MICRON

POWER DELIVERY

Made in the United States

DESIGN CAPABILITIES/GENERAL CATALOG

600 Volt Class
Control Power Transformers

DIN Rail Power Supplies

Custom Transformers

600 Volt Class
Encapsulated General Purpose

600 Volt Class
Ventilated General Purpose

Catalog #0717A-English

www.micronpower.com

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PROUDLY BUILT IN THE USA

Micron Industries Corporation is a manufacturer of control magnetics and custom windings headquartered in Oak Brook IL with manufacturing facilities in Sterling IL. Best known for the Impervi**TRAN**™ brand 600 volt class control transformer, Micron is also an industry leader in DIN Rail mount industrial power supplies and converters as well as NEMA 3R transformers. Banking on our history of providing non-catalog products within the same lead time as catalog standards, Micron's design capabilities can now solve your difficult power issues with specialty reactors and custom wound coils.

Oak Brook IL Headquarters

Why Choose Micron?

Over its nearly 50 year history as a transformer manufacturer, Micron has become the supplier of choice to the majority of the motor control and drive industry. Besides maintaining rapid response inventories on over 250 catalog items, Micron's active SKU file exceeds 4,500 additional part numbers which are available in a maximum of 15 working days.

Sterling IL Manufacturing

Micron has retained a constant philosophy. We are **User-Centric**. Throughout our history we have not only reacted to the customer, we made it a point to collaborate to come up with the best possible solution, not just a one-size-fits-all response.

Manufacturing Capabilities

Control Transformers: The Impervi**TRAN**™ product offering is available from 25VA through 5,000VA in any 600 volt class voltage combination. All designs meet UL, cUL, CSA or EN61558-2-2 and can be built in 105°C, 130°C, 155°C or 180°C designs.

Power Supplies and Converters: The ***DIN***ergy™ product offering encompasses power supplies from 18 watt single phase through 960 watt three-phase in the most popular industrial output voltages. The majority also operate as converters with 120 VDC input capability. Low profile, PCB and panel mount supplies and converters on special order.

NEMA 3R Products: Micron can furnish virtually all combinations of 600 volt class single and three-phase catalog designs both as encapsulated and ventilated. Included in this selection are transformers capable of providing voltage adjustments as buck-boost designs.

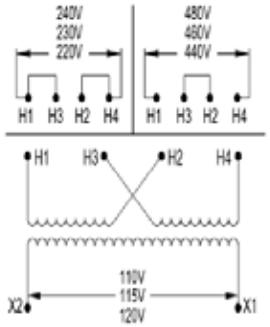
Specialty Designs and Coils: Micron can provide 15 day turn-around on your magnetics needs.

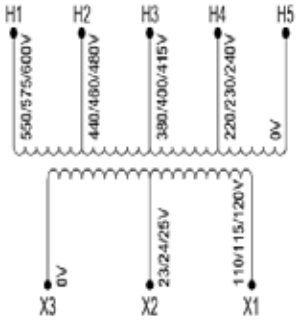
- Specialty coils both stick and bobbin configurations
- Single-phase 600 volt class transformers and chokes built on E-I laminations
- Custom three-phase open construction 600 volt class transformers through 150kVA
- Custom three-phase load bank reactors from 0.25kvar through 150kvar
- Custom three-phase line and load reactors from fractional through 250HP
- Custom capacitor detuning reactors through 75kvar
- Medium voltage power, control and metering accuracy transformers through 10kVA and 14,400V
- Custom auto transformers through 500kVA
- 600 volt class motor starting reactors through 250HP

GENERAL CAPABILITY OVERVIEW

Control Transformers:

25VA – 5Kva





Custom designs too!

This user-centric philosophy is visible in all Micron products, from control transformers and general purpose to DC power supplies and reactors and coils.

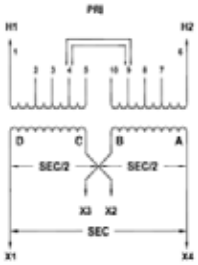
Can't get what you need from your current source? **Contact Micron's customer service department at 1.800.664.4660 and press 1.**

General Purpose, Power and Buck-Boost Transformers:

50VA – 750Kva

TYPICAL EXAMPLES

Single Phase from 0.05kVA – 100kVA



Typical Single Phase Connection Diagrams

WDG	VOLTS	CONNECT	LINE
PRI	480	H2-H3	H1-H4
	240	H1H3-H2H4	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

Buck-Boost Transformers are used to provide an economical method of correcting a lower or higher voltage to a voltage rating more suitable for efficient operation of electrical equipment. Buck-Boost applications are primarily used for motor operation and should not be used for motor control circuits, correction of fluctuating voltages or obtaining a neutral on a Delta system.

Typical Buck-Boost Selection Table and Wiring Diagram Depiction

Need Single Phase 230Volts, 60Hz

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of: 199		203		207		209		216		219		242		246		253		260	
			Max Load: Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.05	**J050A1EA1A01**	-	-	-	-	0.43	1.88	0.48	2.08	-	-	0.96	4.16	1.00	4.38	-	-	0.53	2.29	-	-
1	.05	**J050A1EB1A01**	0.31	1.36	0.36	1.56	-	-	-	-	0.72	3.12	-	-	-	-	0.77	3.34	-	-	0.41	1.77
1	.10	**J100A1EA1A01**	-	-	-	-	0.86	3.75	0.96	4.17	-	-	1.92	8.33	2.01	8.75	-	-	1.05	4.58	-	-
1	.10	**J100A1EB1A01**	0.62	2.71	0.72	3.12	-	-	-	-	1.44	6.25	-	-	-	-	1.53	6.67	-	-	0.82	3.54
1	.15	**J150A1EA1A01**	-	-	-	-	1.29	5.62	1.44	6.25	-	-	2.87	12.5	3.02	13.1	-	-	1.58	6.87	-	-
1	.15	**J150A1EB1A01**	0.93	4.06	1.08	4.69	-	-	-	-	2.16	9.37	-	-	-	-	2.30	10	-	-	1.22	5.31
Connection Diagram			**G**		**F**		**G**		**F**		**E**		**E**		**E**		**E**		**F**		**F**	

Diagram E

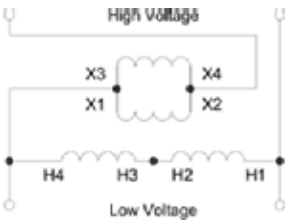


Diagram F

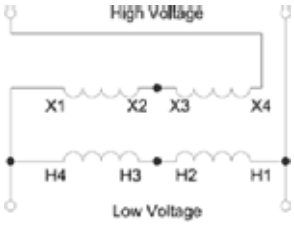
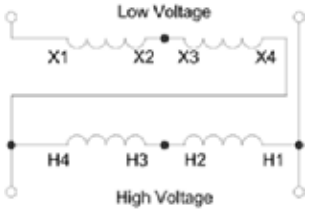


Diagram G



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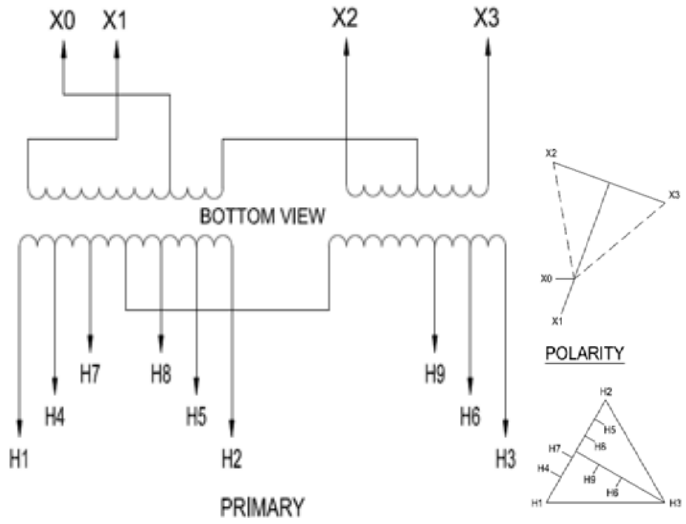
Three-Phase from 3kVA – 750kVA



(8) 2 @+2.5%, 2 @-2.5%; (6) 2 @+2.5%, 4@-2.5%;

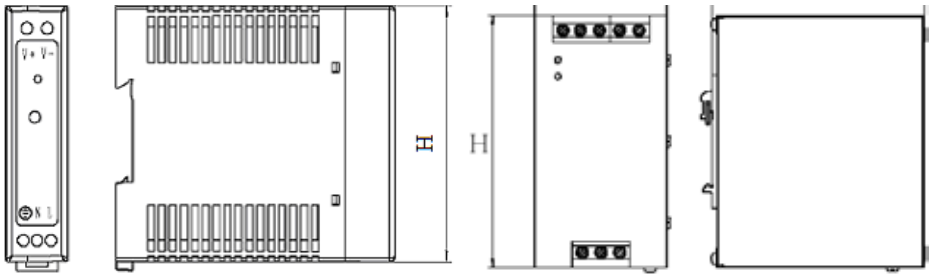
KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	WEIGHT LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "M": PRI: 480Δ SEC: 480Y/277 60HZ											

Power Supplies and Converters:

18 Watts – 960 Watt Three-Phase

TYPICAL EXAMPLES

Industrial DIN-Mount power supplies are used in an ever increasing number of automation applications. 480 volt and three-phase capability offers even more user flexibility.



Can't get what you need from your current source? **Contact Micron's customer service department at 1.800.664.4660 and press 1!**

Some of the industry's smallest packages
Model Comparison

Model	W (Width)	D (Depth)	H (Height)	Max Amps @ 24Vdc	Agency Listings
MDP18	0.89" (22.5)	4.49" (114)	3.60" (90)	0.94	UL 508, 1310, ISA 12.12..01, CE
MDP30	0.89" (22.5)	3.94" (100)	3.60" (90)	1.36	UL 508, CE
MDP50	1.18" (30)	3.94" (100)	3.60" (90)	2.27	UL 508, CE
MDP60	1.59" (40.5)	4.49" (114)	3.60" (90)	3.00	UL 508, 1310 (24Vdc), ISA 12.12.01, CE
MDP100	2.13" (54)	4.49" (114)	3.60" (90)	3.80 (CL2)	UL 508, 1310 (24Vdc), ISA 12.12.01, CE
MD120-1C	2.52" (64)	4.59" (117)	4.90" (124.5)	7.25	UL 508, ISA 12.12.01, CE
MD240-1CS	2.52" (64)	4.59" (117)	4.90" (124.5)	14.50	UL 508, ISA 12.12.01, CE
MD240-3C	3.50" (89)	4.41" (112)	4.88" (124)	14.00	UL 508, ISA 12.12.01, CE
MD480-1C	6.91" (175.5)	4.59" (117)	4.90" (124.5)	28.00	UL 508, ISA 12.12.01, CE
MD480-3C	5.91" (150)	4.41" (112)	4.88" (124)	27.00	UL 508, ISA 12.12.01, CE

CUSTOM CAPABILITIES

Specialty Reactors:

Need to think outside the box?

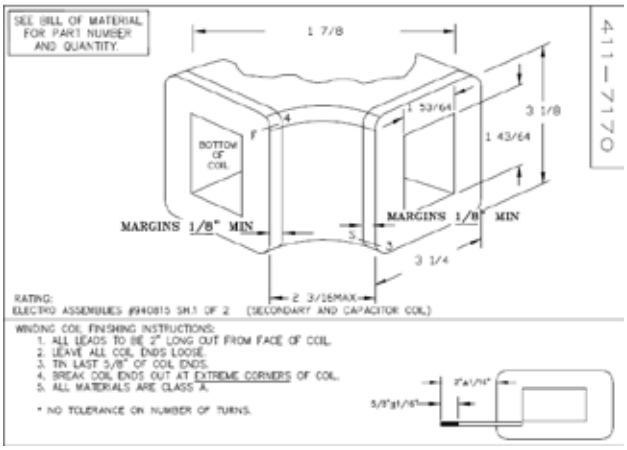
Look to the "CLNX Series" to meet the most difficult of low voltage reactor demands!

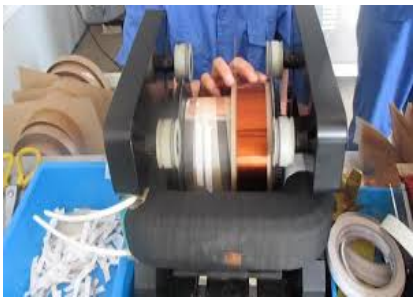
Whether Kvar, Kva or HP, through 1,000 Volts/200 Amps and from 40 through 600Hz.

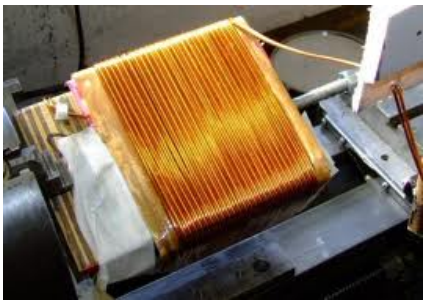
UL Recognized System

Custom Coils:

AND since all of our products contain coils, we are the perfect choice for your custom coil winding requirements! **Contact Micron's customer service department at 1.800.664.4660 and press 1!**







Do you have a specification that just cannot be met by "catalog" designs? Micron's user-centric design philosophy allows you to determine what works best for you. Either by choosing a product built to match industry standards or by choosing to work with our engineering staff and design to meet your individual OEM needs.

Contact Micron at +1.630.516.1222 or info@micronpower.com to learn more.

CUSTOM INDUCTORS

Product Selection Guide

OVERVIEW: Do I need a reactor, inductor or a choke? What is the difference? The answer is that they all perform a similar function; their main objective is to reduce the effects of generated harmonics, limit high frequency voltage transients, add reactance to neutralize the effects of capacitive loads or to limit current or voltage.

Applications: Special purpose reactors are built to meet a customer's specific need. Reactors have been built since the early 1920's to limit the current draw when starting a motor they are now most commonly built as line or load reactors typically used in conjunction with variable or adjustable frequency drives, as load bank reactors to add a reactive element to load simulation or to protect capacitor banks.

Line and Load Reactors have been used for many years to solve voltage and harmonics problems in variable speed drive installations. The desired characteristic of a reactor is inductance, "the opposition to a rapid change in current flow". VFDs draw current from the power line in sharp pulses causing harmonic current to flow. The current is drawn in sharp pulses because the input diodes only conduct current at the peak of the voltage waveform in order to keep the capacitors fully charged. The use of line reactors in series with incoming line power helped to solve typical problems on the input (line side) of variable frequency drives (VFD) and SCR controllers.

- Drive nuisance tripping
- Voltage notch reduction (for SCR controllers)
- Increase capacitor life
- Harmonic attenuation
- Improve drive's true power factor
- Low cost substitutes for 1:1 isolation transformers

The introduction of **Harmonic Compensated** Reactors in the late 1980's offered a product that was suitable for use on either the input or output of a variable speed drive. Harmonic compensation meant the reactor was designed to handle the harmonic spectrum and high frequency carrier waves which are typical on the output side of a variable speed drive.
Now that reactors could be used on the output of a VFD, many more application problems could be solved.

- Motor temperature rise
- Motor winding degradation
- Motor noise
- Motor efficiency
- VFD short circuit protection

DC Link Reactors/Chokes and Swinging Chokes are designed to be connected after the input diodes in the VFD power circuit and impede current flow not voltage. Although DC reactors and chokes cannot protect those diodes from transient damage, they can help eliminate nuisance faults due to excessive voltage drops in the drive which can occur if a line reactor is used where the incoming power line regularly dips in voltage. Often a combination of a lower impedance reactor plus a choke provides the best solution to harmonic attenuation with minimal voltage drop.

- Single or two coil construction typically 1.5X less expensive than three coil reactors
- Reduction of bus ripple within a partially loaded VFD
- Will not cause voltage drop at drive thereby reducing nuisance tripping when line voltage is already low

Load Bank Reactors are used in conjunction with back-up power generators which need to be exercised on a regular basis.

Performing this function without or with little load may lead to a phenomenon called “wetstacking” which shortens the life of the diesel engine that runs the generator. Wetstacking is the build-up of unburned fuel in the diesel’s exhaust system. This fuel eventually turns into a sludge of tar and carbon deposits on the valves. To counter this, a load bank, which simulates the actual load, is connected to the generator during the exercise period. Load banks historically where designed around resistors. Circuits containing purely resistive loads have a power factor of 1 (unity). Generally, in any facility, the only equipment operating on a resistive load are its incandescent lights and electric heaters. In fact, resistive loads are usually only a small part of any facility’s total power consumption. Quite often, the influence of a lagging power factor <0.8 due to reactive loads is underestimated. Actual circuits containing inductive or capacitive elements; electric motors, solenoid valves, lamp ballasts, and others, in total, often have a power factor below 1.0. Most commercial loads are made up of all three load types, inductive, capacitive and reactive. Many specifications and local codes demand that load testing be performed at less than unity power factor, typically 0.8p.f. lagging. To achieve this, the load bank is designed to include both resistive and reactive elements. This combination provides a true test of the actual rating and simulates a “real world” load. The reactive component of the load will have a current that “lags” the voltage. The resulting power is described in two terms, the KW, or real power and the KVA or apparent power. Since the current lags the voltage in the reactive load the total power is not the direct sum of the two but their vector sum. That vector is the phase angle difference between the voltage and the current. The combination of resistive and reactive current in the load will allow for the full nameplate KVA rating of the generator windings to be tested.

These reactors are typically installed in commercial load banks used to simulate a large overall load such as that of a data center, hospital, school, stadium or municipal building. The load bank is often specifically built to reflect the exact electrical characteristics, resistive, capacitive and reactive of the facility in question. The load bank manufacturer is provided with information pertaining to:

- The number of motors and their function.
- The type and quantity of lamps.
- UPS systems.
- The local power quality.

Based on this, a load bank is designed to be used in conjunction with the facilities emergency generator. Each time the generator is exercised, the load bank simulates the exact facility load so that there is no danger of interrupting the power to the facility itself. Load banks can also be built as portable units with controls to allow variation of load characteristics.

Micron has over 100 active basic load bank reactor designs. We excel at providing a quality product with precise balanced inductance in all three phases and specialize in taking the basic designs and customizing the impedance, Q-factor, frequency, mounting or connection methodology to meet the customer’s specific requirements.

Capacitor Bank Detuning Reactors: It has been stated that the electrical power to industrial networks has become as polluted as our worst air. This is due to the increasing application of non-linear electrical loads such as VFDs, frequency converters and rectifiers with the effect multiplied by the ever growing number of consumers. The outcome is unusually high levels of harmonic distortion, not only resulting in unnecessary losses from transmission lines, but also in non-calculable resonances between network inductances and power factor correction capacitors. Modern thin film capacitors are particularly sensitive to harmonic distortion. This promotes premature aging because:

- The induced resonance between inductances of the network and power capacitors causes excessive capacitor heating.
- Harmonic currents over and above the fundamental load result in voltage drops across the capacitor elements which then may exceed the design voltage of the capacitor.
- Excessive harmonic currents can overload the internal connections between the cables and the capacitor film.

The use of detuned filter circuits has proved to be a reliable and safe way of avoiding premature failure in power factor correction equipment. A detuning reactor is connected in series with each capacitor and forms a rejection filter with a resonance frequency that is far away from the harmonic frequencies present in the network.

The purpose of the rejection filter is to prevent the resonance between the inductive impedance resulting from the line, supply transformer and capacitors installed to compensate the power factor.

Motor Starting Reactors and Autotransformers: Although not as common since the advent of solid state reduced voltage starters and market priced VFDs, starting reactors have variable taps designed to add impedance between line and motor effectively reducing the starting voltage and current to the motor terminals. When properly sized to horsepower, voltage rating and necessary starting torque, a reactor starting system will allow enough current to pass to allow the motor to overcome starting torque and smoothly come up to speed in three to four seconds. The typical current then required would be 2X running current as opposed as much as 7X for across-the-line systems.

Similarly, starting autotransformers contain taps which transform line voltage down to a desired starting voltage for the motor, although not as smoothly as a reactor start system. Depending on the application, both methods provide an inexpensive method to reduce voltage drop when starting large industrial motors.

Medium Voltage: From 750VA through 10kVA to meet power, control circuit or metering accuracy applications.

Special Applications for custom inductors abound in the industrial environment. From reducing total harmonic distortion within a drive system to increasing the life of capacitor banks, you can rely on Micron's engineering expertise to design a product that suits **your** exact needs!

	Custom Inductor Design Limits					
Product	kVA	kvar	HP	Volts	Amps	Frequency
Load Bank Reactor		≤ 150		≤ 1,000	≤ 200	40 – 600
Line/Load Reactor			≤ 250	≤ 1,000	≤ 200	40 – 600
Isolation	≤ 150			≤ 1,000	≤ 200	40 – 600
Auto Transformer	≤ 500			≤ 1,000	≤ 200	40 – 600
Medium Voltage	≤ 10			≤14,400	≤ 85	50 – 60

LET MICRON PROVIDE YOUR NEXT MAGNETICS NEED

NOTES

*DIN*ergy™ By Micron Power Delivery

Advanced power supplies built for the industrial environment

Why Choose Micron?

Power Supplies and Converters: The ***DIN***ergy™ product offering encompasses power supplies from 18 watt single phase through 960 watt three-phase in the most popular industrial output voltages (see the selection guide on the following page). The majority also operate as converters with 120 VDC input capability. Low profile, PCB and panel mount supplies and converters on special order. The ***DIN***ergy™ product carries an average MTBF of 450,000 hours and is built to the same demanding design parameters that made our Imperv**TRAN**™ the preeminent 600 Volt class transformer in the marketplace for over 40 years.

POWER SUPPLY QUICK SELECTOR

Plastic/Metal Cases	Case Material	Output Power	Output Voltage	Voltage Adj.	Output Current	Peak Current	Input Voltage	UL/CE/EN/ISA				STOCK
Model		(Watts)	(VDC)	Range	(A)	(A)	(VAC)	508/60950	UL 1604 ISA	1310	61000	
SINGLE-PHASE INDUSTRIAL DIN-MOUNT POWER SUPPLIES												
MDP18-12A-1C	P	18	12	10.8 --13.8	1.67 – 1.30	1.80	90-264	X	X	X	X	X
MDP18-24A-1C	P	18	24	21.6 --28.8	0.83 – 0.63	0.94	90-264	X	X	X	X	X
MDP30-5-1	P	20	5	4.5 -- 5.5	4.44 – 3.64	4.44	90-255	X	X		X	X
MDP30-5A-1C	P	30	5	5.0 – 5.5	6.00 – 5.50	8.03	85-264	X	X		X	X
MDP30-5A-1CS	P	20	5	4.5 – 5.5	4.00 – 3.60	5.60	85-264	PROPOSED				
MDP30-12-1	P	30	12	10 -- 14	3.00 – 2.14	3.00	90-255	X	X		X	X
MDP30-12A-1C	P	30	12	12 -- 14	2.50 – 2.10	3.45	85-264	X	X	X	X	X
MDP30-12A-1CS	P	24	12	11.4 – 15.6	2.00 – 1.60	2.80	85-264	PROPOSED				
MDP30-15-1	P	30	15	14 -- 18	2.14 – 1.67	2.14	90-255	X	X		X	X
MDP30-24A-1C	P	30	24	24 -- 28	1.25 – 1.05	1.71	85-264	X	X	X	X	X
MDP30-24A-1CS	P	30	24	22.5 – 28.5	1.25 – 1.00	1.75	85-264	X			X	X
MDP50-12-1	P	50	12	10 -- 14	5.00 - 3.57	5.00	90-255	X			X	X
MDP50-12A-1CS	P	48	12	11.4 – 15.6	4.00 – 3.20	6.00	85-264	PROPOSED				
MDP50-24A-1CS	P	50	24	22.5 – 28.5	2.10 – 1.70	3.15	85-264	X			X	X
MD60-12-1	P	60	12	10 -- 16	4.50 – 3.80	5.40	85-264	X	X		X	X
MDP60-12A-1C	P	60	12	12 – 14	5.00 – 4.25	5.85	85-264	X	X		X	X
MDP70-12A-1CS	P	72	12	11.4 – 15.6	5.50 – 4.40	7.70	85-264	PROPOSED				
MD60-24-1	M	60	24	22 -- 28	2.50 – 2.10	3.00	85-264	X	X		X	X
MDP60-24A-1C	P	60	24	24 -- 28	2.50 – 2.10	3.25	85-264	X	X	X	X	X
MDP70-24A-1CS	P	72	24	22.5 – 28.5	3.00 – 2.70	4.2	85-264	PROPOSED				
MD60-48-1	M	60	48	46 -- 52	1.25 – 1.15	1.50	85-264	X	X		X	X
MDP100-12A-1C	P	100	12	11.4 --14.5	8.40 – 6.90	10.42	90-264	X	X		X	X
MDP100-24AL-1C	P	91.2	24	22.5 --24.5	4.44 – 3.70	4.50	90-264	X	X	X	X	X
MD120-12-1	M	96	12	10 -- 16	8.00 – 6.00	9.60	85-264	X	X		X	X
MD120-12A-1C	M	120	12	11.4 --14.5	10.53 – 8.28	14.50	90-264	X	X		X	X
MD120-24A-1C	M	120	24	22.5 --28.5	5.33 – 4.21	6.85	90-264	X	X		X	X
MD120-48A-1C	M	120	48	45 -- 55	2.50 – 2.10	3.33	90-264	X	X		X	X
MD240-12A-1CS	M	190	12	11.4—14.5	16.00—13.00	23.75	88-264	X	X		X	X
MD240-24A-1C	M	240	24	22.5 – 28.5	10.00 – 8.40	13.50	90-264	X	X		X	X
MD240-24A-1CS	M	240	24	22.5 –28.5	10.67 - 8.42	14.50	88-264	X	X		X	X
MD240-48-1	M	240	48	46 – 52	5.00 – 4.60	6.00	85-264	X	X		X	X
MD240-48A-1C	M	240	48	47 – 56	5.00 – 4.20	6.90	90-264	X	X		X	2017
MD480-24-1	M	480	24	22 – 28	20.00 – 17.10	24.00	85-264	X			X	X
MD480-24A-1C	M	480	24	22.5 – 28.5	21.33 – 16.84	25.00	90-264	X	X		X	X
MD480-36-1	M	480	36	34 – 40	13.30 – 12.00	16.00	85-264	X			X	C/F
MD480-48A-1C	M	480	48	47 – 56	10.00 – 8.50	12.50	90-264	X	X		X	X
MDP-PDMA-C	P	REDUNDANCY DIODE MODULE				20.00	24Vdc	X			X	X

