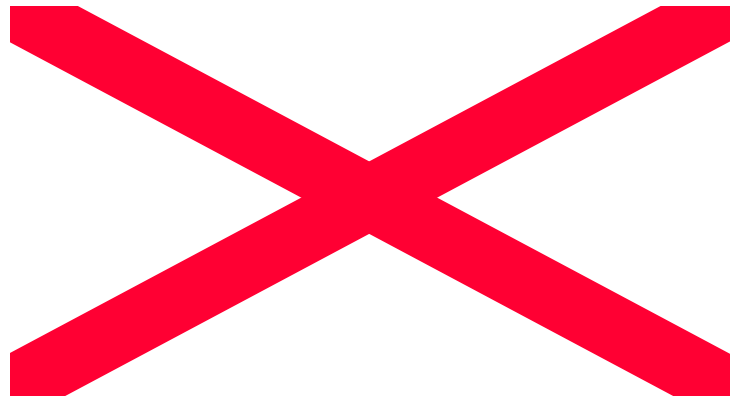
## Output Harmonics - Perfect Harmony motor operating from Alternator vs Perfect Harmony





# Price & Reliability = Customer Value

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# Thank You

## Next is Wolfgang



# Input Voltage and Current Harmonics

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30-Pulse Rectifier - kVA Source = kVA VFD

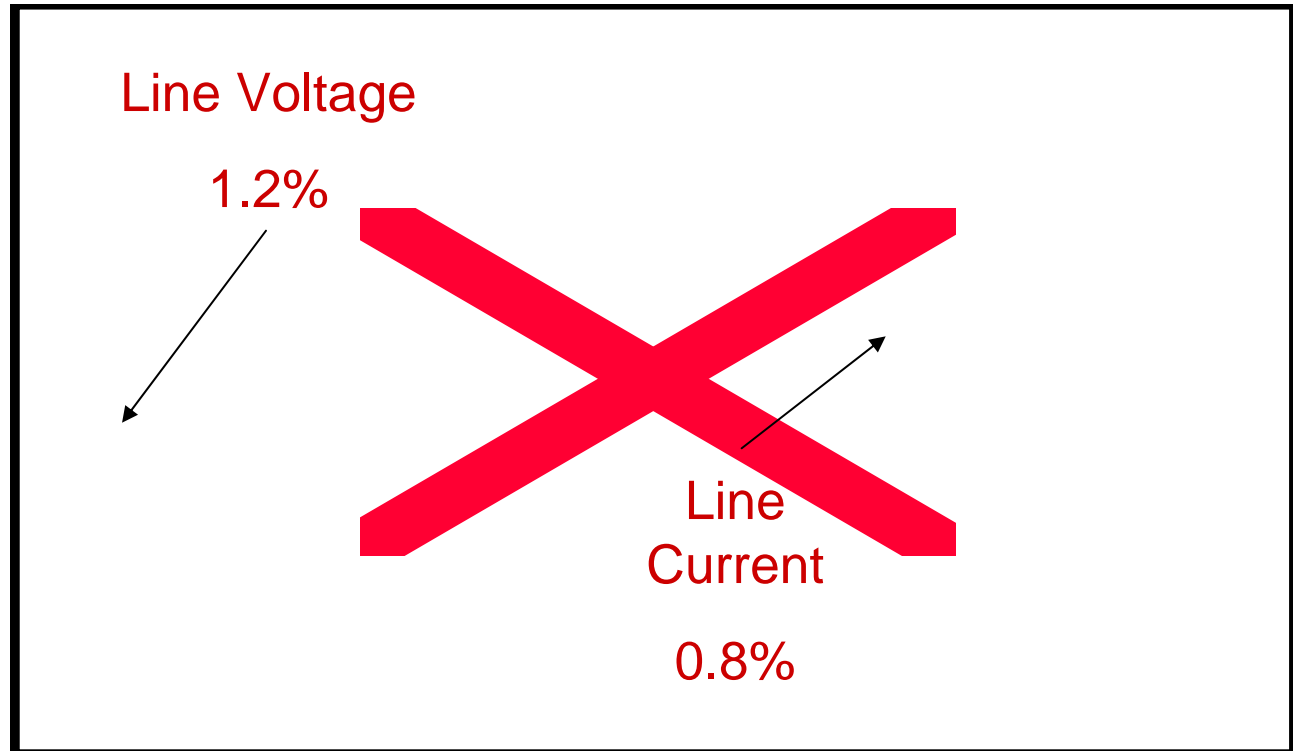


Figure 9 Input Voltage and Current to Drive

**Actual Test Data Shown**