POWER SUPPLY QUICK SELECTOR

Plastic/Metal Cases Model	Case Material	Output Power (Watts)	Output Voltage (VDC)	Voltage Adj. Range	Output Current (A)	Peak Current (A)	Input Voltage (VAC)	UL/CE/EN/ISA 508/60950	 UL 1604 ISA 12.12.01	 1310	 61000	STOCK
PANEL MOUNT IP67 RATED POWER SUPPLIES												
PMIP67A50S24A (IP67)	P	50	24	N/A	2.10	2.70	90-264	X			X	C/F
PMIP67A75S24 (IP67)	P	72	24	N/A	3.00	3.90	90-264	X			X	C/F
PMIP67A100S24 (IP67)	P	96	24	N/A	4.17	5.40	90-264	X			X	C/F
600700-04512	CONNECTOR, 7/8" FEMALE-STRAIGHT											C/F
600700-04513	CONNECTOR, 7/8" MALE-STRAIGHT											C/F
600700-04514	CONNECTOR, 7/8" FEMALE-90°											C/F
600700-04515	CONNECTOR, 7/8" MALE-90°											C/F
TWO-PHASE & THREE-PHASE INDUSTRIAL DIN-MOUNT POWER SUPPLIES												
MDP100-24-2C (2-PH)	P	100.8	24	22.5 – 28.5	4.20 – 3.50	5.40	340-575	X	X		X	X
MDP100-12-2C (2-PH)	P	100.8	12	11.2 – 14.5	8.40 – 6.90	10.75	340-575	X	X		X	X
MD120-24-3C (3-PH)	M	120	24	22.5 – 28.5	5.00 – 4.20	6.50	340-575	X	X		X	X
MD240-24-3C (3-PH)	M	240	24	22.5 – 28.5	10.67 – 8.42	14.00	340-575	X	X		X	X
MD480-24-3C (3-PH)	M	480	24	22.5 – 28.5	21.33 – 16.84	27.00	340-575	X	X		X	X
MD960-24-3C (3-PH)	M	960	24	22.5 – 28.5	42.67 – 33.68	56.00	340-575	X	X		X	X
BUILDING AUTOMATION STYLE INDUSTRIAL DIN-MOUNT POWER SUPPLIES												
MDP10-5-1CBA	P	7.5	5	N/A	1.50	2.10	90-264	X	X	X	X	EVAL
MDP10-12-1CBA	P	10	12	N/A	0.83	1.16	90-264	X	X	X	X	EVAL
MDP10-15-1CBA	P	10	15	N/A	0.67	0.94	90-264	X	X	X	X	EVAL
MDP10-24-1CBA	P	10	24	N/A	O.42	0.59	90-264	X	X	X	X	EVAL
MDP24-5-1CBA	P	15	5	5.0 – 5.5	3.00 – 2.70	3.90	90-264	X	X	X	X	EVAL
MDP24-12-1CBA	P	24	12	12.0 – 14.0	2.00 – 1.70	2.60	90-264	X	X	X	X	EVAL
MDP24-15-1CBA	P	24	15	13.5 – 16.5	1.60 – 1.40	2.08	90-264	X	X	X	X	EVAL
MDP24-24-1CBA	P	24	24	24.0 – 28.0	1.00 – 0.85	1.30	90-264	X	X	X	X	X
MDP34-5-1CBA	P	22.5	5	5.0 – 5.5	4.50 – 4.00	5.85	90-264	X	X	X	X	EVAL
MDP34-12-1CBA	P	33	12	12.0 – 14.0	2.75 – 2.30	3.58	90-264	X	X	X	X	EVAL
MDP34-15-1CBA	P	36	15	13.5 – 16.5	2.40 – 2.10	3.12	90-264	X	X	X	X	EVAL
MDP34-24-1CBA	P	36	24	24.0 – 28.0	1.50 – 1.25	1.95	90-264	X	X	X	X	X
MDP60-5-1CBA	P	35	5	5.0 – 5.5	7.00 – 6.30	9.10	90-264	X	X		X	EVAL
MDP60-12-1CBA	P	54	12	12.0 – 14.0	4.50 – 3.80	5.85	90-264	X	X	X	X	EVAL
MDP60-15-1CBA	P	60	15	13.5 – 16.5	4.00 – 3.60	5.2	90-264	X	X	X	X	EVAL
MDP60-24-1CBA	P	60	24	24.0 – 28.0	2.50 – 2.10	3.25	90-264	X	X	X	X	X
MDP75-5-1CBA	P	60	5	5.0 – 5.5	12.00 – 10.50	15.25	90-264	X	X		X	EVAL
MDP75-12-1CBA	P	72	12	12.0 – 14.0	6.00 – 5.10	7.68	90-264	X	X		X	EVAL
MDP75-15-1CBA	P	75	15	13.5 – 16.5	5.00 – 4.50	6.40	90-264	X	X		X	EVAL
MDP75-24-1CBA	P	100.8	24	24.0 – 28.0	4.20 – 3.60	5.38	90-264	X	X		X	X
MDP100-24L-1CBA	P	91.2	24	20.0 – 24.2	3.80 – 3.70	4.10	90-264	X	X	X	X	EVAL
UPS DEVICES AND BATTERY HOLDERS												
MD-VSB240-24-1	M	240	24	24VDC/240WATT VOLTAGE SAG BUFFER/UPS				X			X	C/F
DRU30-12/MDPU30	P	360	12	12VDC/30A UPS MODULE				X			X	X
DRU30-24/MDPU30	P	720	24	24VDC/30A UPS MODULE				X			X	X
MD-DINBRKTA	M	DIN-MOUNT L.A.B. BRACKET. MAX BATTERY DIMENSION: 134x62x134MM										C/F
MD-DINBRKTB	M	DIN-MOUNT L.A.B. BRACKET. MAX BATTERY DIMENSION: 88x57x97MM										C/F

MICRON “CBA SERIES” LOW PROFILE POWER SUPPLIES

Small enclosure, big job?

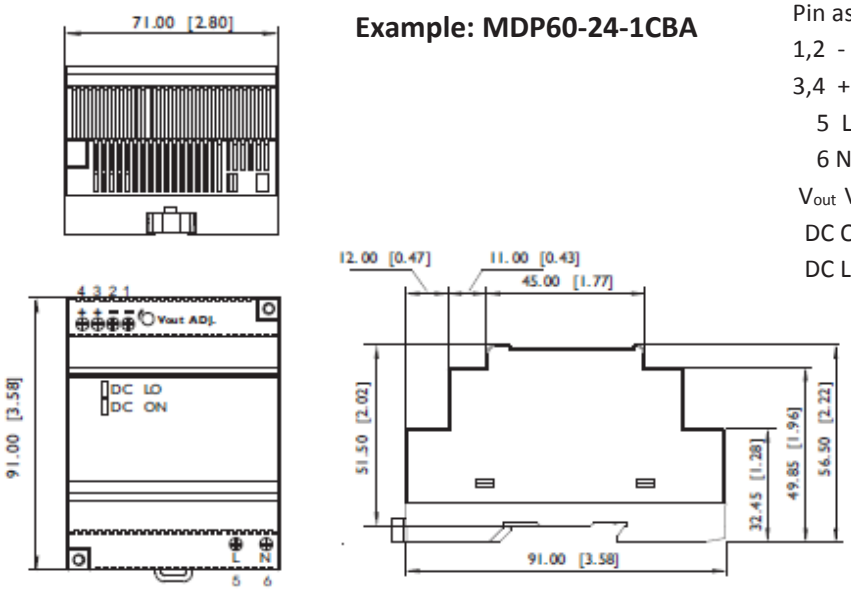
You need a power supply with full features, plus a low profile.

Look to the “CBA Series” of low profile building automation style power supply that is also UL508 Listed, UL1310 Recognized plus ISA 12.12.01 approved!

Choices from 7.5 – 100.8 watts; 5, 12, 15 and 24 Vdc in five frame sizes.

MECHANISM & PIN CONFIGURATION

mm [inch]



Example: MDP60-24-1CBA

Pin assignment:
1,2 - Negative output
3,4 + Positive output
5 L Input Terminal
6 N Neutral input
V_{out} Voltage adjustment
DC ON Operation LED
DC LO V_{out} low LED

The full featured Micron “CBA Series” was designed for building automation but is fully functional in the industrial environment as well. Available five different frame sizes in wattages from 7.5 through 100.8 including a 91.2 watt/24Vdc Class 2 design.

FEATURES	BENEFITS
• Agency approvals: UL 508 Listed, UL 1310 Class 2 Recognized and ISA 12.12.01 (UL1604) Approved	• Can be used for industrial control as well as building automation applications
• Series available from 7.5 watts @ 5Vdc through 100.8 watts @ 24Vdc with DC output choices of 5V, 12V, 15V and 24Vdc	• Serves a wide range of applications from logic control to building automation and industrial control and includes a UL 1310 Class 2, 24Vdc design at 91.2 watts
• Low Profile Design Only 52MM off the rail	• 55% more headroom than comparable Industrial power supplies. Solves low clearance issues
• Full feature design Wide input: AC: 90/264; DC: 120/375 Operational from -40° through +71°C MTBF of up to 970,000 hrs	• Both DC "OK" and DC "low" LEDs, adjustable output voltage and performance normally reserved for industrial power supplies
• Cost efficient design and pricing	• Project problems solved within budget

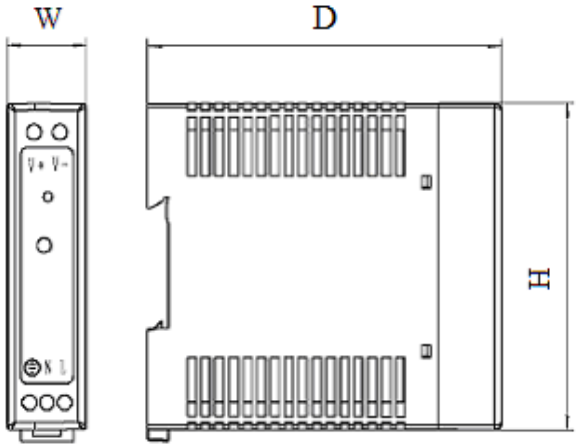
SERIES "XX" = VOLTS OUT	VOLTS OUT	RATED WATTS	VOLTS OUT	RATED WATTS	VOLTS OUT	RATED WATTS	VOLTS OUT	RATED WATTS
MDP10-XX-1CBA	5*	7.5	12*	10	15*	10	24*	10
MDP24-XX-1CBA	**5***	**15**	**12***	**24**	15*	24	**24***	**24**
MDP34-XX-1CBA	5*	22.5	**12***	**33**	15*	36	**24***	**36**
MDP60-XX-1CBA	5	35	**12***	**54**	15*	60	**24***	**60**
MDP75-XX-1CBA	5	60	**12**	**72**	15	75	**24**	**100.8**
MDP100-24L-1CBA							24*	91.2

Entire series is UL 508 Listed
Entire series carries ISA 12.12.01; CL1, Div2 rating
All marked "*" are UL 1310; Class 2 power limited
Bold: Planned stock

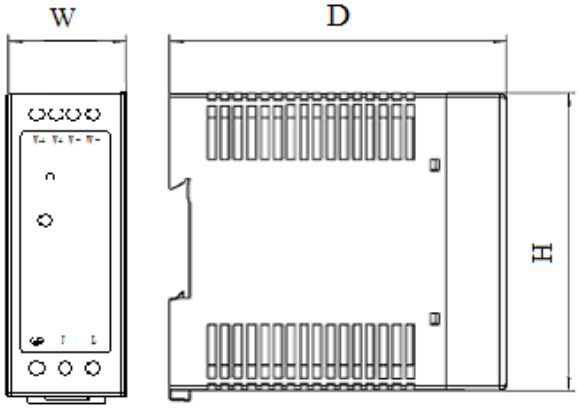
DIMENSIONS	IN WIDTH MM		IN DEPTH MM		IN LENGTH MM	
MDP10-XX-1CBA	0.71	18	2.05	52	3.58	91
MDP24-XX-1CBA	1.38	35	2.05	52	3.58	91
MDP34-XX-1CBA	2.09	53	2.05	52	3.58	91
MDP60-XX-1CBA	2.80	71	2.05	52	3.58	91
MDP75-XX-1CBA	3.54	90	2.07	53	3.58	91

MDP SERIES - SINGLE PHASE/TWO PHASE

Plastic Case DIN Rail Power Supply Dimensions



(MDP18, MDP30, MDP30-1CS)



（MDP30-1C, MDP50, MDP50-1CS, MDP60, MDP70-1CS, MDP100-1C, MDP100-2C MDP-PDMA-C, DRU30-xx/MDPU30）

Model Comparison

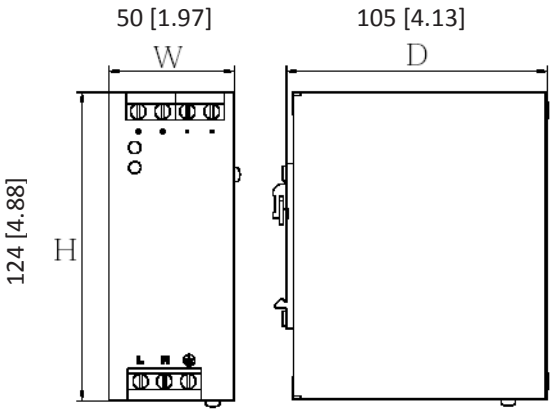
Model	W (Width)	D (Depth)	H (Height)	Weight	Connectors	Torque lb/in
MDP18	0.89”(22.5mm)	4.49”(114mm)	3.60” (90mm)	0.33lbs (150g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP30	0.89”(22.5mm)	4.02”(102mm)	3.60” (90mm)	0.35lbs (160g)	IN/OUT: AWG 22-12	IN/OUT 5
MDP30-1C	1.59”(40.5mm)	4.49”(114mm)	3.60” (90mm)	0.60lbs (270g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP30-1CS	0.89”(22.5mm)	3.94”(100mm)	3.60” (90mm)	0.30lbs(140g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP50	1.26” (32mm)	4.02”(102mm)	3.60”(90mm)	0.51lbs (230g)	IN/OUT: AWG 22-12	IN/OUT 5
MDP50-1CS	1.18”(30mm)	3.94”(100mm)	3.60” (90mm)	0.44lbs(200g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP60-1C	1.59 (40.5mm)	4.49”(114mm)	3.60” (90mm)	0.75lbs (340g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP70-1CS	1.59”(40.5mm)	3.94”(100mm)	3.60” (90mm)	0.55lbs(250g)	IN/OUT: AWG 26-12	IN/OUT 5
MDP100-1C	2.13” (54mm)	4.49”(114mm)	3.60” (90mm)	0.95lbs (430g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MDP100-2C	2.13” (54mm)	4.49”(114mm)	3.60” (90mm)	1.10lbs (500g)	IN/OUT: AWG24-10	IN 9/OUT 5.5
MDP-PDMA-C	2.13” (54mm)	4.49”(114mm)	3.60” (90mm)	0.50lbs (210g)	IN/OUT AWG24-10	IN 9/OUT 5.5
DRU30-xx/ MDPU30	2.13” (54mm)	4.49”(114mm)	3.60” (90mm)	0.82lbs(370g)	IN/OUT AWG 18-8	IN 9/Relay 5

GENERAL TOLERANCE	
0.00[0.00] - 30.00[1.18]	±0.30[0.01]
30.00[1.18] - 120.00[4.72]	±0.50[0.02]

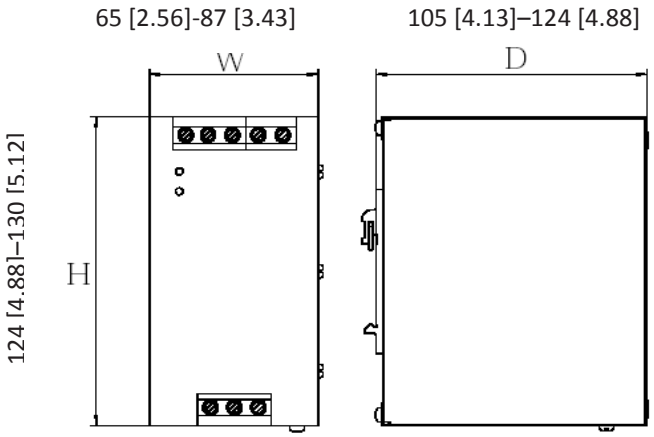
MD SERIES – SINGLE PHASE

Metal Case DIN Rail Power Supply Dimensions

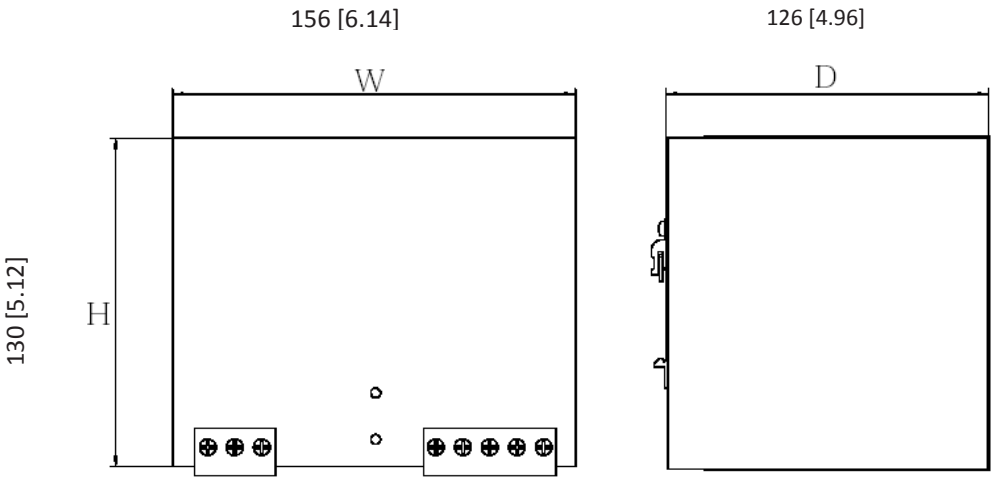
MD60-xx-1 – MD480-xx-1 Dimensions



60W/MD - Outline

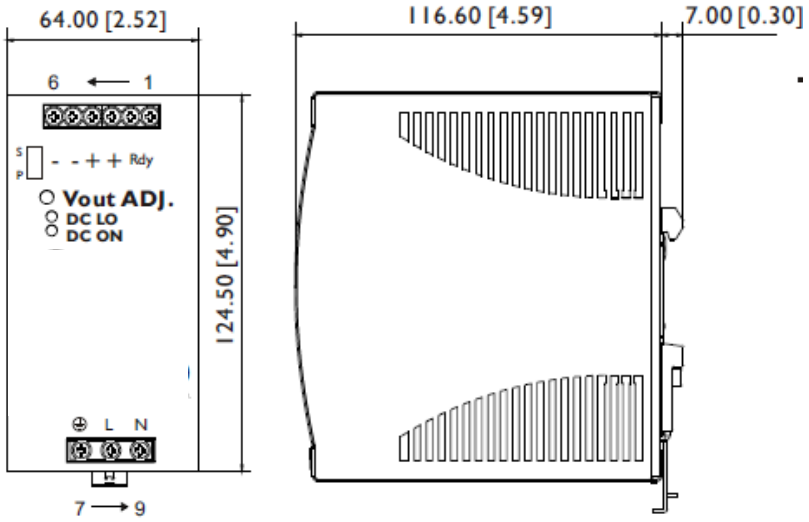


120W-240W Outline

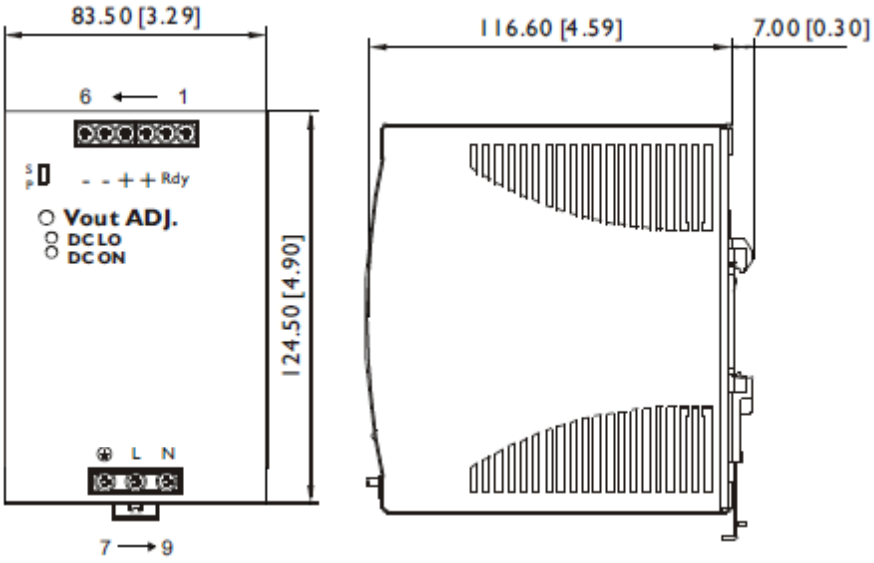


480W Outline

MD120-xxA-1C and MD240-xxA-1CS Dimensions

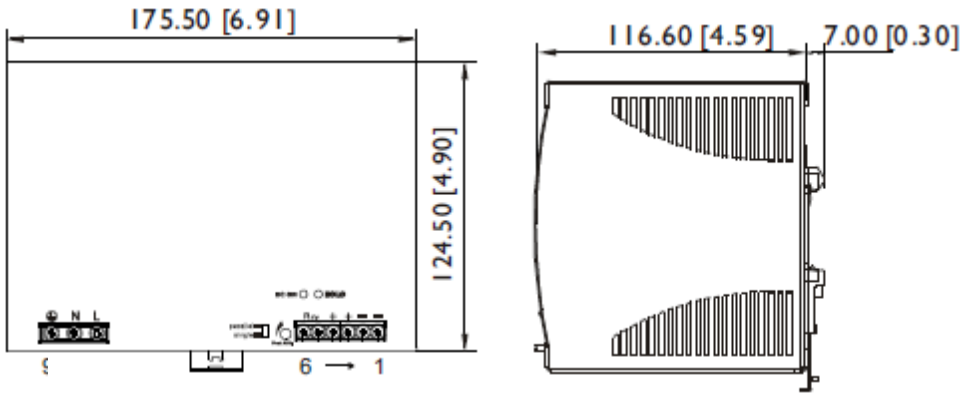


MD240-xxA-1C Dimensions



MICRON ALSO OFFERS THE ImperviTRAN™ LINE OF CONTROL TRANSFORMERS PLUS SINGLE, THREE PHASE LVGP AND BUCK-BOOST TRANSFORMERS PLUS SPECIALTY CHOKES AND INDUCTORS

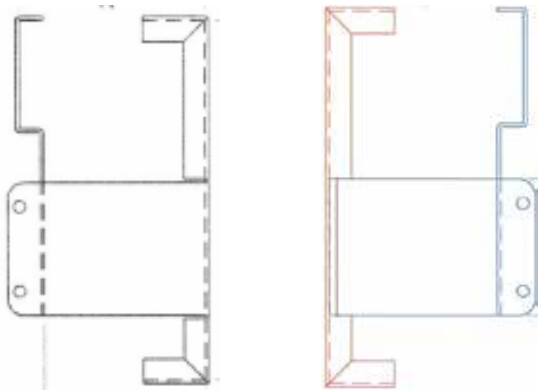
MD480-xxA-1C Dimensions



Model Comparison

Model	W (Width)	D (Depth)	H (Height)	Weight	Connectors	Torque lb/in
MD60	1.97” (50)	4.13” (105)	4.88” (124)	1.08lbs (490g)	IN/OUT: AWG 24-10	4.4
MD120	2.56” (65)	4.13” (105)	4.88” (124)	1.65lbs (750g)	IN/OUT: AWG 24-10	4.4
MD120-1C	2.52” (64)	4.59” (117)	4.90” (124.5)	2.03lbs (920g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD240	3.43” (87)	4.88” (124)	5.12” (130)	2.87lbs (1300g)	IN/OUT: AWG 21-12	4.4
MD240-1C	3.29” (83.5)	4.59” (117)	4.90” (124.5)	3.04lbs (1380g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD240-1CS	2.52” (64)	4.59” (117)	4.90” (124.5)	2.03lbs (920g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD480	6.14” (156)	4.96” (126)	5.12” (130)	4.96lbs (2250g)	IN/OUT: AWG 20-6	7.0
MD480-1C	6.91” (175.5)	4.59” (117)	4.90” (124.5)	4.23lbs (1920g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD-DINBRKTA	5.38” (135)	3.13 (80)	5.50 (140)	1.08lbs (490g)	IN/OUT: AWG 16	N/A
MD-DINBRKTB	3.56 (90)	3.19 (80)	4.00 (102)	0.75lbs (340g)	IN/OUT: AWG 16	N/A

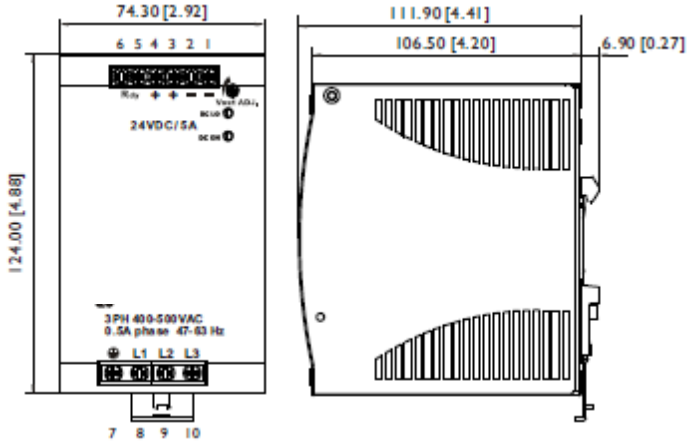
DIN-MOUNT BATTERY HOLDER KITS



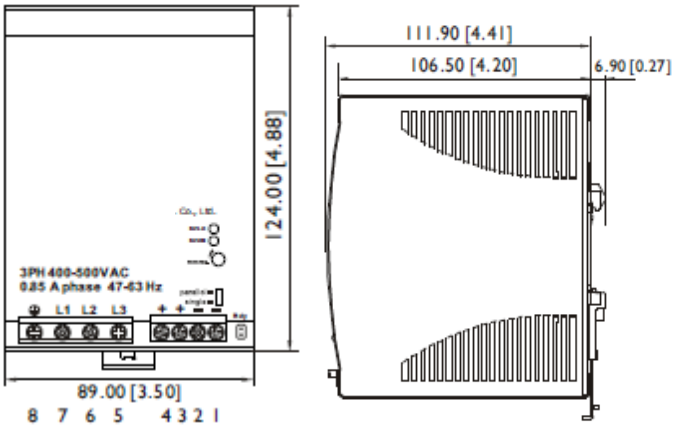
MD SERIES – THREE PHASE

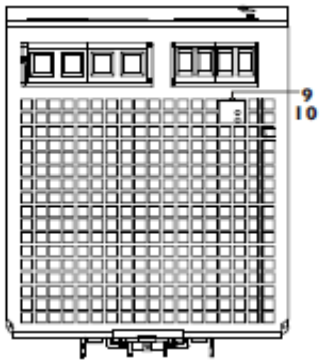
MD120-xx-3C – MD960-xx-3C Dimensions

MD120-xx-3C

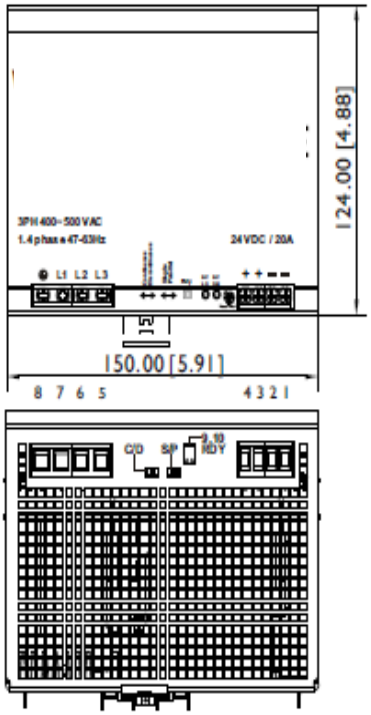


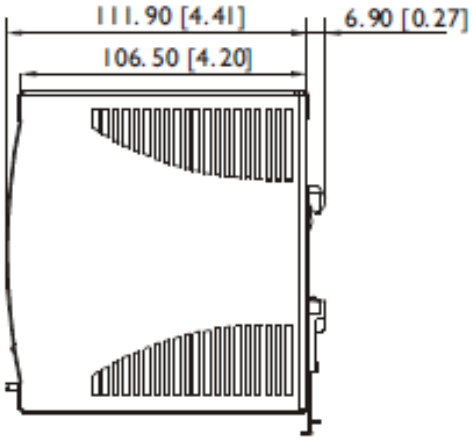
MD240-xx-3C



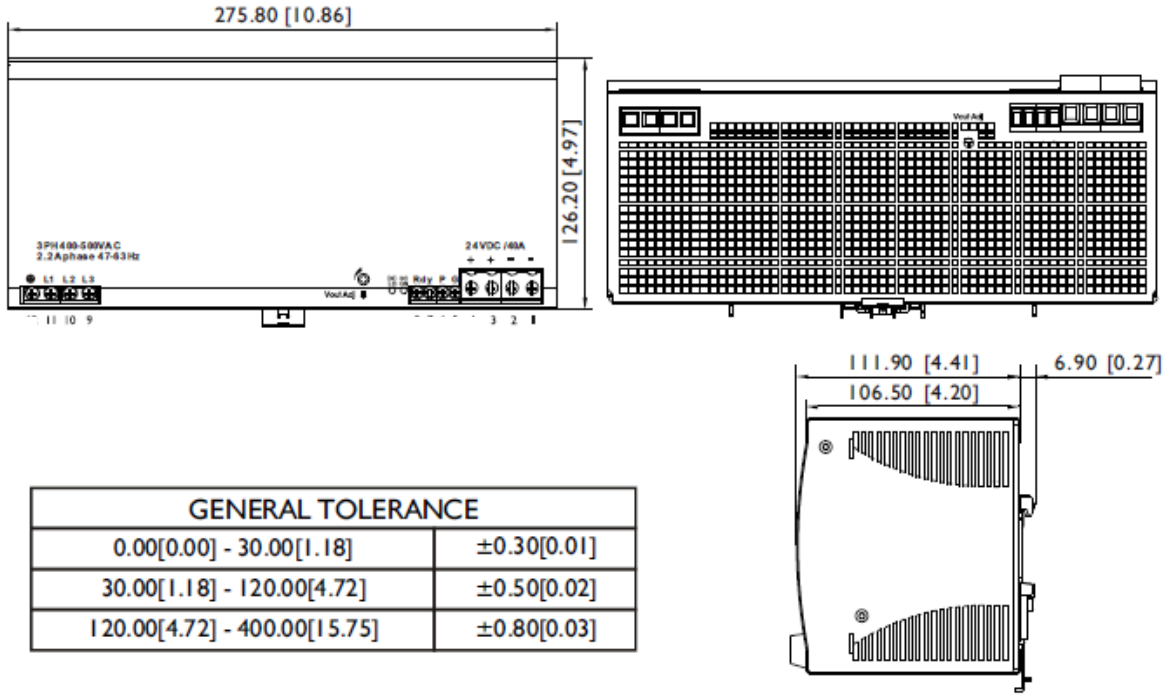


MD480-xx-3C





MD960-xx-3C Dimensions



GENERAL TOLERANCE	
0.00[0.00] - 30.00[1.18]	±0.30[0.01]
30.00[1.18] - 120.00[4.72]	±0.50[0.02]
120.00[4.72] - 400.00[15.75]	±0.80[0.03]

Model Comparison

Model	W (Width)	D (Depth)	H (Height)	Weight	Connectors	Torque lb/in
MD120-3C	2.92" (74.3)	4.41" (112)	4.88" (124)	1.76lbs (800g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD240-3C	3.50" (89)	4.41" (112)	4.88" (124)	2.43lbs (1100g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD480-3C	5.91" (150)	4.41" (112)	4.88" (124)	3.80lbs (1720g)	IN/OUT: AWG 24-10	IN 9/OUT 5.5
MD960-3C	10.86 (276)	4.41" (112)	4.97" (126)	7.50lbs (3400g)	IN: AWG 24-10 OUT: AWG 20-6	IN 9/OUT 5.5

Basic Specifications

For individual product detail, please refer to the four-page PDF technical document for each power supply listing (Wattage & Single/Two/Three Phase). Contact Micron Industries Corporation, +1 630.516.1222 or www.micronpower.com.

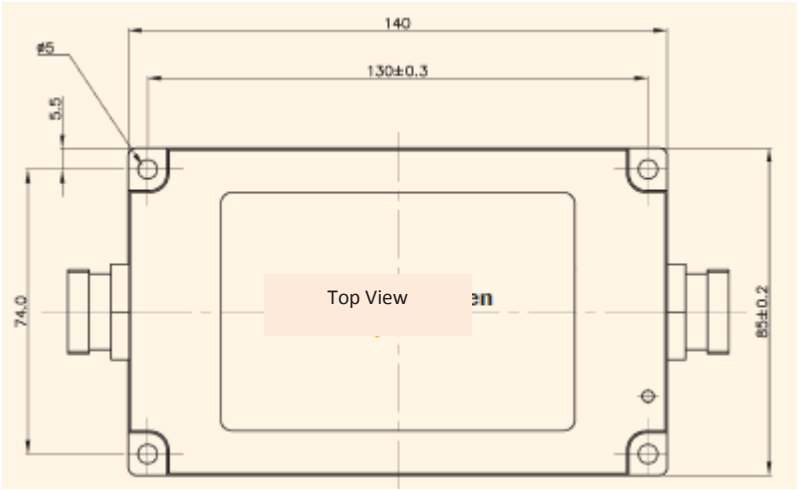
- All ***DIN***ergy products are $_{c}$UL Listed to UL508/60950-1 and CE Certified to EN 61000 specifications.
- Virtually all ***DIN***ergy products qualify to UL 1604; Class 1, Division 2 requirements.
- Many ***DIN***ergy products are classified to UL 1310; Class 2 – current limiting applications.
- All ***DIN***ergy products, excepting UL 1310, are capable of at least 120% rated load.
- All ***DIN***ergy products carry a 3-year warranty.

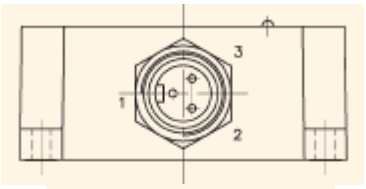
Micron also offers engineered designs such as UPS Modules,
Power supplies for battery backup,
Encapsulated power supplies,
Open frame power supplies
Individual four-page technical PDF's are available for all *DIN*ergy power supplies

PM SERIES ENCAPSULATED

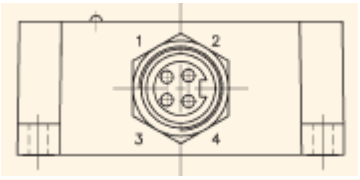
DIN-Mount, Non-Metallic Power Supplies

PM-IP67A50 S24, PM-IP67A75 S24 and PM-IP67A100 S24 Dimensions



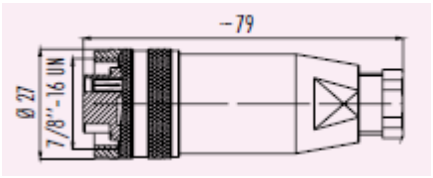


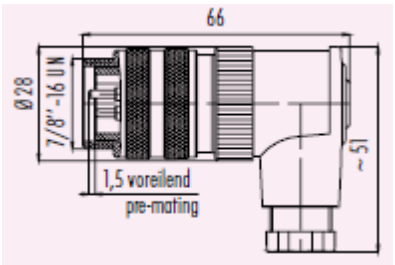
1	2	3
nc	AC_{In}	AC_{In}



1	2	3	4
$+U_1$	$+U_1$	GND	GND

CONNECTORS SOURCED SEPARATELY (Binder 820 Series) 7/8”





Part Number	Description
600700-04512	Connector, 7/8" Female-Straight
600700-04513	Connector, 7/8% Male-Straight
600700-04514	Connector, 7/8" Female-90°
600700-04515	Connector, 7/8" Male-90°

Advanced transformers built for the industrial environment

Micron chose to encapsulate its control transformer designs over 40 years ago and still does so today. Why? Encapsulation provides:

- Improved heat dissipation from the core.
- Windings and solder connections protected from corrosion for longer transformer life.
    - The average MTBF of our 600 volt class Impervi**TRAN**™ is 192,720 hours.
- The use of encapsulation and robust terminal block construction greatly reduces freight and installation damage.

From the beginning, Micron designed a user-centric product that stands the test of time.

- Compact terminal spacing.
- Integral secondary fusing capability was designed into the first Impervi**TRAN™**.
- Offering primary fusing capability for nearly 40 years! Simplified by the factory installed Impervi**MOUNT**™ accessory mounting plate.
- Impervi**MOUNT**™ is standard on all Series 2 designs and is optional on all other Micron transformer products, including open construction transformers and reactors; thus allowing the installer an additional accessory mounting location.
- Philslot/pressure plate terminal screws simplify the wiring process.

How to size a transformer

Inrush VA: Helps choose final VA

Sealed VA: helps choose FLA

Selection Guide for Control Transformers

REGULATION DATA CHART

Inrush VA at 20% Power Factor

VA	NEMA / IEC 95% Sec. Voltage	NEMA / IEC 90% Sec. Voltage	NEMA / IEC 85% Sec. Voltage
25[1]	100 / ----	130 / ---	150 / ---
50[1]	170 / 190	200 / 220	240 / 270
75[1]	310 / 350	410 / 460	540 / 600
100[1]	370 / 410	540 / 600	730 / 810
150[2]	780 / 850	930 / 1030	1150 / 1270
200[2]	810 / 900	1150 / 1270	1450 / 1600
250[2]	1400 / 1540	1900 / 2090	2300 / 2530
300[2]	1900 / 2090	2700 / 2970	3850 / 4240
350[2]	3100 / 3410	3650 / 4020	4800 / 5280
500[2]	4000 / 4400	5300 / 5830	7000 / 7700
750[2]	8300 / 9130	11000 / 12100	14000 / 15400
1000[2]	15000 / 16500	21000 / 23000	27000 / 29500
1000[3]	9000 / 9900	13000 / 14300	18500 / 20300
1500[3]	10500 / 11500	15000 / 16500	20500 / 22500
2000[3]	17000 / 18900	25500 / 27300	34000 / 36400
3000[3]	24000 / 25700	36000 / 38500	47500 / 50200
5000[3]	55000 / 58800	92500 / 98900	115000 / 122000

[1] For units with class 105° C insulation system.
[2] For units with class 130° C insulation system.
[3] For units with class 180° C insulation system.

SELECTION PROCESS

Selecting a transformer for industrial control circuit applications requires understanding the relationships between the following terms.

INRUSH VA is the product of the *load voltage (V)* multiplied by the *current (A)* that is required during start-up. This is also known as *magnetizing current*. It is calculated by adding together the inrush VA of all components that might be energized simultaneously. Inrush VA is available from the component manufacturer.

SEALED VA also called *Steady State VA* is the product of the *load voltage (V)* multiplied by the *current (A)* that is required during normal operation. It is calculated by adding together the sealed VA of all components that might be operating simultaneously. Sealed VA is available from the component manufacturer.

PRIMARY VOLTAGE is the voltage available from the distribution system and its operational frequency, which is connected to the transformer *supply* voltage (H) terminals.

SECONDARY VOLTAGE is the voltage required for load operation, which is connected to the transformer *load* voltage (X) terminals.

Once the circuit variables have been determined, transformer selection is a simple four step process:

1) Based on the industry accepted formula: **Application Inrush VA = √((Inrush VA)² + (Sealed VA)²)**
2) Refer to the regulation data chart. If the load can tolerate a 10% voltage sag upon start-up select from the 90% secondary voltage column; if only 5%, select from the 95% column.
3) After determining the proper secondary voltage column, read down until a value equal or greater than the Application Inrush VA is found. The numbers indicate the *maximum* Application Inrush VA that will still generate the required secondary voltage upon start-up.
4) Read left to the transformer VA column and select the proper transformer for the application. *As a final check make sure that the Transformer VA is equal or greater than the total Sealed VA requirements.*

Pick the VA rating requested + the **secondary** voltage. ie: 250VA @ 24 volts. The chart indicates a maximum 15 amp fuse

Pick the VA rating requested + the **primary** voltage. ie: 250Va @ 480 volts. The chart indicates a maximum 1-1/4 amp fuse.

SECONDARY AND PRIMARY OVERCURRENT PROTECTION

Secondary Voltage	VA RATING															
	25	50	75	100	150	200	250	300	350	500	750	1000	1500	2000	3000	5000
12	3-2/10	6-1/4	10	12	15	20	25	30	--	--	--	--	--	--	--	--
23	1-8/10	3-1/2	5	7	10	12	15	17-1/2	20	30	--	--	--	--	--	--
24	1-6/10	3-2/10	5	6-1/4	10	12	15	17-1/2	20	30	--	--	--	--	--	--
25	1-6/10	3-2/10	5	6-1/4	10	12	15	15	17-1/2	25	--	--	--	--	--	--
90	4/10	8/10	1-1/4	1-8/10	2-1/2	3-1/2	4-1/2	5	6-1/4	9	12	15	20	25	--	--
95	4/10	8/10	1-1/4	1-6/10	2-1/2	3-1/2	4	5	6	8	12	15	17-1/2	25	--	--
100	4/10	8/10	1-1/4	1-6/10	2-1/2	3-2/10	4	5	5-6/10	8	12	15	17-1/2	25	--	--
110	3/10	3/4	1-1/8	1-1/2	2-1/4	3	3-1/2	4-1/2	5	7-1/2	10	12	17-1/2	25	--	--
115	3/10	6/10	1	1-4/10	2	2-8/10	3-1/2	4	5	7	10	12	17-1/2	25	--	--
120	3/10	6/10	1	1-1/4	2	2-1/2	3-2/10	4	4-1/2	6-1/4	10	12	17-1/2	25		
220	3/16	3/10	1/2	3/4	1-1/8	1-1/2	1-8/10	2-1/4	2-1/2	3-1/2	5-6/10	7-1/2	10	12	17-1/2	30
230	15/100	3/10	1/2	6/10	1	1-4/10	1-8/10	2	2-1/2	3-1/2	5	7	10	12	17-1/2	30
240	15/100	3/10	1/2	6/10	1	1-4/10	1-6/10	2	2-1/4	3-2/10	5	6-1/4	10	12	17-1/2	30

Primary Voltage	VA RATING															
	25	50	75	100	150	200	250	300	350	500	750	1000	1500	2000	3000	5000
115	1/2	1	1-6/10	2	3-2/10	4	5	6-1/4	7-1/2	10	15	20	30	--	--	--
120	1/2	1	1-1/2	2	3	4	5	6-1/4	7	10	15	20	30	--	--	--
200	3/10	6/10	8/10	1-1/4	1-8/10	2-1/2	3	3-1/2	4	6-1/4	9	12	17-1/2	25	--	--
208	3/10	6/10	8/10	1-1/8	1-8/10	2-1/4	3	3-1/2	4	6	9	12	17-1/2	20	--	--
220	1/4	1/2	8/10	1-1/8	1-6/10	2-1/4	2-8/10	3-2/10	3-1/2	5-6/10	8	10	15	20	30	--
230	1/4	1/2	8/10	1	1-6/10	2	2-1/2	3-2/10	3-1/2	5	8	10	15	20	30	--
240	1/4	1/2	3/4	1	1-1/2	2	2-1/2	3	3-1/2	5	7-1/2	10	15	20	30	--
277	2/10	4/10	6/10	8/10	1-1/4	1-8/10	2-1/4	2-1/2	3	4-1/2	6-1/4	9	12	17-1/2	25	--
380	15/100	3/10	4/10	6/10	8/10	1-1/4	1-6/10	1-8/10	2-1/4	3-2/10	4-1/2	6-1/4	9	12	17-1/2	30
400	15/100	3/10	4/10	6/10	8/10	1-1/4	1-1/2	1-8/10	2	3	4-1/2	6-1/4	9	12	17-1/2	30
415	15/100	3/10	4/10	6/10	8/10	1-1/8	1-1/2	1-8/10	2	3	4-1/2	6	9	12	17-1/2	30
440	1/8	1/4	4/10	1/2	8/10	1-1/8	1-4/10	1-6/10	1-8/10	2-8/10	4	5-6/10	8	10	15	25
460	1/8	1/4	4/10	1/2	8/10	1	1-1/4	1-6/10	1-8/10	2-1/2	4	5	8	10	15	25
480	1/8	1/4	3/10	1/2	3/4	1	1-1/4	1-1/2	1-8/10	2-1/2	3-1/2	5	7-1/2	10	15	25
550	1/10	2/10	3/10	4/10	6/10	8/10	1-1/8	1-1/4	1-1/2	2-1/4	3-2/10	4-1/2	6-1/4	9	12	20
575	1/10	2/10	3/10	4/10	6/10	8/10	1	1-1/4	1-1/2	2	3-2/10	4	6-1/4	8	12	20
600	1/10	2/10	3/10	4/10	6/10	8/10	1	1-1/4	1-4/10	2	3	4	6-1/4	8	12	20

- If the rated secondary current is less than 9 amps, the secondary rating of overcurrent protection is 167% maximun of rated secondary current.
- If the rated secondary current is 9 amps or greater, the secondary rating of overcurrent protection is 125% maximun of rated secondary current
- Primary rating of overcurrent protection is 250% maximun of rated primary current when secondary is protected by overcurrent protection.

Reference: NEC 450.3(B)

Rev 9/3/10

ImperviTRAN™ PRODUCT SELECTION GUIDE

GENERAL SPECIFICATIONS: ALL ARE 50/60 Hz RATED

BUILDING STYLE:

Series 2 IMPERVITRA — IMPERVITRAN (non-Series 2) highlighted in blue

APPROVALS: UL/cUL File #E46323 — APPROVALS: UL File #E46323/CSA File #LR27533

TERMINAL TIGHTENING TORQUE (ALL IMPERVITRAN STYLES): ≤30A: 20 lb/in; >30A: 30 lb/in

TERMINAL NUMBER: Column "T" denotes terminal count needed to select terminal cover kits
Sold as 10-Paks. TPTC-2001 fits all 4-terminal designs; TPTC-2002 fits all 6-terminal designs.

TEMPERATURE CLASS:
Two letter suffix denotes Temp Class 105°C
Three letter suffix ending in "F" denotes Temp Class 130°C
Three letter suffix ending in "H" denotes Temp Class 180°C

PART NUMBER DESCRIPTORS:

Alpha-numeric

B150BTZ13JKF

B = Impervitran construction
150 = VA rating (Kva = *K*ie: 3K0)
BT = Primary voltage rating
Z = Triple rated ±5% around nominal voltage
13 = Secondary voltage
JK = installed accessories
F = 130°C construction

Serialized

B150-2004-GAF

B = Impervitran construction
150 = VA rating
2004 = Assigned by engineering
GA = GlobalTran EN61558-2-2
F = 130°C construction

COMMON PRIMARY VOLTAGES

120 = L	277 = Q	460 = T
208 = M	380 = R	480 = U
230 = B	400 = F	575 = W
240 = P	415 = D	±5% = Z

COMMON SECONDARY VOLTAGES

5 = 12	19 = 240
7 = 24	34 = 110 X 220
13 = 115	37 = 95, 115
15 = 120	

SUFFIX DESCRIPTION:

"J" in suffix denotes jumpers necessary for operation
"K" in suffix denotes installed secondary fuse clips for 13/32 x 1-1/2 fuse
"-1" in suffix denotes installed secondary fuse clips (serialized P/Ns)
"-3" in suffix denotes no fuse clips on unit (serialized P/Ns)
"R" in suffix denotes installed Class "CC" primary fuse block
"-8 or -5" in suffix denotes installed Class "CC" primary fuse block (serialized P/Ns)
"X" in suffix is a place holder. The letter it replaces is not available on that unit

EXAMPLE:

B100BTZ13**JK** >>> B100BTZ13**RB**
B150MBT13**XKF** >>> B150MBT13**RKF**

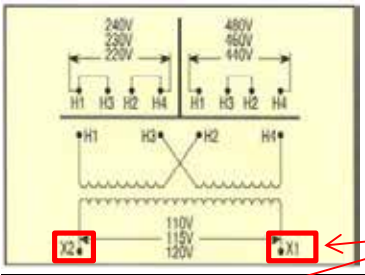
Blue not Series 2

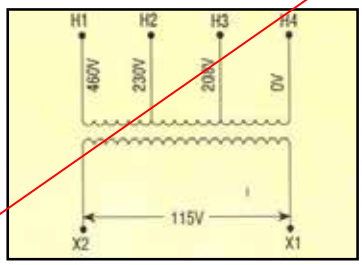
Pertinent agency and mechanical data

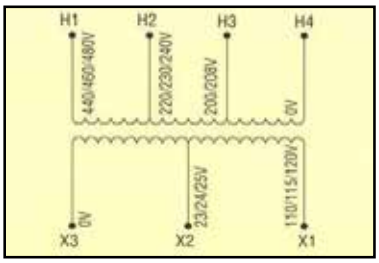
Number of terminals

Transformer Full Load Amps

Terminal designators





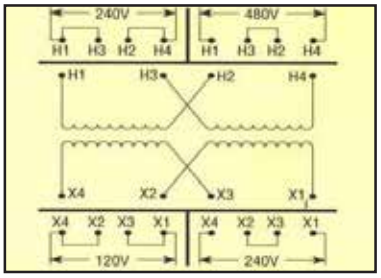


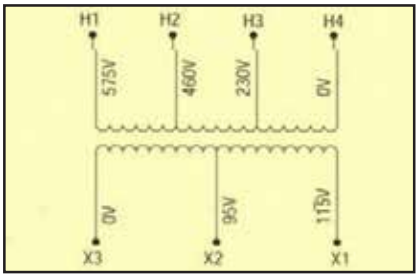
Primary: 220 x 440, 230 x 460, 240 x 480 Secondary: 110/115/120			
T	F.L.A.	VA	CATALOG NUMBER
4	0.43	50	B050BTZ13JK
4	0.65	75	B075BTZ13JK
4	0.87	100	B100BTZ13JK
4	1.30	150	B150BTZ13JKF
4	1.74	200	B200BTZ13JKF
4	2.17	250	B250BTZ13JKF
4	2.61	300	B300BTZ13JKF
4	3.04	350	B350BTZ13JKF
6	4.35	500	B500BTZ13JKF
6	6.52	750	B750BTZ13JKF
6	8.70	1000	B1K0BTZ13JKF
6	13.04	1500	B1K5BTZ13JKF
6	17.39	2000	B2K0BTZ13JKH
6	26.09	3000	B3K0BTZ13JXH
6	43.48	5000	B5K0BTZ13JXH

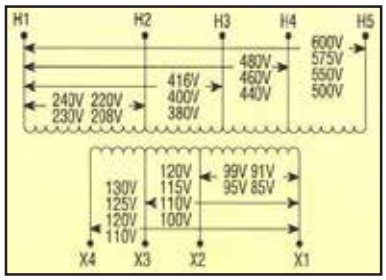
Primary: 208, 230, 460 Secondary: 115			
T	F.L.A.	VA	CATALOG NUMBER
4	0.43	50	B050MBT13XK
4	0.65	75	B075MBT13XK
4	0.87	100	B100MBT13XK
4	1.30	150	B150MBT13XKF
4	1.74	200	B200MBT13XKF
4	2.17	250	B250MBT13XKF
4	2.61	300	B300MBT13XKF
4	3.04	350	B350MBT13XKF
6	4.35	500	B500MBT13XKF
6	6.52	750	B750MBT13XKF
6	8.70	1000	B1K0MBT13XKF
6	13.04	1500	B1K5MBT13XKF
6	17.39	2000	B2K0MBT13XKH
6	26.09	3000	B3K0MBT13XXH
6	43.48	5000	B5K0MBT13XXH

Primary: 208/230/460 Secondary: 24/115			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08/0.44	50	B050-2000-1
4	3.13/0.65	75	B075-2001-1
4	4.17/0.87	100	B100-2002-1
4	6.25/1.30	150	B150-2003-1F
4	8.33/1.74	200	B200-2004-1F
4	10.42/2.17	250	B250-2005-1F
6	12.50/2.61	300	B300-2006-1F
6	14.58/3.04	350	B350-2007-1F
6	20.84/4.35	500	B500-2008-1F
6	31.30/6.50	750	B750-2009-1F
6	41.70/8.70	1000	B1K0-2010-1F

Blue is not Series 2





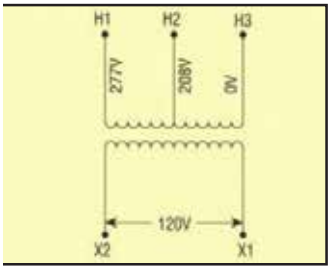


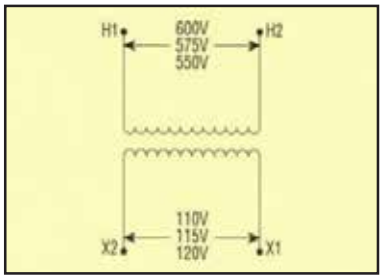
Primary: 240 x 480 Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
4	0.42/0.21	50	B050PU1519JJ
4	0.63/0.31	75	B075PU1519JJ
4	0.83/0.42	100	B100PU1519JJ
4	1.25/0.63	150	B150PU1519JJF
4	1.67/0.83	200	B200PU1519JJF
4	2.08/1.04	250	B250PU1519JJF
4	2.50/1.25	300	B300PU1519JJF
4	2.92/1.46	350	B350PU1519JJF
6	4.17/2.08	500	B500PU1519JJF
6	6.25/3.12	750	B750PU1519JJF
6	8.70/4.35	1000	B1K0-0500-3F
6	13.04/6.52	1500	B1K5-0501-3H
6	17.39/8.70	2000	B2K0-0502-3H
6	26.09/13.04	3000	B3K0-0503-3H
6	43.48/21.74	5000	B5K0-0504-3H

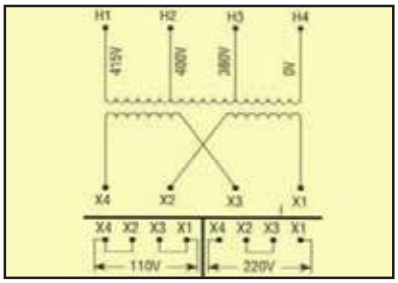
Primary: 230,460,575 Secondary: 95,115			
T	F.L.A.	VA	CATALOG NUMBER
4	0.53/0.44	50	B050BTW37XX
4	0.79/0.65	75	B075BTW37XX
4	1.05/0.87	100	B100BTW37XX
4	1.58/1.30	150	B150BTW37XXF
4	2.11/1.74	200	B200BTW37XXF
4	2.63/2.17	250	B250BTW37XXF
4	3.16/2.61	300	B300BTW37XXF
4	3.68/3.04	350	B350BTW37XXF
6	5.26/4.35	500	B500BTW37XXF
6	7.89/6.52	750	B750BTW37XXF
6	10.53/8.70	1000	B1K0BTWZ37XKH
6	15.79/13.04	1500	B1K5BTWZ37XKH
6	21.05/17.39	2000	B2K0BTWZ37XKH
6	31.58/26.09	3000	B3K0BTWZ37XXH
6	52.63/43.48	5000	B5K0BTWZ37XXH

Primary: 208 – 600 Secondary: 85 – 130			
T	F.L.A.	VA	CATALOG NUMBER
6	0.38	50	B050-0482-1
6	0.77	100	B100-0483-1
6	1.15	150	B150-0484-1F
6	1.92	250	B250-0485-1F
6	2.69	350	B350-0486-1F
6	3.85	500	B500-0487-1F
6	5.77	750	B750-0488-1F

IMPERVITRAN (non-Series 2)



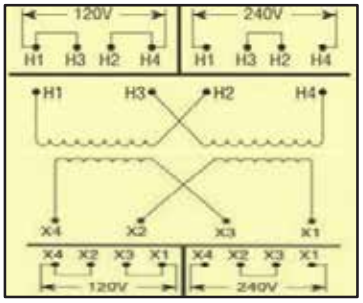




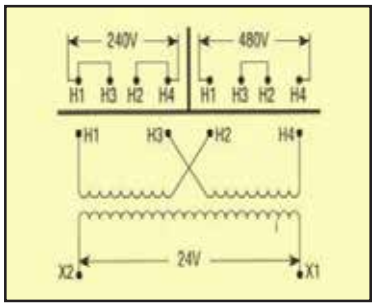
Primary: 208, 277 Secondary: 120			
T	F.L.A.	VA	CATALOG NUMBER
4	0.42	50	B050MQ15XK
4	0.63	75	B075MQ15XK
4	0.83	100	B100MQ15XK
4	1.25	150	B150MQ15XKF
4	1.67	200	B200MQ15XKF
4	2.08	250	B250MQ15XKF
4	2.50	300	B300MQ15XKF
4	2.92	350	B350MQ15XKF
6	4.17	500	B500MQ15XKF
6	6.25	750	B750MQ15XKF

Primary: 550/575/600 Secondary: 110/115/120			
T	F.L.A.	VA	CATALOG NUMBER
4	0.42	50	B050WZ13XK
4	0.65	75	B075WZ13XK
4	0.87	100	B100WZ13XK
4	1.30	150	B150WZ13XKF
4	1.74	200	B200WZ13XKF
4	2.17	250	B250WZ13XKF
4	2.61	300	B300WZ13XKF
4	3.04	350	B350WZ13XKF
6	4.35	500	B500WZ13XKF
6	6.52	750	B750WZ13XKF

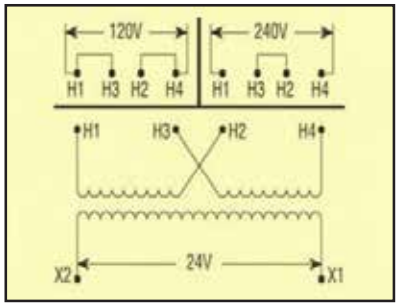
Primary: 380, 400, 415 Secondary: 110 x 220			
T	F.L.A.	VA	CATALOG NUMBER
4	0.46/0.23	50	B050RFD34XJ
4	0.68/0.34	75	B075RFD34XJ
4	0.91/0.46	100	B100RFD34XJ
4	1.37/0.69	150	B150RFD34XJF
4	1.82/0.91	200	B200RFD34XJF
4	2.28/1.14	250	B250RFD34XJF
4	2.72/1.36	300	B300RFD34XJF
4	3.18/1.59	350	B350RFD34XJF
6	4.55/2.27	500	B500RFD34XJF
6	6.82/3.41	750	B750RFD34XJF



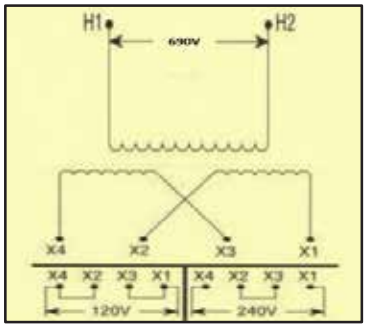
Primary: 120 x 240 Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
4	0.42/0.21	50	B050LP1519JJ
4	0.83/0.42	100	B100LP1519JJ
4	1.25/0.63	150	B150LP1519JJF
4	2.08/1.04	250	B250LP1519JJF
4	2.92/1.46	350	B350LP1519JJF
6	4.17/2.08	500	B500LP1519JJF
6	6.25/3.12	750	B750LP1519JJF



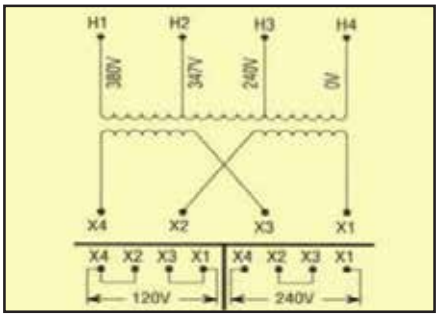
Primary: 240 x 480 Secondary: 24			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08	50	B050PU7JK
4	3.13	75	B075PU7JK
4	4.17	100	B100PU7JK
4	6.25	150	B150PU7JKF
4	8.33	200	B200PU7JKF
4	10.42	250	B250PU7JKF
4	12.50	300	B300PU7JKF
4	14.58	350	B350PU7JKF
6	20.83	500	B500PU7JKF
6	31.25	750	B750PU7JKF



Primary: 120 x 240 Secondary: 24			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08	50	B050LP7JK
4	3.13	75	B075LP7JK
4	4.17	100	B100LP7JK
4	6.25	150	B150LP7JKF
4	8.33	200	B200LP7JKF
4	10.42	250	B250LP7JKF
4	12.50	300	B300LP7JKF
4	14.58	350	B350LP7JKF
6	20.83	500	B500LP7JKF
6	31.25	750	B750LP7JKF



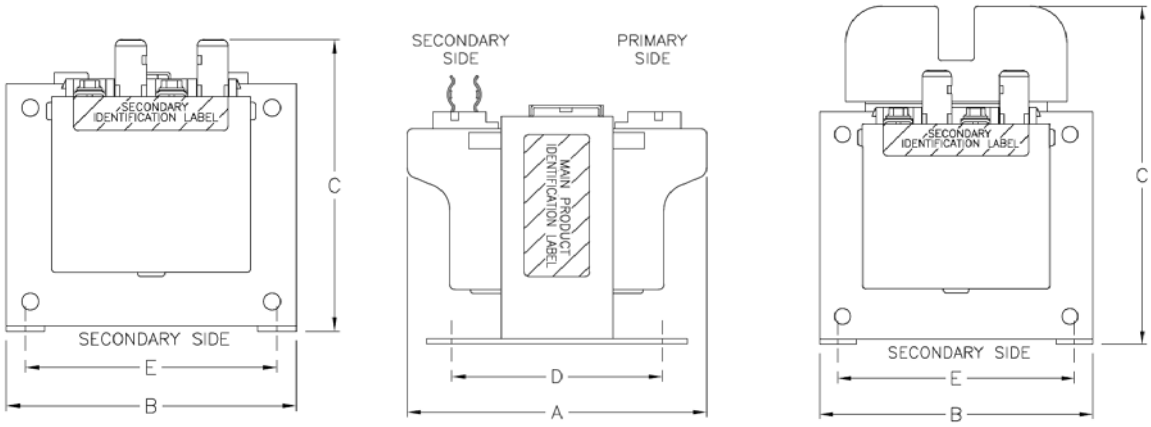
(non UL) Primary: 690 (non CSA) Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
4	0.42/0.21	50	B050-3656-5
4	0.83/0.42	100	B100-3657-5
4	1.25/0.63	150	B150-0653-5F
4	2.08/1.04	250	B250-0654-5F
4	2.92/1.46	350	B350-0655-5F
6	4.17/2.08	500	B500-0656-5F
6	6.25/3.12	750	B750-0657-5F



Primary: 240, 347, 380 Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
6	8.33/4.17	1000	B1K0-0321-3F
6	12.50/6.25	1500	B1K5-0322-3H
6	16.67/8.33	2000	B2K0-0323-3H
6	25.00/12.50	3000	B3K0-0324-3H
6	41.67/20.83	5000	B5K0-0325-3H
IMPERVITRAN (Non-Series 2)			

MICRON ALSO OFFERS THE *DIN*ergy™ LINE OF INDUSTRIAL DIN-MOUNT POWER SUPPLIES FROM 18 – 960 WATT PLUS SINGLE PHASE AND THREE PHASE LVGP, BUCK-BOOST TRANSFORMERS AND SPECIALTY MAGNETICS

ImperviTRAN™ PRODUCT DIMENSIONAL DATA



Series 2 Depicted

The yellow and red highlighted part numbers represent footprint identical matches to either the "BTZ" series or the Group "J" series which equate to the two most popular voltage groupings

All highlighted in yellow matches footprint to identical VA "BTZ13" design

Note: Dimension "C" is always depicted as a maximum dimension

Primary fuse block adds 1.375" (35MM) to the "C" dimension as measured from top of accessory mounting plate

Deduct 0.50" (12.7MM) from "C" dimension when removing secondary fuse clips

MATCHED DIMENSIONS: 50-750VA **Yellow highlight equals match to same VA, BTZ13 footprint**

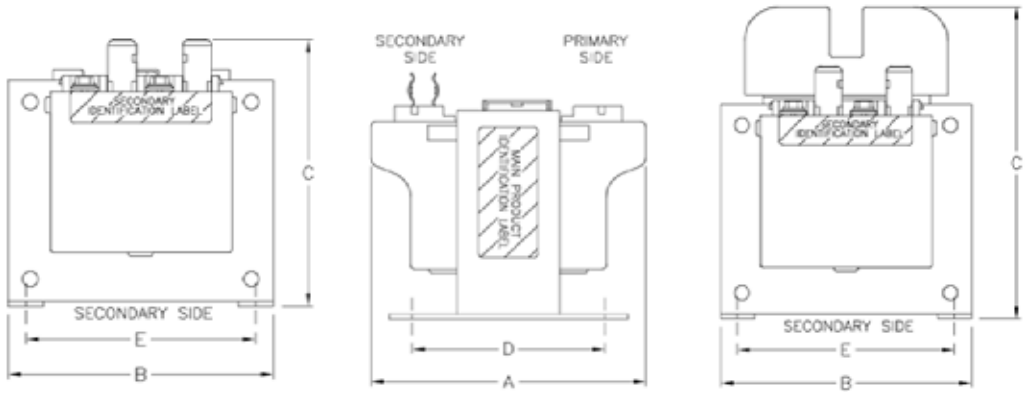
Voltage Groups: BTZ13, PU7, LP7, WZ13, MQ15, RFD34, PU1519, LP1519

VA	SERIES 2 (MAX)		ALL VERSIONS		INC'L FUSE CLIP		ALL VERSIONS		ALL VERSIONS		W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
50	3.78	96	3.00	76	3.14	79	1.96	50	2.50	64	2.70
75	4.00	102	3.00	76	3.14	79	2.42	62	2.50	64	3.40
100	4.00	102	3.38	86	3.46	88	2.45	62	2.81	71	4.40
150	4.03	102	3.75	95	3.77	96	2.82	71	3.13	79	6.00
200	4.38	111	4.50	114	4.40	112	2.42	62	3.75	95	8.90
250	4.38	111	4.50	114	4.40	112	2.82	71	3.75	95	9.30
300	4.75	121	4.50	114	4.40	112	3.18	81	3.75	95	11.00
350	4.75	121	4.50	114	4.40	112	3.75	95	3.75	95	11.60
500	6.11	155	5.25	133	5.14	131	3.88	99	4.38	111	17.40
750	7.61	193	5.25	133	5.14	131	5.38	137	4.38	111	26.50

THE FOLLOWING DIMENSIONS DIFFER FROM THE PREVIOUSLY LISTED VA RATINGS

MBT13 -- Pri: 208, 230, 460 Sec: 115

VA	SERIES 2 (MAX)		ALL VERSIONS		INC'L FUSE CLIP		ALL VERSIONS		ALL VERSIONS		W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
B050MBT13XK	3.78	96	3.00	76	3.14	79	2.21	56	2.50	64	2.70
B075MBT13XK	4.00	102	3.38	86	3.46	88	2.45	63	2.82	71	3.40
B100MBT13XK	4.00	102	3.38	86	3.46	88	2.62	67	2.81	71	4.40
B150MBT13XKF	4.03	102	3.75	95	3.77	96	2.82	71	3.13	79	5.60
B200MBT13XKF	4.38	111	4.50	114	4.40	112	2.82	71	3.75	95	9.10
B250MBT13XKF	4.75	121	4.50	114	4.40	112	3.18	81	3.75	95	10.80
B300MBT13XKF	4.75	121	4.50	114	4.40	112	3.75	95	3.75	95	11.20
B350MBT13XKF	5.75	146	4.50	114	4.40	112	4.72	120	3.75	95	12.40
B500MBT13XKF	6.11	155	5.25	133	5.14	131	4.38	111	4.38	111	17.40
B750MBT13XKF	7.61	193	5.25	133	5.14	131	5.87	149	4.38	111	26.20



Series 2 Depicted

BTW37 -- Pri: 230, 460, 575 Sec: 95, 115

VA	SERIES 2 (MAX)		ALL VERSIONS		NO FUSE CLIP		ALL VERSIONS		ALL VERSIONS		W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
B050BTW37XX	4.03	102	3.00	76	2.72	69	2.20	56	2.50	64	3.20
B075BTW37XX	4.03	102	3.38	86	3.04	77	2.42	62	2.81	71	4.20
B100BTW37XX	4.50	114	3.38	86	3.04	77	2.81	71	2.81	71	5.50
B150BTW37XXF	4.53	115	3.75	95	3.36	85	3.18	81	3.13	79	7.70
B200BTW37XXF	4.38	111	3.75	95	3.98	101	2.82	72	3.75	95	9.10
B250BTW37XXF	4.38	111	4.50	114	3.98	101	3.18	81	3.75	95	9.50
B300BTW37XXF	4.75	121	4.50	114	3.98	101	3.75	95	3.75	95	11.60
B350BTW37XXF	5.61	143	5.25	133	4.63	118	3.38	86	4.38	111	13.80
B500BTW37XXF	6.19	157	5.25	133	4.63	118	4.38	111	4.38	111	17.60
B750BTW37XXF	8.11	206	5.25	133	4.63	118	5.87	149	4.38	111	29.90

All highlighted in red matches footprint to identical VA "Group J" design

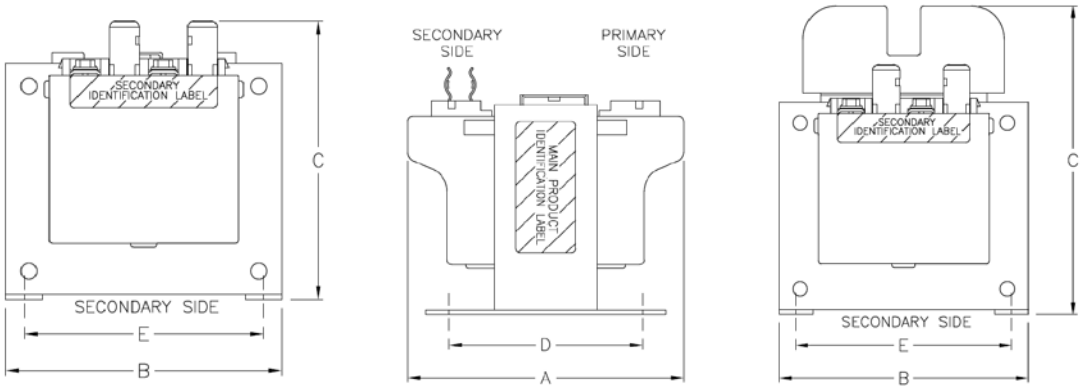
GROUP J – (SERIES 2 VERSION OF MBT713) ***B1K0-2010-1F IS NON SERIES 2**

Pri: -- 208, 230, 460 Sec: 24, 115 **Red highlight equals match to same VA Group J footprint**

VA					INC'L FUSE CLIP						W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
B050-2000-1	4.53	115	3.00	76	3.14	79	2.81	71	2.50	64	4.30
B075-2001-1	4.50	114	3.38	86	3.46	88	2.81	71	2.81	71	5.50
B100-2002-1	4.53	115	3.75	95	3.78	96	3.00	76	3.13	79	6.50
B150-2003-1F	5.03	128	3.75	95	3.78	96	3.18	81	3.13	79	9.50
B200-2004-1F	4.38	111	4.50	114	4.40	112	3.00	76	3.75	95	9.80
B250-2005-1F	4.75	121	4.50	114	4.40	112	3.75	95	3.75	95	11.30
B300-2006-1F	6.11	155	5.25	133	5.14	131	3.88	99	4.38	111	14.10
B350-2007-1F	6.11	155	5.25	133	5.14	131	3.88	99	4.38	111	16.40
B500-2008-1F	7.11	181	5.25	133	5.14	131	5.38	137	4.38	111	23.10
B750-2009-1F	7.11	181	6.75	172	6.30	160	5.00	127	6.13	156	38.60
*B1K0-2010-1F	8.13	207	6.75	172	5.73	146	6.13	156	6.13	156	48.40

Universal Voltage – Pri: 208-600 Sec: 85-130 **ALL ARE NON SERIES 2**

VA					INC'L FUSE CLIP						W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
B050-0482-1	3.44	87	3.88	99	3.38	86	2.41	61	2.81	71	4.00
B100-0483-1	4.00	102	3.75	95	3.62	92	3.00	76	3.13	79	6.80
B150-0484-1F	4.00	102	4.50	114	4.11	104	2.82	71	3.75	95	7.90
B250-0485-1F	5.75	146	4.50	114	4.11	104	4.73	120	3.75	95	10.00
B350-0486-1F	5.69	145	5.25	133	4.64	118	4.38	111	4.38	111	13.60
B500-0487-1F	7.19	183	5.25	133	4.95	126	5.88	149	4.38	111	18.20
B750-0488-1F	6.44	164	6.75	172	5.73	146	4.25	108	6.13	156	30.70

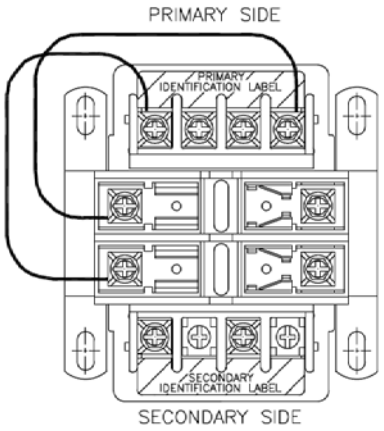


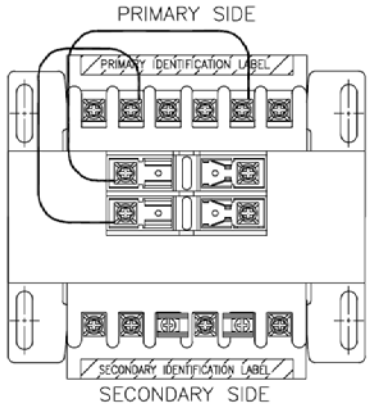
Series 2 Depicted

Special Products – Pri: 690, Sec: 120 x 240

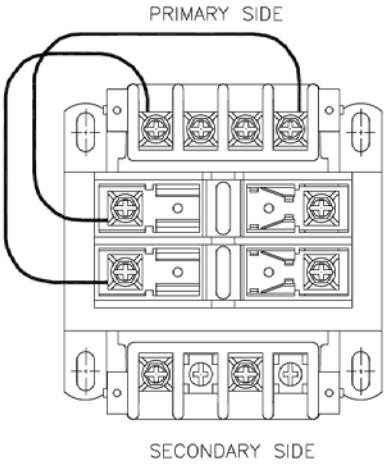
VA					NO FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B050-3656-3	3.78	96	3.00	76	2.95	75	1.96	50	2.50	64	2.70
B100-3657-3	4.00	102	3.38	86	3.27	83	2.45	62	2.81	71	4.10
B150-0653-5F	4.03	102	3.75	95	3.57	91	2.82	71	3.13	79	5.10
B250-0654-5F	4.37	111	4.50	114	4.20	107	2.82	71	3.75	95	8.80
B350-0655-5F	4.74	121	4.50	114	4.18	106	3.18	81	3.75	95	10.90
B500-0656-5F	6.11	155	5.25	133	4.94	126	3.88	99	4.38	111	16.20
B750-0657-5F	7.61	193	5.25	133	4.94	126	5.38	137	4.38	111	24.90

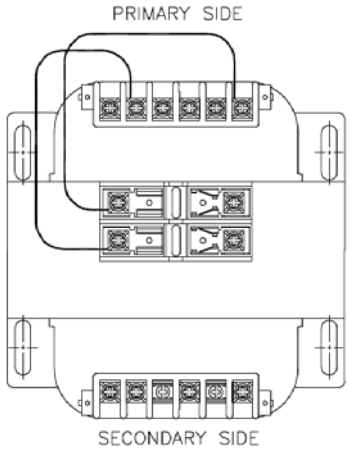
DIAGRAMS BELOW DEPICT SERIES 2 PRIMARY FUSING OPTION

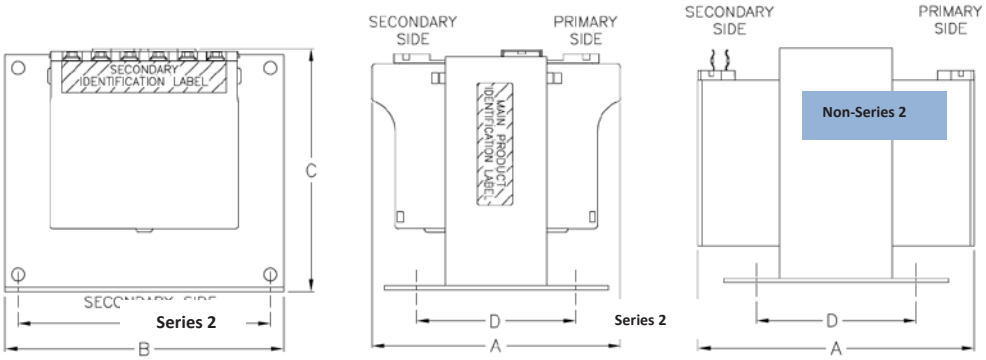




DIAGRAMS BELOW DEPICT NON-SERIES 2 PRIMARY FUSING OPTION







KVA SIZES: **Can be either Series 2 or Non-Series 2**

BTZ13 Pri: 230/460 Sec: 115 No secondary fuse clip > 2Kva **Yellow highlight equals same VA footprint**

VA					INC'L FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B1K0BTZ13JKF	6.11	155	6.75	172	6.30	160	3.91	99	6.13	156	30.50
B1K5BTZ13JKF	8.11	206	6.75	172	6.32	161	6.13	156	6.13	156	50.10
B2K0BTZ13JKH	7.75	197	6.75	172	6.28	160	6.13	156	6.13	156	46.10
B3K0BTZ13JXH	8.00	203	9.00	229	7.50	191	5.25	133	7.50	191	68.80
B5K0BTZ13JXH	10.00	254	9.00	229	7.50	191	7.19	183	7.50	191	109.40

MBT13 Pri: 208, 230, 460 Sec: 115 No secondary fuse clip > 2Kva

VA					INC'L FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B1K0MBT13XKF	7.45	189	6.38	162	5.42	138	5.06	129	5.31	135	37.00
B1K5MBT13XKF	8.50	216	6.75	172	5.75	146	6.09	155	6.13	156	53.90
B2K0MBT13XKH	8.13	207	6.75	172	6.28	160	5.25	133	6.13	156	51.60
B3K0MBT13XXH	8.50	216	9.00	229	7.50	191	5.75	146	7.50	191	77.10
B5K0MBT13XXH	10.31	262	9.00	229	7.50	191	7.56	192	7.50	191	114.60

BTWZ37 Pri: 230/460/575 Sec: 95/115 No secondary fuse clip > 2Kva

VA					INC'L FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B1K0BTWZ37XKH	7.00	178	6.38	162	5.42	138	5.06	129	5.31	135	31.80
B1K5BTWZ37XKH	7.45	189	6.75	172	6.29	160	5.25	133	6.13	156	44.20
B2K0BTWZ37XKH	7.56	192	9.00	229	7.80	198	4.81	122	7.50	191	57.70
B3K0BTWZ37XXH	8.69	221	9.00	229	7.50	191	5.94	151	7.50	191	83.60
B5K0BTWZ37XXH	11.00	279	9.00	229	7.50	191	8.19	208	7.50	191	129.40

PU1519 Pri: 240 x 480 Sec: 120 x 240

VA					NO FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH MM	D	INCH MM	E	LBS
B1K0-0500-3F	7.00	178	5.25	133	4.48	114	5.38	137	4.38	111	28.8
B1K5-0501-3H	7.00	178	6.75	172	5.75	146	4.25	108	6.13	156	37.00
B2K0-0502-3H	7.75	197	6.75	172	5.73	146	4.97	126	6.13	156	46.00
B3K0-0503-3H	8.00	203	9.00	229	7.62	194	5.25	133	7.50	191	80.00
B5K0-0504-3H	10.00	254	9.00	229	7.50	191	7.19	183	7.50	191	114.60

Special Voltages – Pri: 240, 347, 380 Sec: 120 x 240

VA					NO FUSE CLIP						W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH MM	D	INCH MM	E	LBS
B1K0-0321-3F	7.19	183	6.38	162	5.42	138	5.06	129	5.31	135	29.00
B1K5-0322-3H	8.13	207	6.38	162	5.44	138	5.06	129	5.31	135	33.30
B2K0-0323-3H	8.88	226	6.75	172	5.79	147	6.13	156	6.13	156	61.10
B3K0-0324-3H	8.50	216	9.00	229	7.62	194	5.69	146	7.50	191	80.00
B5K0-0325-3H	10.31	262	9.00	229	7.50	191	7.56	192	7.50	191	114.60

GlobalTRAN™ PRODUCT SELECTION GUIDE

GENERAL SPECIFICATIONS: ALL ARE 50/60 Hz RATED

BUILDING STYLE:

ImperviTRAN (non-Series 2)

APPROVALS: UL File #E46323/CSA File #LR27533/CE to EN61558-2-2

GlobalTran includes installed IP-20 terminal covers

TERMINAL TIGHTENING TORQUE (ALL IMPERVITRAN STYLES):

≤30A: 20 lb/in

>30A: 30 lb/in

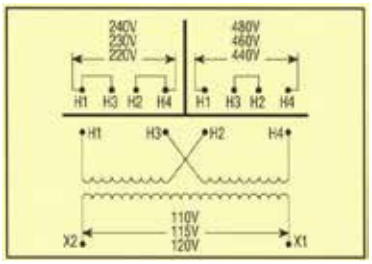
SUFFIX DESCRIPTION:

The GlobalTRAN product is defined by serialized part numbers ending in the basic suffix “GA”

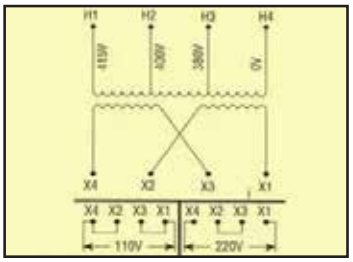
Two letter suffix denotes Temp Class 105°C

Three letter suffix ending in “F” denotes Temp Class 130°C

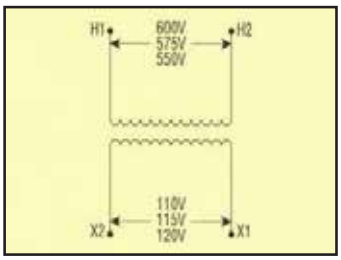
Three letter suffix ending in “H” denotes Temp Class 180°C



Primary: 220 x 440, 230 x 460, 240 x 480 Secondary: 110/115/120			
T	F.L.A.	VA	CATALOG NUMBER
4	0.43	50	B050-2001-GA
4	0.65	75	B075-2002-GA
4	0.87	100	B100-2003-GA
4	1.30	150	B150-2004-GAF
4	1.74	200	B200-2005-GAF
4	2.17	250	B250-2006-GAF
4	2.61	300	B300-2007-GAF
4	3.04	350	B350-2008-GAF
4	4.35	500	B500-2009-GAF
4	6.52	750	B750-2010-GAF
6	8.70	1000	B1K0-2008-GAH
6	13.04	1500	B1K5-2009-GAH
6	17.39	2000	B2K0-2010-GAH
6	26.09	3000	B3K0-2011-GAH
6	45.45	5000	B5K0-2012-GAH



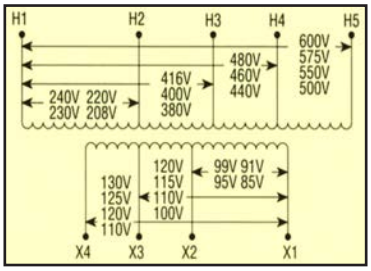
Primary: 380, 400, 415 Secondary: 110 x 220			
T	F.L.A.	VA	CATALOG NUMBER
4	0.46/0.23	50	B050-2061-GA
4	0.68/0.34	75	B075-2062-GA
4	0.91/0.46	100	B100-2063-GA
4	1.37/0.69	150	B150-2064-GAF
4	1.82/0.91	200	B200-2065-GAF
4	2.28/1.14	250	B250-2066-GAF
4	2.72/1.36	300	B300-2067-GAF
4	3.18/1.59	350	B350-2068-GAF
4	4.55/2.27	500	B500-2069-GAF
4	6.82/3.41	750	B750-2070-GAF

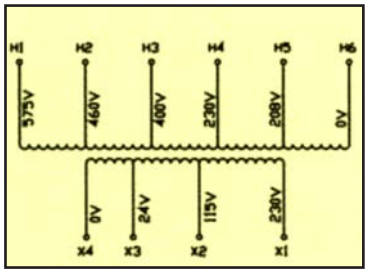


Primary: 550/575/600 Secondary: 110/115/120			
T	F.L.A.	VA	CATALOG NUMBER
4	0.43	50	B050-2041-GA
4	0.65	75	B075-2042-GA
4	0.87	100	B100-2043-GA
4	1.30	150	B150-2044-GAF
4	1.74	200	B200-2045-GAF
4	2.17	250	B250-2046-GAF
4	2.61	300	B300-2047-GAF
4	3.04	350	B350-2048-GAF
4	4.35	500	B500-2049-GAF
4	6.52	750	B750-2050-GAF

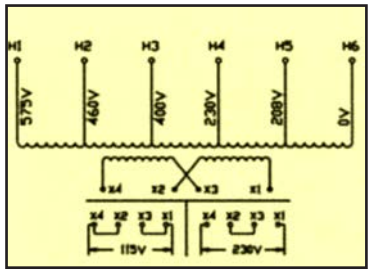
MICRON ALSO OFFERS THE DINergy™ LINE OF INDUSTRIAL DIN-MOUNT POWER SUPPLIES FROM 18 – 960 WATT PLUS SINGLE PHASE AND THREE PHASE LVGP, BUCK-BOOST TRANSFORMERS AND SPECIALTY MAGNETICS

250VA – 1KVA



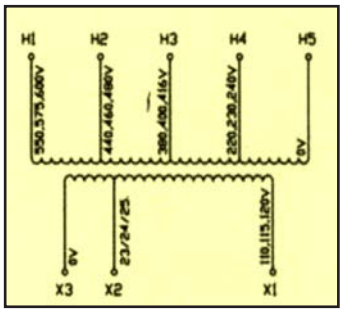


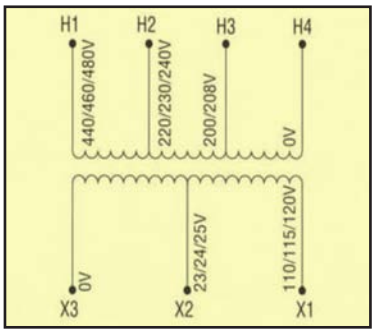
1.5KVA – 5KVA



Primary: 208 – 600 Secondary: 85 – 130			
T	F.L.A.	VA	CATALOG NUMBER
6/4	1.92	250	B250-2283-GAF
6/4	2.31	300	B300-2284-GAF
6/4	2.69	350	B350-2285-GAF
6/4	3.85	500	B500-2286-GAF
6/4	5.77	750	B750-2287-GAF
6	7.69	1000	B1K0-2288-GAH
6	11.54	1500	B1K5-2289-GAH
6	15.38	2000	B2K0-2290-GAH
6	23.08	3000	B3K0-2291-GAH

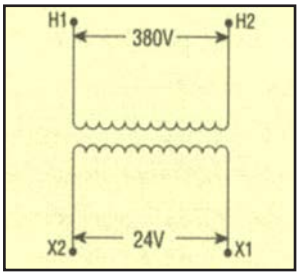
Primary: 230/400/460/575 Secondary: 24/115/230			
T	F.L.A.	VA	CATALOG NUMBER
4	10.42/2.17/1.10	250	B250-2263-GAF
4	12.50/2.61/1.30	300	B300-2264-GAF
4	14.58/3.04/1.50	350	B350-2265-GAF
4	20.84/4.35/2.20	500	B500-2266-GAF
6	31.30/6.50/3.30	750	B750-2267-GAF
6	41.70/8.70/4.30	1000	B1K0-2268-GAH
6	XX/13.04/6.52	1500	B1K5-2269-GAH
6	XX/17.39/8.70	2000	B2K0-2270-GAH
6	XX/26.09/13.04	3000	B3K0-2271-GAH
6	XX/43.48/21.74	5000	B5K0-2272-GAH



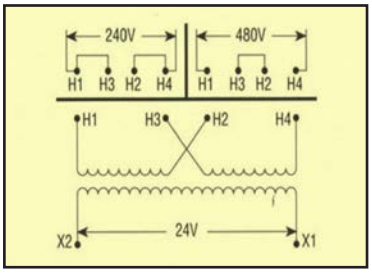


Primary: 230/400/460/575 Secondary: 24/115			
T	F.L.A.	VA	CATALOG NUMBER
6/4	10.40/2.20	250	B250-2243-GAF
6/4	12.50/2.60	300	B300-2244=GAF
6/4	14.60/3.00	350	B350-2245-GAF
6/4	20.80/4.30	500	B500-2246-GAF
6/4	31.30/6.50	750	B750-2247-GAF
6/4	41.70/8/70	1000	B1K0-2248-GAH

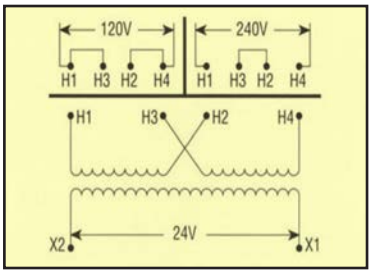
Primary: 208/230/460 Secondary: 24/115				
T	T	F.L.A.	VA	CATALOG NUMBER
4	4	2.08/0.44	50	B050-2101-GA
4	4	3.13/0.65	75	B075-2102-GA
4	4	4.17/0.87	100	B100-2103-GA
4	4	6.25/1.30	150	B150-2104-GAF
4	4	8.33/1.74	200	B200-2105-GAF
4	4	10.42/2.17	250	B250-2106-GAF
4	4	12.50/2.61	300	B300-2107-GAF
4	4	14.58/3.04	350	B350-2108-GAF
4	4	20.84/4.35	500	B500-2109-GAF
4	6	31.30/6.50	750	B750-2110-GAF
6	6	41.70/8.70	1000	B1K0-2188-GAH



Primary: 380 Secondary: 24			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08	50	B050-2051-GA
4	3.13	75	B075-2052-GA
4	4.17	100	B100-2053-GA
4	6.25	150	B150-2054-GAF
4	8.33	200	B200-2055-GAF
4	10.42	250	B250-2056-GAF
4	12.50	300	B300-2057-GAF
4	14.48	350	B350-2058-GAF
4	20.83	500	B500-2059-GAF
4	31.25	750	B750-2060-GAF

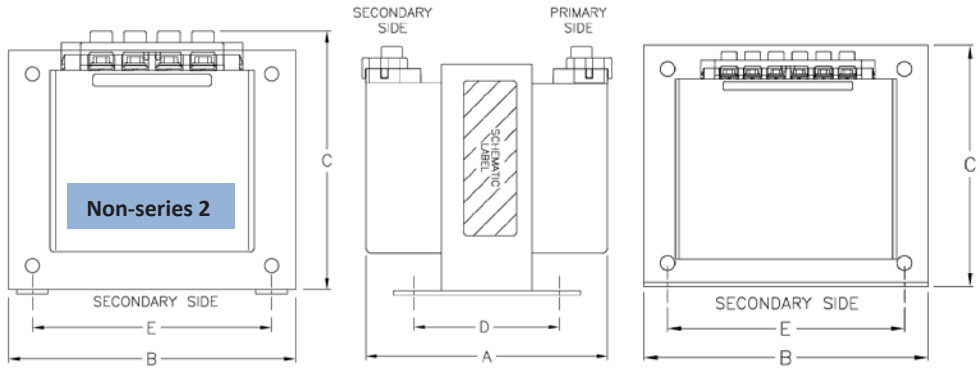


Primary: 240 x 480 Secondary: 24			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08	50	B050-2011-GA
4	3.13	75	B075-2012-GA
4	4.17	100	B100-2013-GA
4	6.25	150	B150-2014-GAF
4	8.33	200	B200-2015-GAF
4	10.42	250	B250-2016-GAF
4	12.50	300	B300-2017-GAF
4	14.48	350	B350-2018-GAF
4	20.83	500	B500-2019-GAF
4	31.25	750	B750-2020-GAF
6	41.67	1000	B1K0-2028-GAF



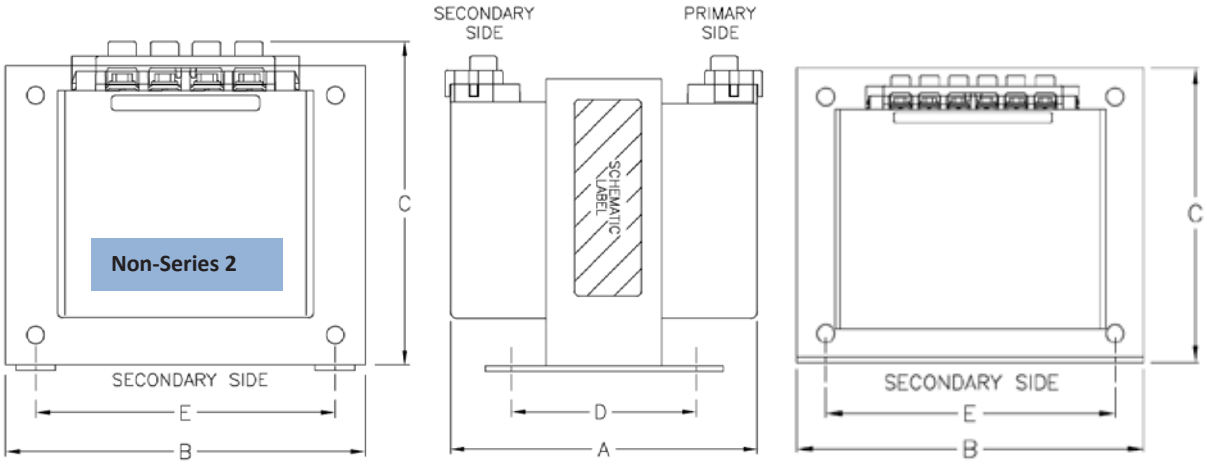
Primary: 120 x 240 Secondary: 24			
T	F.L.A.	VA	CATALOG NUMBER
4	2.08	50	B050-2021-GA
4	3.13	75	B075-2022-GA
4	4.17	100	B100-2023-GA
4	6.25	150	B150-2024-GAF
4	8.33	200	B200-2025-GAF
4	10.42	250	B250-2026-GAF
4	12.50	300	B300-2027-GAF
4	14.48	350	B350-2028-GAF
4	20.83	500	B500-2029-GAF
4	31.25	750	B750-2030-GAF
6	41.67	1000	B1K0-2048-GAF

GlobalTRAN™ PRODUCT DIMENSIONAL DATA



Voltage – Pri: 230/460 Sec: 115

VA											W
DIMENSIONS	INCH A	MM	INCH B	MM	INCH C	MM	INCH D	MM	INCH E	MM	LBS
B050-2001-GA	3.38	86	3.00	76	3.00	76	2.44	61	2.50	64	3.40
B075-2002-GA	3.46	88	3.38	86	3.25	83	2.44	61	2.81	71	4.80
B100-2003-GA	3,38	86	3.75	95	3.50	89	2.44	61	3.13	79	5.90
B150-2004-GAF	3.75	95	4.50	114	4.00	102	2.44	61	3.75	95	8.50
B200-2005-GAF	3.75	95	4.50	114	4.00	102	2.81	71	3.75	95	10.00
B250-2006-GAF	4.00	102	4.50	114	4.00	102	3.19	81	3.75	95	11.00
B300-2007-GAF	4.38	111	4.50	114	4.00	102	3.75	95	3.75	95	13.00
B350-2008-GAF	4.95	126	5.25	133	4.50	114	3.38	86	4.38	111	15.00
B500-2009-GAF	5.13	130	5.25	133	4.50	114	4.38	111	4.38	111	20.00
B750-2010-GAF	7.00	178	5.25	133	5.00	127	5.88	149	4.38	111	29.80
B1K0-2008-GAH	6.63	168	6.38	162	5.50	140	3.75	95	5.31	135	35.00
B1K5-2009-GAH	7.31	186	6.75	172	6.00	152	5.00	127	6.13	156	40.00
B2K0-2010-GAH	8.13	203	6.75	172	6.00	152	5.25	133	6.13	156	45.00
B3K0-2011-GAH	8.06	202	9.00	225	8.00	200	5.25	133	7.50	191	65.20
B5K0-2012-GAH	10.00	250	9.00	225	8.00	200	7.19	183	7.50	191	104.80



Voltage – Pri: 380, 400, 415 Sec: 110 x 220

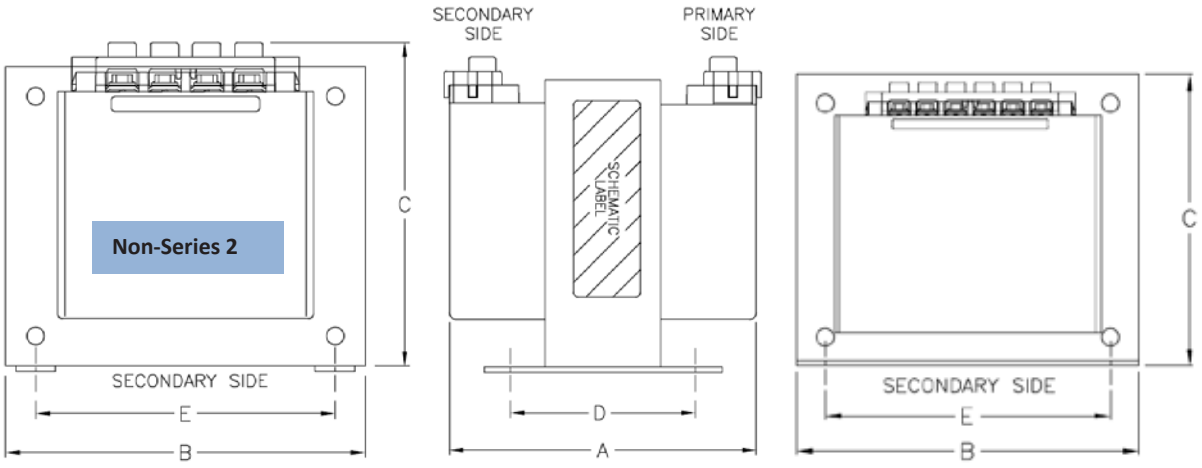
VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B050-2061-GA	3.38		86	3.00		76	3.00		76	2.44		61	2.50		64	3.40
B075-2062-GA	3.46		88	3.38		86	3.25		83	2.44		61	2.81		71	4.80
B100-2063-GA	3.38		86	3.75		95	3.50		89	2.44		61	3.13		79	5.90
B150-2064-GAF	3.75		95	4.50		114	4.00		102	2.44		61	3.75		95	8.50
B200-2065-GAF	3.75		95	4.50		114	4.00		102	3.00		76	3.75		95	10.00
B250-2066-GAF	4.00		102	4.50		114	4.00		102	3.19		81	3.75		95	11.00
B300-2067-GAF	4.38		111	4.50		114	4.00		102	3.75		95	3.75		95	13.00
B350-2068-GAF	4.75		121	4.50		114	4.00		102	3.75		95	3.75		95	15.00
B500-2069-GAF	5.13		130	5.25		133	4.50		114	4.38		111	4.38		111	20.00
B750-2070-GAF	7.00		178	5.25		133	4.50		114	5.88		149	4.38		111	27.00

Voltage – Pri: 550/575/600 Sec: 110/115/120

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B050-2041-GA	3.38		86	3.00		76	3.00		76	2.44		61	2.50		64	3.40
B075-2042-GA	3.38		86	3.38		86	3.25		83	2.44		61	2.81		71	4.80
B100-2043-GA	3.38		86	3.75		95	3.50		89	2.44		61	3.13		80	5.90
B150-2044-GAF	3.75		95	4.50		114	4.00		102	2.44		61	3.75		95	8.50
B200-2045-GAF	3.75		95	4.50		114	4.00		102	3.00		76	3.75		95	10.00
B250-2046-GAF	4.00		102	4.50		114	4.00		102	3.19		81	3.75		95	11.00
B300-2047-GAF	4.38		111	4.50		114	4.00		102	3.75		95	3.75		95	13.00
B350-2048-GAF	4.50		114	5.25		133	4.50		114	3.38		86	4.38		111	15.00
B500-2049-GAF	5.13		130	5.25		133	4.50		114	4.38		111	4.38		111	20.00
B750-2050-GAF	7.00		178	5.25		133	4.50		114	5.38		137	4.38		111	28.00

Voltage – Universal Pri: 208-600 Sec: 85-130

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B250-2283-GAF	4.25		108	4.50		114	4.00		102	3.44		86	3.75		95	11.40
B300-2284-GAF	4.75		121	4.50		114	4.00		102	3.75		95	3.75		95	13.60
B350-2285-GAF	5.25		133	4.50		114	4.11		104	3.75		95	3.75		95	14.20
B500-2286-GAF	5.50		140	5.25		133	4.66		118	3.88		99	4.38		111	17.40
B750-2287-GAF	7.38		187	5.25		133	4.78		121	5.88		149	4.38		111	27.50
B1K0-2288-GAH	7.00		178	6.38		162	5.50		140	5.06		129	5.31		135	27.90
B1K5-2289-GAH	7.75		199	6.75		171	6.00		152	5.00		127	6.13		156	43.10
B2K0-2290-GAH	7.63		194	9.00		229	8.00		203	4.81		122	7.50		191	56.00
B3K0-2291-GAH	8.56		217	9.00		229	7.63		194	5.75		146	7.50		191	76.20



Voltage -- Pri: 208/230/400/460/575 Sec: 24*/115/230

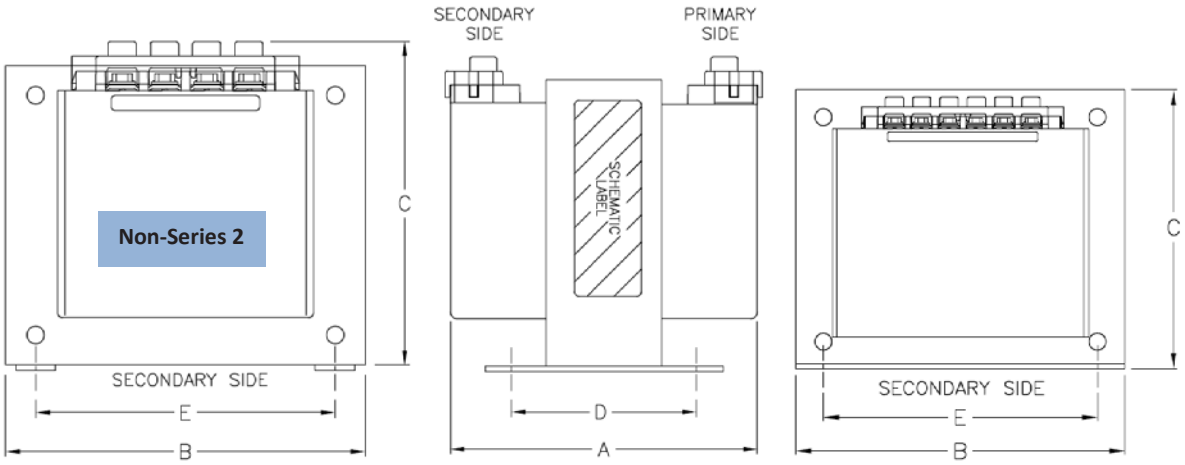
VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B250-2263-GAF	4.75		121	4.50		114	4.00		102	4.75		121	3.75		95	14.90
B300-2264-GAF	5.25		133	4.50		114	4.00		102	4.75		121	3.75		95	17.40
B350-2265-GAF	5.60		145	5.25		133	4.50		114	4.38		111	4.38		111	17.80
B500-2266-GAF	7.19		183	5.25		133	4.75		121	5.88		149	4.38		111	26.60
B750-2267-GAF	7.44		189	6.38		162	5.56		141	5.06		129	5.31		135	32.50
B1K0-2268-GAH	7.75		199	6.75		171	6.25		159	5.00		127	6.13		156	44.00
B1K5-2269-GAH	7.75		199	6.75		171	6.00		152	5.00		127	6.13		156	45.40
B2K0-2270-GAH	7.63		194	9.00		229	7.63		194	4.81		122	7.50		191	58.60
B3K0-2271-GAH	8.75		222	9.00		229	7.63		194	5.94		151	7.50		191	92.90
B5K0-2272-GAH	10.44		265	9.00		229	7.63		194	7.63		194	7.50		191	127.40

Voltage -- Pri: 230/400/460/575 Sec: 24/115

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B250-2243-GAF	4.75		121	4.50		114	4.00		102	3.75		95	3.75		95	14.30
B300-2244-GAF	5.00		127	4.50		114	4.00		102	4.75		121	3.75		95	15.80
B350-2245-GAF	5.19		132	5.25		133	4.50		114	3.88		99	4.38		111	16.50
B500-2246-GAF	6.19		157	5.25		133	4.50		114	4.88		124	4.38		111	20.50
B750-2247-GAF	7.00		178	6.38		162	5.56		141	5.06		129	5.31		135	28.80
B1K0-2248-GAH	8.13		207	6.38		162	6.00		152	5.06		129	5.31		135	34.90

Voltage -- Pri: 208/230/460 Sec: 24/115

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
B050-2101-GA	3.38		86	3.00		76	3.25		83	2.25		56	2.81		71	4.20
B075-2102-GA	3.38		86	3.38		86	3.50		89	2.44		61	3.13		79	5.90
B100-2103-GA	3.63		92	3.75		95	3.50		89	3.19		81	3.13		79	7.90
B150-2104-GAF	3.75		95	4.50		114	4.00		102	2.81		71	3.75		95	10.00
B200-2105-GAF	4.38		111	4.50		114	4.00		102	3.44		87	3.75		95	12.80
B250-2106-GAF	4.75		121	4.50		114	4.00		102	3.75		95	3.75		95	14.00
B300-2107-GAF	4.88		124	5.25		133	4.50		114	3.88		99	4.38		111	16.80
B350-2108-GAF	4.88		124	5.25		133	4.50		114	3.88		99	4.38		111	19.20
B500-2109-GAF	5.63		143	5.25		133	4.60		114	5.88		149	4.38		111	29.00
B750-2110-GAF	6.75		172	6.38		162	5.56		141	5.06		129	5.31		135	29.80
B1K0-2188-GAH	7.06		179	6.38		162	6.00		152	5.06		129	5.31		135	30.20



Voltage -- Pri: 380 Sec: 24

VA											W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B050-2051-GA	3.38	86	3.00	76	3.00	76	2.19	55	2.50	64	3.50
B075-2052-GA	3.46	88	3.38	86	3.25	83	2.19	55	2.81	71	4.20
B100-2053-GA	3.38	86	3.75	95	3.50	89	2.44	61	3.13	79	5.90
B150-2054-GAF	3.63	91	3.75	95	3.50	89	3.00	76	3.13	79	8.50
B200-2055-GAF	3.75	95	4.50	114	4.00	102	2.81	70	3.75	95	10.00
B250-2056-GAF	4.00	102	4.50	114	4.00	102	3.19	81	3.75	95	11.00
B300-2057-GAF	4.38	111	4.50	114	4.00	102	3.75	95	3.75	95	13.20
B350-2058-GAF	4.50	114	5.25	133	4.50	114	3.88	99	4.38	111	14.90
B500-2059-GAF	5.13	130	5.25	133	4.50	114	3.88	99	4.38	111	19.20
B750-2060-GAF	7.00	178	5.25	133	5.00	127	5.88	149	4.38	111	28.10

Voltage -- Pri: 240 x 480 Sec: 24

VA											W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B050-2011-GA	3.38	86	3.00	76	3.00	76	2.19	56	2.50	64	3.40
B075-2012-GA	3.38	86	3.38	86	3.25	83	2.19	56	2.81	71	4.20
B100-2013-GA	3.38	86	3.75	95	3.50	89	2.44	61	3.13	80	5.90
B150-2014-GAF	4.00	102	4.50	114	4.00	102	2.44	62	3.75	95	8.50
B200-2015-GAF	4.00	102	4.50	114	4.00	102	2.81	71	3.75	95	10.00
B250-2016-GAF	4.00	102	4.50	114	4.00	102	3.19	81	3.75	95	11.00
B300-2017-GAF	4.38	111	4.50	114	4.00	102	3.75	95	3.75	95	13.20
B350-2018-GAF	4.50	114	5.25	133	4.50	114	3.38	86	4.38	111	14.90
B500-2019-GAF	5.13	130	5.25	133	4.50	114	3.88	99	4.38	111	19.20
B750-2020-GAF	7.00	178	5.25	133	5.00	127	5.38	137	4.38	111	28.10
B1K0-2028-GAF	7.00	178	6.38	162	6.00	152	3.75	95	5.31	135	30.00

Voltage – Pri: 120 x 240 Sec: 24

VA											W
DIMENSIONS	INCH	A MM	INCH	B MM	INCH	C MM	INCH	D MM	INCH	E MM	LBS
B050-2021-GA	3.38	86	3.00	76	3.00	76	2.19	56	2.50	64	3.40
B075-2022-GA	3.38	86	3.38	86	3.25	83	2.19	56	2.81	71	4.20
B100-2023-GA	3.38	86	3.75	95	3.50	89	2.44	61	3.13	79	5.90
B150-2024-GAF	4.00	102	4.50	114	4.00	102	2.44	61	3.75	95	8.50
B200-2025-GAF	4.00	102	4.50	114	4.00	102	2.81	70	3.75	95	10.00
B250-2026-GAF	4.00	102	4.50	114	4.00	102	3.19	81	3.75	95	11.00
B300-2027-GAF	4.38	111	4.50	114	4.00	102	3.75	95	3.75	95	13.20
B350-2028-GAF	4.50	114	5.25	133	4.50	114	3.38	86	4.38	111	14.90
B500-2029-GAF	5.13	130	5.25	133	4.50	114	3.88	99	4.38	111	19.20
B750-2030-GAF	7.00	178	5.25	133	5.00	127	5.88	149	4.38	111	29.80
B1K0-2048-GAF	7.00	178	6.38	162	6.00	152	3.75	95	5.31	135	31.00

MEDIUM VOLTAGE CONTROL TRANSFORMERS

GENERAL SPECIFICATIONS: All are EITHER 50Hz or 60Hz

BUILDING STYLE: Open core and coil

APPROVALS: This product is not UL/CSA

130°C Insulation system

24" Minimum primary lead length

Frequency: 60Hz

HIPOT: 7,400 volts for 2,400 volt primary

11,500 volts for 4160 volt primary

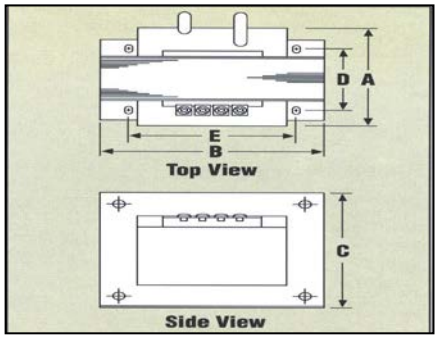
Construction: – Epoxy impregnated coils

Primary: 4200 Secondary: 120			
T	F.L.A.	VA	CATALOG NUMBER
W/4	6.25	750	H750-0030

Primary: 2400 Secondary: 120			
T	F.L.A.	VA	CATALOG NUMBER
W/4	6.25	750	H750-0031

Primary: 4160 Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
W/4	8.33/4.17	1000	H1K0-0015
W/4	12.50/6.25	1500	HN1K5G1519P
W/4	16.67/8.33	2000	HN2K0G1519P
W/4	25.00/12.50	3000	HN3K0G1519P

Primary: 2400 Secondary: 120 x 240			
T	F.L.A.	VA	CATALOG NUMBER
W/4	8.33/4.17	1000	H1K0-0010
W/4	12.50.6.25	1500	HN1K5F1519P
W/4	16.67/8.33	2000	HN2K0F1519P
W/4	25.00/12.50	3000	HN3K0F1519P



Voltage – Pri: 4200* or 2400 Sec: 120

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
*H750-0030	6.63		168	6.38		162	5.81		148	5.25		133	5.31		135	30.50
H750-0031	6.63		168	6.38		162	5.81		148	5.25		133	5.31		135	30.70

Voltage – Pri: 4160* or 2400 Sec: 120 x 240

VA											W
DIMENSIONS	INCH	A	MM	INCH	B	MM	INCH	C	MM	INCH	D	MM	INCH	E	MM	LBS
H1K0-0010	6.25		159	7.56		192	6.38		162	3.50		89	5.63		143	31.30
*H1K0-0015	6.25		159	7.56		192	6.38		162	3.50		89	5.63		143	31.10
HN1K5F1519P	7.00		178	9.00		229	7.63		194	4.25		108	6.50		165	53.7
*HN1K5G1519P	7.00		178	9.00		229	7.63		194	4.25		108	6.50		165	53.2
HN2K0F1519P	7.94		202	9.00		229	7.63		194	5.19		132	6.50		165	65.40
*HN2K0G1519P	7.94		202	9.00		229	7.63		194	5.19		132	6.50		165	58.20
HN3K0F1519P	9.75		248	9.00		229	7.63		194	7.00		178	6.50		165	99.90
*HN3K0G1519P	9.75		248	9.00		229	7.63		194	7.00		178	6.50		165	101.00

CONTROL TRANSFORMER ACCESSORIES

CATALOG NUMBER	DESCRIPTION	APPROX. WEIGHT	
		LBS	KG
	IP-20 Safetouch™ Covers		
TPTC-2001	10PACK 4TERM.	1.0	0.5
TPTC-2002	10PACK 6TERM.	1.0	0.5
TPTC-2006	10PACK UNIVERSAL PRI BLOCK	1.0	0.5
			
FKTP-1001	PRIMARY CL "CC" FUSE KIT	0.25	0.1
			
	Bulk Fuse Clips		
514-1661-01C	BULK FUSE CLIPS 13/32 X 1-1/2 SMALL TERMINALS	N/A	
514-1662-01A	BULK FUSE CLIPS 13/32 X 1-1/2 LARGE TERMINALS	N/A	
514-1661-02C	BULK FUSE CLIPS 1/4 X 1-1/4 SMALL TERMINALS	N/A	
514-1662-02A	BULK FUSE CLIPS 1/4 X 1-1/4 LARGE TERMINALS	N/A	
514-1621A	BULK FUSE CLIPS 9/16 X 2 FITS SMALL TERMINALS ONLY	N/A	
	Bulk Jumpers		
514-1653-02A	BAGGED JUMPERS SMALL TERMINALS – 2 PER BAG	N/A	
514-1654-02B	BAGGED JUMPERS LARGE TERMINALS – 2 PER BAG	N/A	
	Optional Factory Installed Primary Fuse Holders		
CL. "CC" PRI.	P/N SUFFIX = RB, RK, RX, RJ, RR, RY, RG, RL, RN, RC, -8		

*Non-rejection version available on all factory installed primary fuseblock options

Secondary Fuse Clip Options	
1/4 X 1-1/4 SEC.	P/N SUFFIX = JQ, XQ
9/16 X 2 SEC.	P/N SUFFIX = JM, XM FITS SMALL TERMINALS ONLY

TRANSFORMER ACCESSORY INTERCHANGE MATRIX		
WITHOUT PRIMARY FUSE BLOCK		DUAL CLASS "CC" PRIMARY FUSED SUFFIX
JK, JKF, JKH	>>	RB, RBF, RBH
XK, XKF, XKH	>>	RK, RKF, RKH
XX, XXF, XXH	>>	RX, RXF, RXH
XJ, XJF, XJH	>>	RJ, RJF, RJH
JJ, JJF, JJH	>>	RR, RRF, RRH
JM, JMF, JMH	>>	RY, RYF, RYH
XM, JMF, JMH	>>	RG, RGF, RGH
JQ, JQF, JQH	>>	RL RLF, RLH
XQ, XQF, XQH	>>	RN, RNF, RNH
JX, JXF, JXH	>>	RC, RCF, RCH
-1, -1F, -1H	>>	-8, -8F, -8H

PRIMARY FUSE KIT # FKTP-1001

Universal mounting instructions

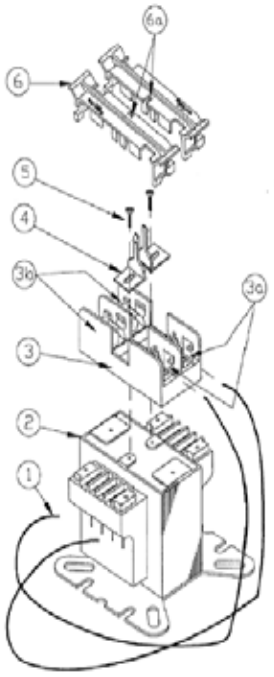
In addition to factory installed primary fusing capability Micron offers a primary fuse kit for ImperviTRAN intended for field installation. The primary fuse kit includes a 2-pole Class "CC" fuse block, instructions and all associated mounting hardware. Additionally, this fuse block will fit many competitive units. To order this kit, use catalog number FKTP-1001. The primary fuse kit, when installed, will add a maximum of 11/16" to the transformer "A" dimension and 1-15/16" to the "C" dimension.

For transformers with integral accessory mounting plate

1. Connect one end of the 2 primary leads (#1) under the appropriate primary terminal screws. Secure screws to 16 lb-in <500VA and 30 lb-in 500VA and larger.
2. Insert locking clips (#4) oriented as shown into the fuse block (#3) pockets. Use caution in choosing screw length if locking clips are not used.
3. Attach clips and fuse block to accessory mounting plate (#2) using screws (#5). Recommended torque 16 lb-in.
4. Insert fuses (not supplied) into fuse block followed by fuse fuse block covers (#6) (IF ORDERED) with lock slots (#6a) matching tip of the clips, as shown. Press down until cover locks.

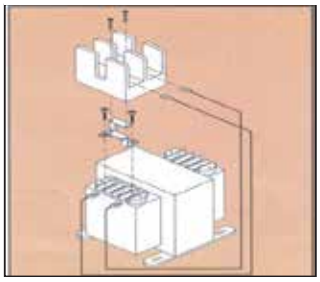
Cover cannot be removed without releasing tab from detent (#6a). A tip of a pen will suffice.

Refer to primary fuse chart for recommended fuses.



For transformers without integral accessory mounting plate:

Loosen two outer screws on primary side of transformer. On 6-terminal designs leave 2 open spaces between. Capture mounting brackets and leads under terminal screws and tighten to correct value.



5. Connect the other end of the 2 primary leads (#1) under the screws on each of the 2 poles on the fuse block (#3a) and secure to 20 lb-in.
6. Apply primary voltage to the opposite end of the fuse block (#3b).

Additionally the mounting plate (#2) can be utilized to mount other accessories such as DIN Rail. Use caution in choosing screw length.

Advanced transformers built for the industrial environment

NEMA 3R Products: Micron can furnish virtually all combinations of 600 volt class single and three-phase catalog designs both as encapsulated and ventilated. Included in this selection are transformers capable of providing voltage adjustments as buck-boost designs.

Low Voltage General Purpose Transformers

			
UL Listed, CSA Certified **Single Phase** **Type 1-E Encapsulated**	**UL Listed** **Three Phase** **Type 3-E Encapsulated**	**UL listed** **Single Phase** **Type 1-V Ventilated**	**UL Listed** **Three Phase** **Type 3-V Ventilated**
Type 1-E general purpose transformers are single phase, resin encapsulated designs suitable for indoor or outdoor applications. It's totally enclosed, non-ventilated enclosure make it ideally suited for use in areas that contain dust, moisture, or corrosive fumes. Available in ratings through 25 KVA type 1-E transformers can be mounted in any position for indoor installations and in upright positions only for outdoor installations.	Type 3-E resin encapsulated, 3-phase transformers are available in ratings of 3-75 KVA. The totally enclosed non-ventilated enclosure makes the 3-E ideally suited for outdoor as well as indoor locations. Type 3-E transformers utilize the 185°C insulation system with 115°C rise. 3-E transformers 3-15 KVA are T-T connected. 3-E units installed outdoors must be mounted in the upright position.	1-V general purpose transformers are single phase ventilated units designed primarily for indoor locations (also for outdoor, 600 volt class with the addition of weather shields). The 1-V utilizes a 220°C insulation system with 150°C rise and is available in ratings of 15-167 KVA. Ventilated units installed outdoors must be mounted in the upright position.	The 3-phase 3-V ventilated dry-type is available in ratings of 15-750 KVA. Its 220°C insulation system (150°C rise) is self-extinguishing. 3-V enclosures are designed for indoor locations (also for outdoor, 600 volt class with addition of weather shields). Ventilated units installed outdoors must be mounted in the upright position.

Efficiency

The Micron series of ventilated 600 volt class general purpose distribution transformers meet DOE 2016 efficiency requirements. Effective January 1, 2016, ventilated single phase distribution transformers from 15kVA through 333kVA and ventilated three phase from 15kVA through 1mVA manufactured for sale in the United States are required to meet these energy efficiency requirements. The efficiency standard affects K-factor transformers as well but does not affect autotransformers, drive isolation, encapsulated or buck-boost products.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. Micron recommends external cables be rated 90°C (sized at 75°C ampacity) for encapsulated designs.

Series-Multiple Windings

Series-multiple windings consist of 2 similar coils in each winding which can be connected in series or parallel (multiple), such as primary voltage of "120**/**240" or "240 **X** 480". Transformers with series-multiple windings are designated with an "**X**" or"**/**" between the voltage ratings. If the series-multiple winding is designated by an "**X**" the winding can be connected only for a series or parallel. With the"**/**" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 **X** 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120**/**240 winding can be connected for 120 (parallel), or 240 (series), or 240 with a 120 mid-point.

General Information

Industry Standards

All Micron dry-type distribution and control transformers are built and tested in accordance with applicable NEMA, ANSI and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted. Encapsulated 600 volt class units through 75kVA are both UL listed and CSA certified. Standard coatings are ANSI 61 thermosetting polyester powder coat which is UL recognized for outdoor use.

Seismic Qualified

The Micron family of dry-type distribution transformers is seismically tested, seismically qualified, and exceeds requirements of the Uniform Building Code (UBC) and California Code Title 24.

Frequency

Micron standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies must be specifically designed.

Overload Capability

Short term overload is designed into transformers as required by ANSI. Basically, dry-type distribution transformers will deliver 200% nameplate load for one-half hour; 150% load for one-hour; and 125% load for four-hours without being damaged provided that a constant 50% load precedes and follows the overload. See ANSI C57 .96-01.250 for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System & Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class	The design life of transformers having different insulation systems is the same – the lower temperature systems are designed for the same life as the higher temperature systems.
40°C	55°C	10°C	105°C	
40°C	80°C	30°C	150°C	
40°C	115°C	30°C	185°C	

Installation Clearances

Micron transformers should be installed with a minimum of 6” clearance around the transformer enclosure to prevent accidental contact with flammable or combustible materials and to allow for proper airflow through the transformer.

Sound Levels

KVA	NEMA Average[1] Sound Level in dB	All Micron 600 volt class dry-type distribution transformers are designed to meet NEMA ST-20, IEEE C57.12.01 maximum audible sound levels as listed.
0-9	40	
10-50	45	
51-150	50	
151-300	55	
301-500	60	

[1]. *Applies to general purpose transformers only.*

All transformers emit some audible sound due mainly to the vibration generated in their core by alternating flux.

Operation

Micron transformers are designed for continuous operation at rated kVA for 24 hours/day, 365 days/year, with a normal life expectancy as defined in ANSI C57.96.

Selection Guide for Single Phase Power Transformers

1. Determine the primary (source) voltage
   -the voltage presently available.
2. Determine the secondary (load) voltage
   -the voltage needed at the load.
3. Determine the Kva load:

- If the load is defined in Kva, a transformer can be selected from the tabulated data.
- If the load rating is given in amperes, determine the load Kva from the Full Load Current chart. To determine Kva when volts and amperes are known, use the formula:

$$\text{Kva} = \frac{\text{Volts x Amperes}}{1000}$$

- If the load is an AC motor, determine the minimum transformer Kva from the chart at the right.
- Select a transformer rating equal to or greater than the load Kva.

4. Define tap arrangements needed.
5. Define operational ambient.

Using the above procedure, select the transformer from the listings in this catalog.

Single Phase AC Motors[1]

Full Load Amperes					
Horsepower	**115V**	**208V**	**220V**	**230V**	**MINIMUM KVA[2]**
1/6	4.4	2.4	2.3	2.2	**0.53**
1/4	5.8	3.2	3	2.9	**0.70**
1/3	7.2	4	3.8	3.6	**0.87**
1/2	9.8	5.4	5.1	4.9	**1.18**
3/4	13.8	7.6	7.2	6.9	**1.66**
1	16	8.8	8.4	8	**1.92**
1-1/2	20	11	10.4	10	**2.40**
2	24	13.2	12.5	12	**2.88**
3	34	18.7	17.8	17	**4.10**
5	56	30.8	29.3	28	**6.72**
7-1/2	80	44	42	40	**9.60**
10	100	55	52	50	**12.0**

EXAMPLE OF TRANSFORMER SELECTION FOR 1.5HP SINGLE-PHASE MOTOR. ALTERNATELY, MULTIPLY VOLTS (115) x AMPS (20) AND DIVIDE BY 1,000 = 2.3KVA

Full Load Current in Amperes[1] – Single Phase Circuits

	Single Phase Volts								
Kva[2]	**120**	**208**	**220**	**240**	**277**	**480**	**600**	**2400**	**4160**
0.250	2	1.2	1.1	1	0.9	0.5	0.4	0.10	0.06
0.500	4.2	2.4	2.3	2.1	1.8	1	0.8	0.21	0.12
0.750	6.3	3.6	3.4	3.1	2.7	1.6	1.3	0.31	0.18
1	8.3	4.8	4.5	4.2	3.6	2.1	1.7	0.42	0.24
1.5	12.5	7.2	6.8	6.2	5.4	3.1	2.5	0.63	0.36
2	16.7	9.6	9.1	8.3	7.2	4.2	3.3	0.83	0.48
3	25	14.4	13.6	12.5	10.8	6.2	5	1.2	0.72
5	41	24	22.7	20.8	18	10.4	8.3	2.1	1.2
7.5	62	36	34	31	27	15.6	12.5	3.1	1.8
10	83	48	45	41	36	20.8	16.7	4.2	2.4
15	125	72	68	62	54	31	25	6.2	3.6
25	208	120	114	104	90	52	41	10.4	6
37.5	312	180	170	156	135	78	62	15.6	9
50	416	240	227	208	180	104	83	20.8	12
75	625	360	341	312	270	156	125	31.3	18
100	833	480	455	416	361	208	166	41.7	24
167	1391	802	759	695	602	347	278	69.6	40.1

1. When motor service factor is greater than 1, increase Full Load amps proportionally. Example: If service factor is 1.15, increase above amp values by 15%.

2. If motors are started more than once per hour, increase the minimum transformer Kva by 20%.

Selection Guide for Three Phase Power Transformers

1. Determine the primary (source) voltage – the voltage available.
2. Determine the secondary (load) voltage – the voltage needed at the load.
3. Determine the KVA load.
   - If the load is defined in KVA, a transformer can be selected directly from the table.
   - If the load rating is given in amperes, determine the load Kva from the Full load Current chart. To determine Kva when volts and amperes are known, use the formula:

     Kva= Volts x Amperes x 1.732
     1000
   - If the load is an AC motor, determine the minimum transformer Kva from the chart at the right.
   - Select a transformer rating equal or greater than the load Kva.
4. Define tap arrangements needed.
5. Define operational ambient.

Using the above procedure, select the transformer from the listings in this catalog.

Three Phase AC Motors[1]

Horsepower	Full Load Amps 208V	230V	380V	460V	575V	MINIMUM KVA[2]
½	2.2	2.0	1.2	1.0	0.8	**0.9**
¾	3.1	2.8	1.7	1.4	1.1	**1.2**
1	4.0	3.6	2.2	1.8	1.4	**1.5**
1-1/2	5.7	5.2	3.1	2.6	2.1	**2.1**
2	7.5	6.8	4.1	3.4	2.7	**2.7**
3	10.7	9.6	5.8	4.8	3.9	**3.8**
5	16.7	15.2	9.2	7.6	6.1	**6.3**
7-1/2	24	22	14	11	9	**9.2**
10	31	28	17	14	11	**11.2**
15	46	42	26	21	17	**16.6**
20	59	54	33	27	22	**21.6**
25	75	68	41	34	27	**26.6**
30	88	80	48	40	32	**32.4**
40	114	104	63	52	41	**43.2**
50	143	130	79	65	52	**52**
60	170	154	93	77	62	**64**
75	211	192	116	96	77	**80**
100	273	248	150	124	99	**103**
125	342	312	189	156	125	**130**
150	396	360	218	180	144	**150**
200	528	480	291	240	192	**200**

EXAMPLE OF TRANSFORMER SELECTION FOR A 1.5HP THREE-PHASE MOTOR. ALTERNATELY, MULTIPLY VOLTS (208) x AMPS (5.7) AND THAT PRODUCT BY 1.732 THEN DIVIDE BY 1,000 = 2.05KVA

Full Load Current in Amperes[1] – Three Phase Circuits

Kva[2]	Three Phase Volts 208	240	380	480	600	2400	4160
3	8.3	7.2	4.6	3.6	2.90	0.72	0.42
6	16.6	14.4	9.1	7.2	5.8	1.4	0.83
9	25	21.6	13.7	10.8	8.6	2.2	1.2
15	41.7	36.1	22.8	18	14.4	3.6	2.1
22.5	62.4	54.1	34.2	27.1	21.6	5.4	3.1
30	83.4	72.3	45.6	36.1	28.9	7.2	4.2
37.5	104	90.3	57	45.2	36.1	9	5.2
45	124	108	68.4	54.2	43.4	10.8	6.3
50	139	120	76	60.1	48.1	12	6.9
75	208	180	114	90	72	18	10.4
112.5	312	270	171	135	108	27.1	15.6
150	416	360	228	180	144	36.1	20.8
225	624	541	342	270	216	54.2	31.3
300	832	721	456	360	288	72.2	41.6
500	1387	1202	760	601	481	120	69.4
750	2084	1806	1140	903	723	180	104
1000	2779	2408	1519	1204	963	241	139

1. When motor service factor is greater than 1, increase Full Load amps proportionally. Example: If service factor is 1.15, increase above amp values by 15%.

2. If motors are started more than once per hour, increase the minimum transformer Kva by 20%.

SINGLE PHASE

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "A": PRI: 240 X 480 SEC: 120/240 60HZ											
.050	G050A1KF1A01	-	-	1E	115	8.91	4.11	4.00	7	52	A	
.075	G075A1KF1A01	-	-	1E	115	8.91	4.11	4.00	7	54	A	
.100	G100A1KF1A01	-	-	1E	115	8.91	4.11	4.00	7	54	A	
.150	G150A1KF1A01	-	-	1E	115	8.91	4.11	4.00	8	55	A	
.250	G250A1KF1A02	-	-	1E	115	9.34	4.45	5.18	12	57P	A	
.500	G500A1KF1A02	-	-	1E	115	9.34	4.45	5.18	16	57P	A	
.750	G750A1KF1A02	-	-	1E	115	11.68	4.99	5.99	26	58AP	A	
1	G001K1KF1A02	-	-	1E	115	13.03	5.74	6.56	31	67P	A	
1.5	G1X5K1KF1A02	-	-	1E	115	13.03	5.74	6.56	42	67P	A	
2	G002K1KF1A02	-	-	1E	115	13.78	6.22	6.32	42	68P	A	
3	G003K1KF7A03	1	1	1E	115	14.25	7.69	8.00	65	176	B	
5	G005K1KF7A03	1	1	1E	115	16.00	10.38	9.89	105	177	B	
7.5	G7X5K1KF7A03	1	1	1E	115	16.00	10.38	9.89	123	178	B	
10	G010K1KF7A03	1	1	1E	115	19.00	13.38	10.52	193	179	B	
15	G015K1KF6A03	2	2	1E	115	19.00	13.38	10.52	216	180	C	
25	G025K1KF6A03	2	2	1E	115	23.31	16.35	14.12	375	182	C	
15	G015K2KF6A04	3	3	1V	150	27.00	20.00	16.50	246	816	3XA	WS11MI
25	G025K2KF6A04	3	3	1V	150	37.53	22.60	19.50	359	818	3XA	WS11MI
37.5	G037K2KF6A04	3	3	1V	150	37.53	22.60	19.50	374	818	3XA	WS11MI
50	G050K2KF9A04	3	3	1V	150	42.00	24.00	23.38	555	819	3XA	WS16MI
75	G075K2KF6A04	3	3	1V	150	42.00	24.00	23.38	740	820	3XA	WS16MI
100	G100K2KF6A04	3	3	1V	150	63.00	30.00	34.00	841	821	3XA	WS13MI

(1) 1@+10%FCBN at 240V Primary; 2@ +5%FCBN at 480V Primary

(2) 2@+5%FCBN at 240V Primary; 4@ +2.5% FCBN at 480V primary

(3) 1@ +5%, 2@ -5% at 240V Primary; 2@+2.5%, 4@ -2.5% at 480V Primary

THESE ARE THE AVAILABLE ADJUSTMENT TAPS

VENTILATED UNITS SHOWN IN BLUE

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "B": PRI: 190/200/208/220 X 380/400/416/440 SEC: 110/220 50/60HZ											
1	G001K1PG1A06	-	-	1E	115	13.03	5.74	6.56	42	67P	D	
1.5	G1X5K1PG1A06	-	-	1E	115	14.25	7.69	8.00	65	176	D	
2	G002K1PG1A07	-	-	1E	115	14.25	7.69	8.00	65	176	D	
3	G003K1PG1A07	-	-	1E	115	16.00	10.38	9.89	113	177	D	
5	G005K1PG1A07	-	-	1E	115	16.00	10.38	9.89	140	178	D	
7.5	G7X5K1PG1A07	-	-	1E	115	19.00	13.38	10.52	193	179	D	
10	G010K1PG1A07	-	-	1E	115	19.00	13.38	10.52	216	180	D	
15	G015K1PG1A07	-	-	1E	115	23.31	16.35	14.12	375	182	D	

DIAGRAM “A”

WDG	VOLTS	CONNECT	LINE
PRI	480	H2-H3	H1-H4
	240	H1H3-H2H4	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

EXAMPLES OF TWO 5% TAPS @ 480V
AND ONE 10% TAP AT 240V

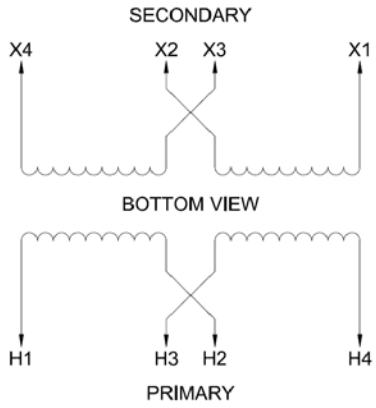


DIAGRAM “B”

WDG	VOLTS	CONNECT	LINE
PRI	480	H3-H4	H1-H6
	456	H3-H5	
	432	H2-H5	
	240	H1H4-H3H6	
	216	H1H5-H2H6	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

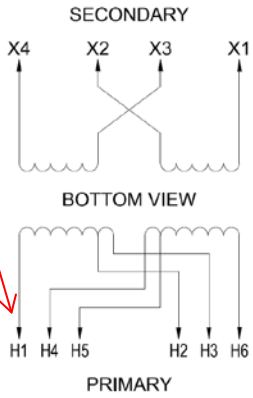
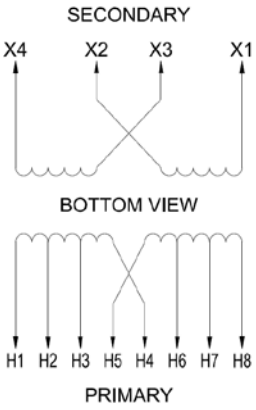


DIAGRAM “C”

WDG	VOLTS	CONNECT	LINE
PRI	480	H4-H5	H1-H8
	468	H3-H5	
	456	H3-H6	
	444	H2-H6	
	432	H2-H7	
	240	H1H5-H4H8	
	228	H1H6-H3H8	
	216	H1H7-H2H8	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4



*Three wire operation

DIAGRAM “3XA”

WDG	VOLTS	CONNECT	LINE
PRI		Use both cables provided	H1-H2
	504	H5-10	
	492	H5-9	
	480	H4-9	
	468	H4-8	
	456	H3-8	
	444	H3-7	
	432	H2-7	
		Use 1 cable per connex	
	252	5 to H2-10 to H1	
	240	4 to H2-9 to H1	
	228	3 to H2-8 to H1	
	216	2 to H2-7 to H1	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

*Three wire operation

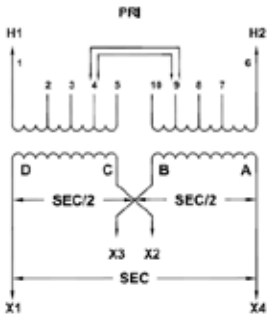
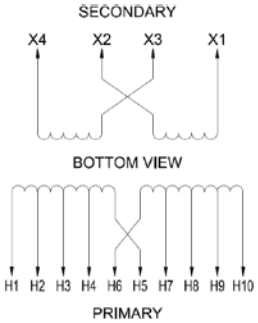


DIAGRAM “D”

WDG	VOLTS	CONNECT	LINE
PRI	440	H5-H6	H1-H10
	416	H4-H6	H1-H9
	400	H3-H6	H1-H8
	380	H2-H6	H1-H7
	220	H1H6-H5H10	H1-H10
	208	H1H6-H4H9	H1-H9
	200	H1H6-H3H8	H1-H8
	190	H1H6-H2H7	H1-H7
SEC	220	X2-X3	X1-X4
	110	X1X3-X2X4	
	110/220	X2-X3*	X1-X3-X4



KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "D": PRI: 600 SEC: 120/240 60HZ											
1	G001K1RF8A02	-	4	1E	115	13.03	5.74	6.56	31	67P	H	
1.5	G1X5K1RF8A02	-	4	1E	115	13.03	5.74	6.56	42	67P	H	
2	G002K1RF8A02	-	4	1E	115	13.78	6.22	6.32	42	68P	H	
3	G003K1RF8A03	-	4	1E	115	14.25	7.69	8.00	65	176	H	
5	G005K1RF8A03	-	4	1E	115	16.00	10.38	9.89	105	177	H	
7.5	G7X5K1RF8A03	-	4	1E	115	16.00	10.38	9.89	123	178	H	
10	G010K1RF8A03	-	4	1E	115	19.00	13.38	10.52	193	179	H	
15	G015K1RF5A03	-	5	1E	115	19.00	13.38	10.52	216	180	I	
25	G025K1RF2A03	6	6	1E	115	20.67	19.02	13.59	395	132	J	
25	G025K2RF2A04	6	6	1V	150	37.53	22.60	19.50	355	818	V	WS11MI
37.5	G037K2RF2A04	6	6	1V	150	37.53	22.60	19.50	375	818	V	WS11MI
50	G050K2RF2A04	6	6	1V	150	42.00	24.00	23.38	594	819	V	WS16MI
75	G075K2RF2A04	6	6	1V	150	42.00	24.00	23.38	755	820	V	WS16MI
100	G100K2RF2A04	6	6	1V	150	63.00	30.00	34.00	865	821	V	WS13MI

(4) 2@ -5%

(5) 4@ -2.5%

(6) 2@ +2.5%; 4@ -2.5%

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	WL BS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "E": PRI: 208 SEC: 120/240 60HZ											
.500	G500A1HF1A02	-	-	1E	115	9.34	4.45	5.18	16	57P	L	
1	G001K1HF1A02	-	-	1E	115	13.03	5.74	6.56	31	67P	L	
1.5	G1X5K1HF1A02	-	-	1E	115	13.03	5.74	6.56	42	67P	L	
2	G002K1HF1A02	-	-	1E	115	13.78	6.22	6.32	42	68P	L	
3	G003K1HF1A03	-	-	1E	115	14.25	7.69	8.00	65	176	L	
5	G005K1HF1A03	-	-	1E	115	16.00	10.38	9.89	113	177	L	
7.5	G7X5K1HF1A03	-	-	1E	115	16.00	10.38	9.89	123	178	L	
10	G010K1HF1A03	-	-	1E	115	19.00	13.38	10.52	193	179	L	
15	G015K1HF1A03	-	-	1E	115	19.00	13.38	10.52	216	180	L	
25	G025K1HF1A03	-	-	1E	115	23.31	16.35	14.12	395	182	L	
25	G025K2HF1A04	6	6	1V	150	37.53	22.60	19.50	346	818	260A	WS11MI
37.5	G037K2HF1A04	6	6	1V	150	37.53	22.60	19.50	374	818	260A	WS11MI
50	G050K2HF1A04	6	6	1V	150	42.00	24.00	23.38	545	819	260A	WS16MI
75	G075K2HF1A04	6	6	1V	150	42.00	24.00	23.38	568	820	260A	WS16MI
100	G100K2HF1A04	7	7	1V	150	63.00	30.00	34.00	1178	821	551A	WS13MI

(6) 2@ +2.5%; 4@ -2.5%

(7) 1@ +5%; 2@ -5%

DIAGRAM "H"

WDG	VOLTS	CONNECT	LINE
PRI	600		H1-H4
	570		H1-H3
	540		H2-H3
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

*Three wire operation

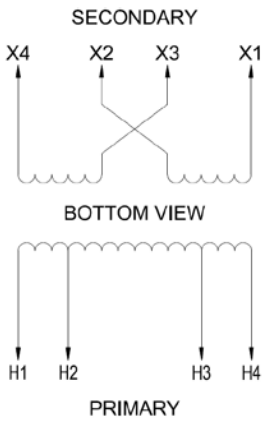
DIAGRAM "I"

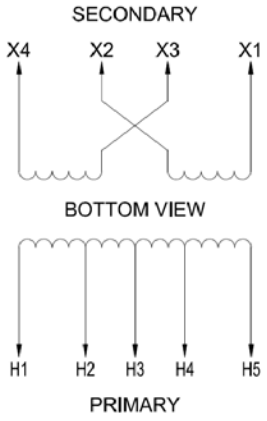
WDG	VOLTS	CONNECT	LINE
PRI	600		H1-H5
	585		H1-H4
	570		H1-H3
	555		H2-H4
	540		H2-H3
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

DIAGRAM "J"

WDG	VOLTS	CONNECT	LINE
PRI	630		H1-H6
	615		H1-H5
	600		H1-H4
	585		H2-H5
	570		H2-H4
	555		H3-H5
	540		H3-H4
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

*Three wire operation





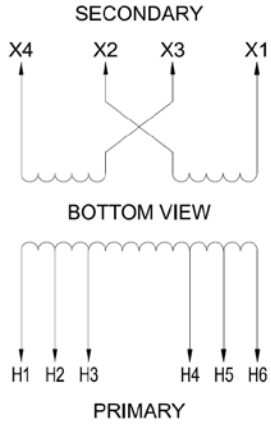


DIAGRAM "V"

VOLTS	TAP
630	1
615	2
600	3
585	4
570	5
555	6
540	7

DIAGRAM "L"

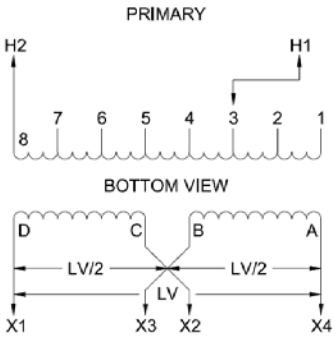
WDG	VOLTS	CONNECT	LINE
PRI	208		X1-X2
SEC	240	H2-H3	H1-H4
	120	H1H3-H2H4	
	120/240	H1-H3-H4*	H1-H3-H4

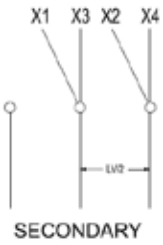
*Three wire operation

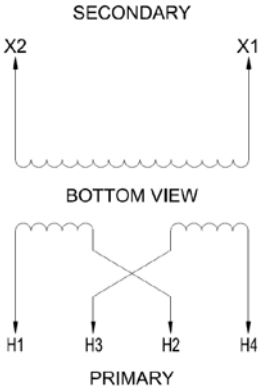
DIAGRAM "260A"

WDG	VOLTS	CONNECT	LINE
		USE BOTH CABLES PROVIDED	X1-X2
	218	5 TO 10	
	213	5 TO 9	
PRI	208	4 T0 9	
	203	4 TO 8	
	198	3 TO 8	
	192	3 TO 7	
	187	2 TO 7	
SEC	240	H2-H3	H1-H4
	120	H1H3-H2H4	
	120/240*	H2-H3	H1-H3-H4

* Three wire operation







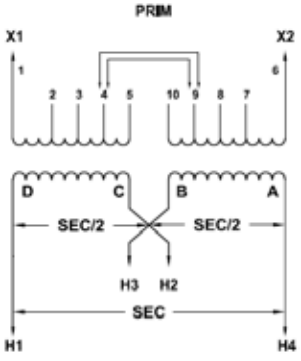


DIAGRAM “551A”

WDG	VOLTS	CONNECT	LINE
PRI		Use 1 cable per connex	X1-X2
	218	5 to X2-10 to X1	
	208	4 to X2-9 to X1	
	198	3 to X2-8 to X1	
	187	2 to X2-7 to X1	
SEC	240	H2-H3	H1-H4
	120	H1H3-H2H4	
	120/240	H2-H3*	H1-H3-H4

*Three wire operation

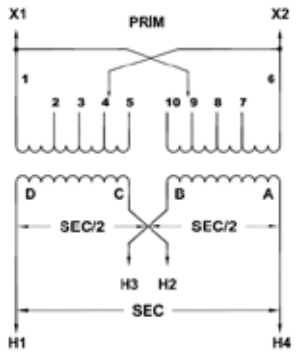
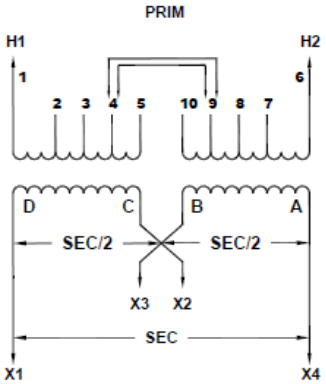


DIAGRAM “262C”

WDG	VOLTS	CONNECT	LINE
PRI		Use both cables provided	H1-H2
	291	5-10	
	284	5-9	
	277	4-9	
	270	4-8	
	263	3-8	
	256	3-7	
	249	2-7	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4

*Three wire operation



KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "F": PRI: 277 SEC: 120/240 60HZ											
3	G003K1MF1A03	-	-	1E	115	14.25	7.69	8.00	55	176	M	
5	G005K1MF1A03	-	-	1E	115	16.00	10.38	9.89	113	177	M	
7.5	G7X5K1MF1A03	-	-	1E	115	16.00	10.38	9.89	123	178	M	
10	G010K1MF1A03	-	-	1E	115	19.00	13.38	10.52	193	179	M	
15	G015K1MF1A03	-	-	1E	115	19.00	13.38	10.52	180	180	M	
25	G025K1MF1A03	-	-	1E	115	23.31	16.35	14.12	375	182	M	
25	G025K2MF1A04	6	6	1V	150	37.53	22.60	19.50	346	818	262C	WS11MI
37.5	G037K2MF1A04	6	6	1V	150	37.53	22.60	19.50	391	818	262C	WS11MI
50	G050K2MF1A04	6	6	1V	150	42.00	24.00	23.38	555	819	262C	WS16MI
75	G075K2MF1A04	6	6	1V	150	42.00	24.00	23.38	568	820	262C	WS16MI
100	G100K2MF1A04	6	6	1V	150	63.00	30.00	34.00	1178	821	262C	WS13MI

(6) 2@ +2.5%; 4@ -2.5%

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "G": PRI: 120 X 240 SEC: 120/240 60HZ											
1	G001K1EF1A02	-	-	1E	115	13.03	5.74	6.56	31	67P	K	
1.5	G1X5K1EF1A02	-	-	1E	115	13.03	5.74	6.56	42	67P	K	
2	G002K1EF1A02	-	-	1E	115	13.78	6.22	6.32	42	68P	K	
3	G003K1EF1A03	-	-	1E	115	14.25	7.69	8.00	55	176	K	
5	G005K1EF1A03	-	-	1E	115	16.00	10.38	9.89	113	177	K	
7.5	G7X5K1EF1A03	-	-	1E	115	16.00	10.38	9.89	123	178	K	
10	G010K1EF1A03	-	-	1E	115	19.00	13.38	10.52	193	179	K	
15	G015K1EF1A03	-	-	1E	115	19.00	13.38	10.52	216	180	K	
25	G025K1EF1A03	-	-	1E	115	23.31	16.35	14.12	375	182	K	

DIAGRAM "M"

WDG	VOLTS	CONNECT	LINE
PRI	277		H1-H2
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4
*Three wire operation			

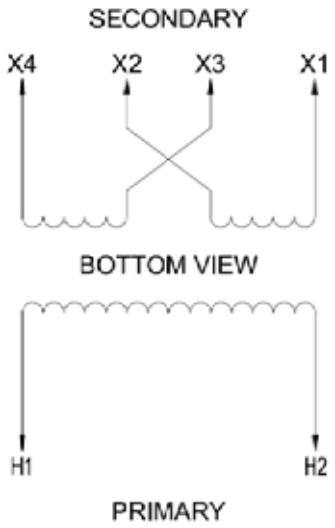
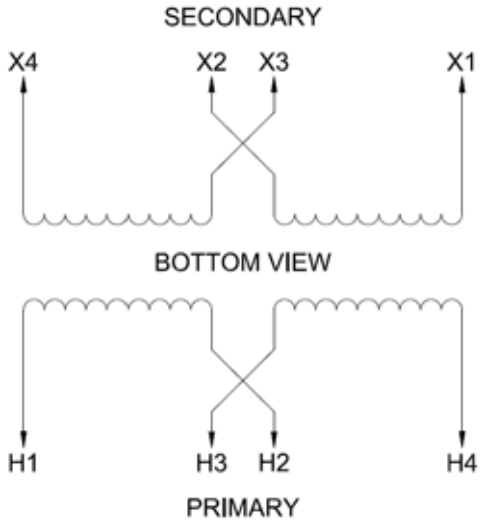


DIAGRAM "K"

WDG	VOLTS	CONNECT	LINE
PRI	240	H2-H3	H1-H4
	120	H1H3-H2H4	
SEC	240	X2-X3	X1-X4
	120	X1X3-X2X4	
	120/240	X2-X3*	X1-X3-X4
*Three wire operation			



THREE PHASE

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "H": PRI: 208Δ SEC: 480Y/277 60HZ											
15	G015K5HQ2A04	6	6	3V	150	28.00	21.88	17.75	124*	939	342B	WS57MI
30	G030K5HQ2A04	6	6	3V	150	36.88	24.88	21.13	298	940	342B	WS58MI
45	G045K5HQ2A04	6	6	3V	150	36.88	24.88	21.13	326	940	342B	WS58MI
75	G075K5HQ2A04	6	6	3V	150	43.00	30.50	24.00	445	942	342B	WS59MI
112.5	G112K5HQ2A04	7	7	3V	150	51.00	34.50	31.50	540	943	351A	WS60MI
150	G150K5HQ2A04	7	7	3V	150	51.00	34.50	31.50	931*	943	351A	WS60MI
225	G225K5HQ4A04	7	7	3V	150	60.00	38.00	33.50	1550*	944	333B	WS61MI
300	G300K5HQ4A04	7	7	3V	150	66.18	42.18	33.50	2274*	945	333B	WS62MI

(6) 2@ +2.5%; 4@ -2.5%

(7) 1@ +5%; 2@ -5%

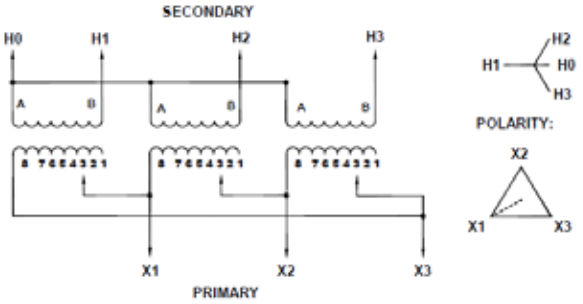
*EST

DIAGRAM "342B"

VOLTS	TAP
218	1
213	2
208	3
203	4
198	5
192	6
187	7

DIAGRAM "351A"

VOLTS	TAP
218	1
208	2
198	3
187	4



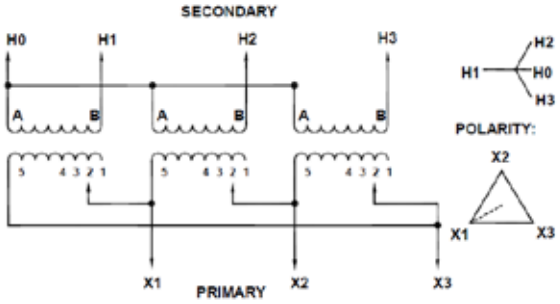
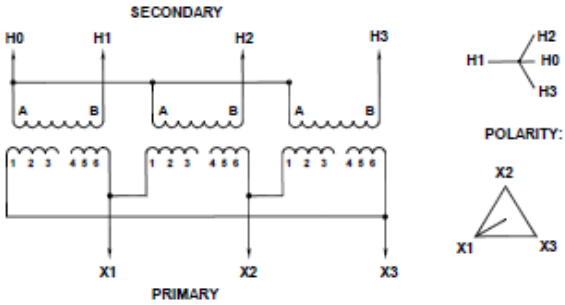


DIAGRAM "333B"

VOLTS	CONNECT
218	**3 TO 4**
208	3 TO 5
198	2 TO 4
187	2 TO 5



KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "I": PRI: 240Δ SEC: 208Y/120 60HZ											
9	G009K3JH8A03	-	4	3E	115	15.90	16.93	10.00	190	103	AA	
15	G015K3JH8A03	-	4	3E	115	17.38	20.00	10.50	275	95	AA	
30	G030K3JH2A03	6	6	3E	115	26.58	21.81	11.65	422	243	BB	
45	G045K3JH2A03	6	6	3E	115	26.58	24.81	13.53	660	244	BB	
15	G015K5JH2A04	6	6	3V	150	28.00	21.88	17.75	124*	939	280C	WS57MI
30	G030K5JH2A04	6	6	3V	150	36.88	24.88	21.13	295	940	280C	WS58MI
45	G045K5JH2A04	6	6	3V	150	36.88	24.88	21.13	324	940	280C	WS58MI
75	G075K5JH2A04	6	6	3V	150	43.00	30.50	24.00	447	942	280C	WS59MI
112.5	G112K5JH2A04	6	6	3V	150	51.00	34.50	31.50	760*	943	280C	WS60MI
150	G150K5JH2A04	6	6	3V	150	51.00	34.50	31.50	974*	943	280C	WS60MI
225	G225K5JH5A04	7	7	3V	150	60.00	38.00	33.50	1460*	944	DD	WS61MI
300	G300K5JH5A04	7	7	3V	150	66.18	42.18	33.50	1650*	945	DD	WS62MI

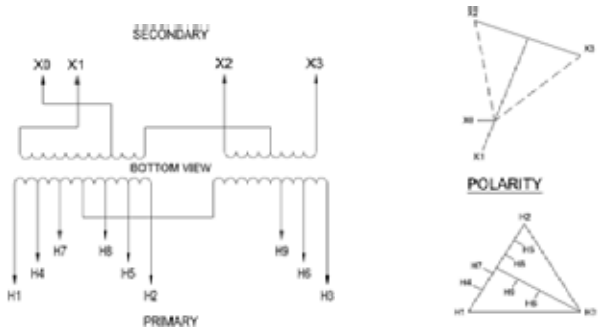
(4) 2@ -5%, (6) 2@ +2.5%; 4@ -2.5%, (7) 1@ +5%; 2@ -5% *EST

DIAGRAM "AA"

WDG	VOLTS	LINE
PRI	240	H1-H2-H3
	228	H4-H5-H6
	216	H7-H8-H9

DIAGRAM "BB"

VOLTS	CONNECT	LINE
252	1-6	H1-H2-H3
246	1-5	
240	1-4	
234	2-5	
228	2-4	
222	3-5	
216	3-4	



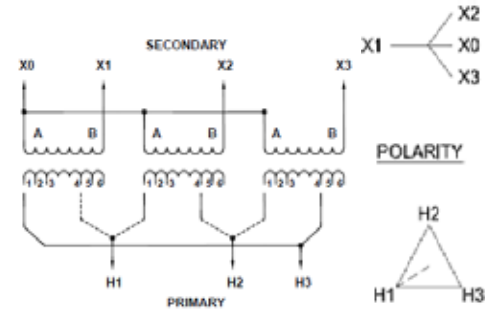


DIAGRAM "280C"

VOLTS	TAP
252	1
246	2
240	3
234	4
228	5
222	6
216	7

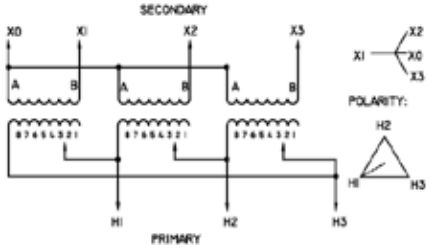
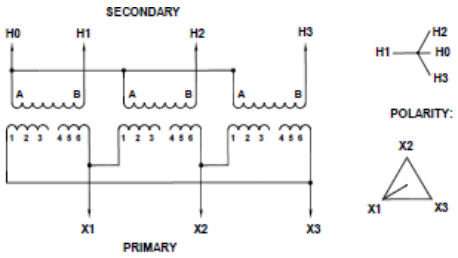


DIAGRAM "DD"

VOLTS	CONNECT
252	3 TO 4
240	3 TO 5
228	2 TO 4
216	2 TO 5



KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "J": PRI: 480Δ SEC: 208Y/120 60HZ											
3	G003K3QH8A03	-	4	3E	115	13.40	15.93	8.25	116	201	FF	
6	G006K3QH8A03	-	4	3E	115	15.90	16.93	10.00	165	200	FF	
6	G006K3QH3A03	8	8	3E	115	15.90	16.93	10.00	165	200	GG	
9	G009K3QH8A03	-	4	3E	115	15.90	16.93	10.00	185	103	FF	
9	G009K3QH5A03	-	5	3E	115	15.90	16.93	10.00	185	103	HH	
9	G009K3QH3A03	8	8	3E	115	15.90	16.93	10.00	185	103	GG	
15	G015K3QH8A03	-	4	3E	115	17.38	20.00	10.50	275	95	FF	
15	G015K3QH5A03	-	5	3E	115	17.38	20.00	10.50	275	95	HH	
15	G015K3QH3A03	8	8	3E	115	17.38	20.00	10.50	275	95	GG	
30	G030K3QH2A03	6	6	3E	115	26.58	21.81	11.65	422	243	II	
45	G045K3QH2A03	6	6	3E	115	26.58	24.81	13.53	720	244	II	
75	G075K3QH2A03	6	6	3E	115	32.00	30.30	15.70	1275	245	II	
15	G015K5QH2A04	6	6	3V	150	28.00	21.88	17.75	228	939	280B	WS57MI
30	G030K5QH2A04	6	6	3V	150	36.88	24.88	21.13	405	940	280B	WS58MI
45	G045K5QH2A04	6	6	3V	150	36.88	24.88	21.13	436	940	280B	WS58MI
75	G075K5QH2A04	6	6	3V	150	43.00	30.50	24.00	609	942	280B	WS59MI
112.5	G112K5QH2A04	6	6	3V	150	51.00	34.50	31.50	970	943	280B	WS60MI
150	G150K5QH2A04	6	6	3V	150	51.00	34.50	31.50	1220	943	280B	WS60MI
225	G225K5QH2A04	6	6	3V	150	60.00	38.00	33.50	1571	944	657A	WS61MI
300	G300K5QH2A04	6	6	3V	150	66.18	42.18	33.50	2157	945	657A	WS62MI
500	G500K5QH2A04	8	8	3V	150	C/F	C/F	C/F	C/F	C/F	428B	C/F
750	G750K5QH2A04	6	6	3V	150	C/F	C/F	C/F	C/F	C/F	KK	C/F

(4) 2 @-5%; (5) 4@-2.5%; (6) 2 @+2.5%, 4@-2.5%; (8) 2@+2.5%, 2@-2.5%

DIAGRAM "FF"

WDG	VOLTS	LINE
PRI	480	H1-H2-H3
	456	H4-H5-H6
	432	H7-H8-H9

DIAGRAM "GG"

WDG	VOLTS	LINE
PRI	504	H1-H2-H3
	492	H4-H5-H6
	480	H7-H8-H9
	468	H10-H11-H12
	456	H13-H14-H15

DIAGRAM "HH"

WDG	VOLTS	LINE
PRI	480	H1-H2-H3
	468	H4-H5-H6
	456	H7-H8-H9
	444	H10-H11-H12
	432	H13-H14-H15

Three Phase 3 wire to three phase 4 wire. For step-up do not connect neutral "X0"

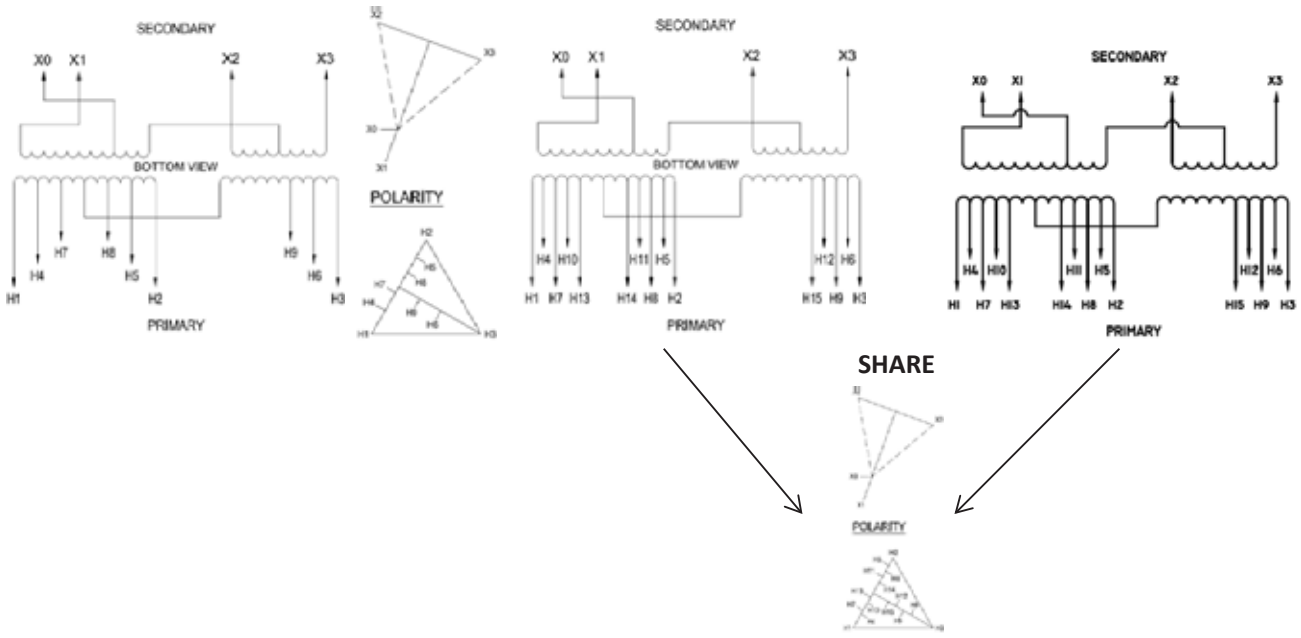
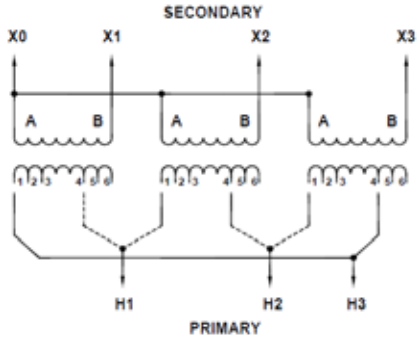
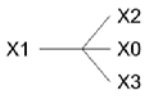


DIAGRAM "II"

VOLTS	CONNECT	LINE
504	1-6	H1-H2-H3
492	1-5	
480	1-4	
468	2-5	
456	2-4	
444	3-5	
432	3-4	





POLARITY

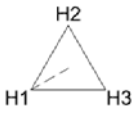
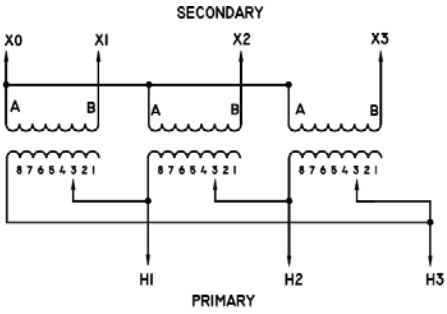
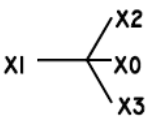


DIAGRAM "280B"

VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7





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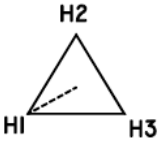
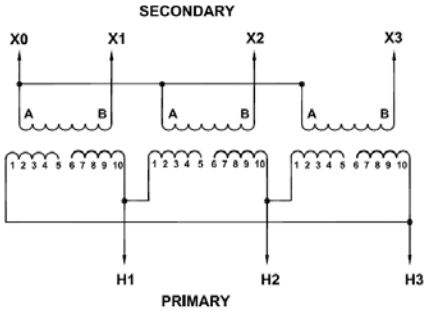
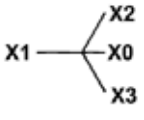


DIAGRAM "657B"

VOLTS	CONNECT
504	5 TO 6
492	6 TO 4
480	4 TO 7
468	7 TO 3
456	3 TO 8
444	8 TO 2
432	2 TO 9

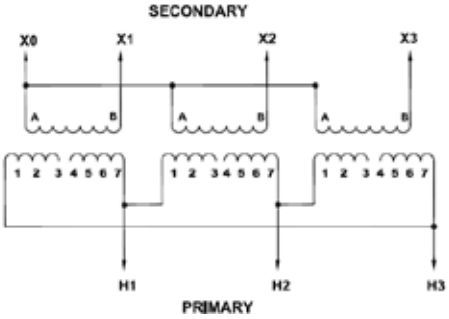


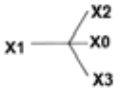


POLARITY

DIAGRAM "428B"

VOLTS	CONNECT
504	3 TO 4
492	3 TO 5
480	3 TO 6
468	2 TO 5
456	2 TO 6

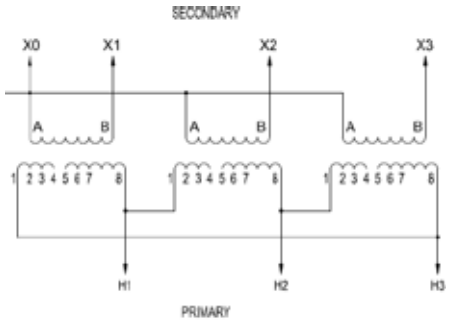


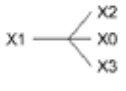


POLARITY:

DIAGRAM "KK"

VOLTS	CONNECT
504	4 TO 5
492	4 TO 6
480	4 TO 7
468	3 TO 6
456	3 TO 7
444	2 TO 6
432	2 TO 7





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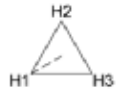


KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "L": PRI: 480Δ SEC: 240Δ/120LT 60HZ LIGHTING TAP ON 3V UNITS ONLY											
3	G003K4QJ8A03	-	4	3E	115	13.40	15.93	8.25	116	201	B1B	
6	G006K4QJ8A03	-	4	3E	115	15.90	16.93	10.00	165	200	B1B	
9	G009K4QJ5A03	-	5	3E	115	15.90	16.93	10.00	185	103	C1C	
15	G015K4QJ5A03	-	5	3E	115	17.38	20.00	10.50	275	95	C1C	
30	G030K4QJ2A03	6	6	3E	115	26.58	21.81	11.65	422	243	D1D	
45	G045K4QJ2A03	6	6	3E	115	26.58	24.81	13.53	660	244	D1D	
15	G015K6QJ9B02	6	6	3V	150	28.00	21.88	17.75	124	939	LL	WS57MI
30	G030K6QJ9B02	6	6	3V	150	36.88	24.88	21.13	293	940	LL	WS58MI
45	G045K6QJ9B02	6	6	3V	150	36.88	24.88	21.13	324	940	LL	WS58MI
75	G075K6QJ9B02	6	6	3V	150	43.00	30.50	24.00	445	942	LL	WS59MI
112.5	G112K6QJ9B02	6	6	3V	150	51.00	34.50	31.50	540	943	LL	WS60MI
150	G150K6QJ9B02	6	6	3V	150	51.00	34.50	31.50	820*	943	LL	WS60MI
225	G225K6QJ9B02	6	6	3V	150	60.00	38.00	33.50	1300*	944	LL	WS61MI
300	G300K6QJ9B02	6	6	3V	150	66.18	42.18	33.50	2400*	945	LL	WS62MI
500	G500K6QJ9B02	6	6	3V	150	C/F	C/F	C/F	C/F	C/F	MM	C/F

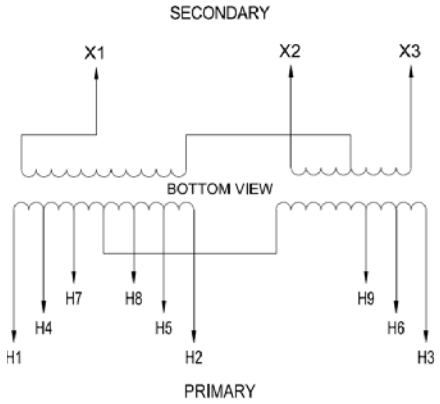
(4) 2 @-5%; (5) 4 @-2.5%; (6) 2 @+2.5%, 4@-2.5%;

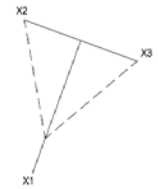
*EST

DIAGRAM "B1B"

WDG	VOLTS	LINE
PRI	480	H1-H2-H3
	456	H4-H5-H6
	432	H7-H8-H9

Three phase 3 wire to three phase 3 wire





POLARITY

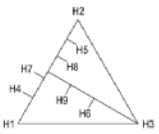
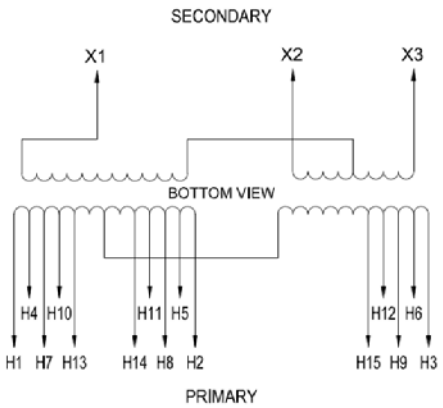
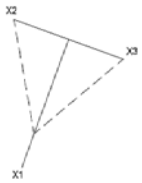


DIAGRAM "C1C"

WDG	VOLTS	LINE
PRI	480	H1-H2-H3
	468	H4-H5-H6
	456	H7-H8-H9
	444	H10-H11-H12
	432	H13-H14-H15

Three phase 3 wire to three phase 3 wire





POLARITY

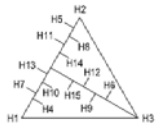
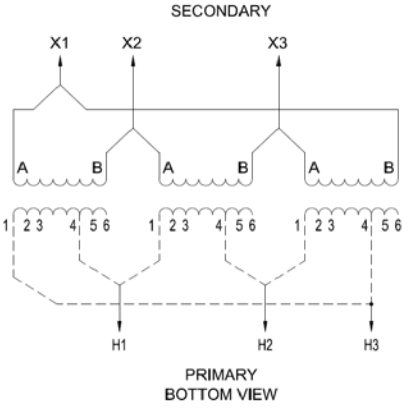
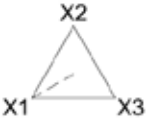


DIAGRAM "D1D"

VOLTS	CONNECT	LINE
504	1-6	H1-H2-H3
492	1-5	
480	1-4	
468	2-5	
456	2-4	
444	3-5	
432	3-4	





POLARITY

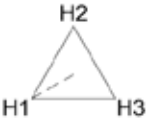
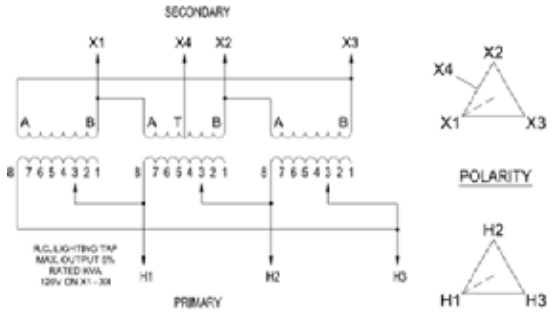


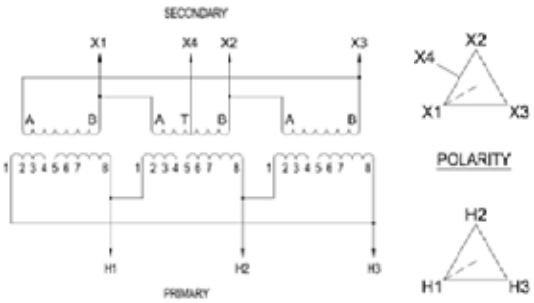
DIAGRAM “LL”

VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7

DIAGRAM”MM”

VOLTS	CONNECT
504	4 TO 5
492	4 TO 6
480	4 TO 7
468	3 TO 6
456	3 TO 7
444	2 TO 6
432	2 TO 7





KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP “M”: PRI: 480Δ SEC: 480Y/277 60HZ											
9	G009K3QQ3A03	8	8	3E	115	15.90	16.93	10.00	190	103	NN	
15	G015K3QQ3A03	8	8	3E	115	17.38	20.00	10.50	275	95	NN	
30	G030K3QQ2A03	6	6	3E	115	26.58	21.81	11.65	422	243	PP	
45	G045K3QQ2A03	6	6	3E	115	26.58	24.81	13.53	660	244	PP	
15	G015K5QQ2A04	6	6	3V	150	28.00	21.88	17.75	124	939	QQ	WS57MI
30	G030K5QQ2A04	6	6	3V	150	36.88	24.88	21.13	296	940	QQ	WS58MI
45	G045K5QQ2A04	6	6	3V	150	36.88	24.88	21.13	324	940	QQ	WS58MI
75	G075K5QQ2A04	6	6	3V	150	43.00	30.50	24.00	447	942	QQ	WS59MI
112.5	G112K5QQ2A04	6	6	3V	150	51.00	34.50	31.50	650*	943	QQ	WS60MI
150	G150K5QQ2A04	6	6	3V	150	51.00	34.50	31.50	770*	943	QQ	WS60MI
225	G225K5QQ2A04	6	6	3V	150	60.00	38.00	33.50	1300*	944	QQ	WS61MI
300	G300K5QQ2A04	6	6	3V	150	66.18	42.18	33.50	2400*	945	QQ	WS62MI

(8) 2 @+2.5%, 2 @-2.5%; (6) 2 @+2.5%, 4@-2.5%; *EST

DIAGRAM “NN”

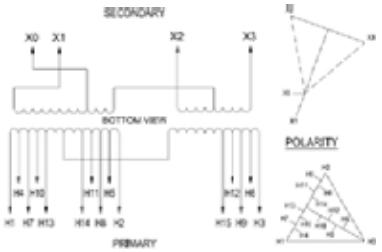
WDG	VOLTS	LINE
PRI	504	H1-H2-H3
	492	H4-H5-H6
	480	H7-H8-H9
	468	H10-H11-H12
	456	H13-H14-H15

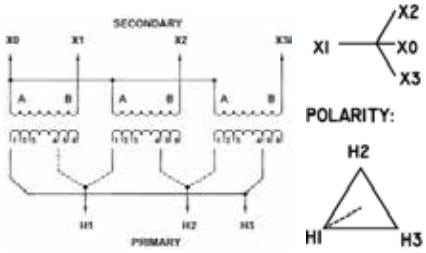
DIAGRAM “PP”

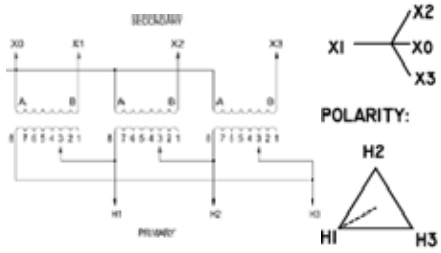
VOLTS	CONNECT	LINE
504	1-6	H1-H2-H3
492	1-5	
480	1-4	
468	2-5	
456	2-4	
444	3-5	
432	3-4	

DIAGRAM “QQ”

VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7







KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "N": PRI: 600Δ SEC: 208Y/120 60HZ											
9	G009K3RH8A03	-	10	3E	115	15.90	16.93	10.00	185	103	SS	
15	G015K3RH8A03	-	10	3E	115	17.38	20.00	10.50	275	95	SS	
30	G030K3RH2A03	6	6	3E	115	26.58	21.81	11.65	422	243	TT	
45	G045K3RH2A03	6	6	3E	115	26.58	24.81	13.53	660	244	TT	
15	G015K5RH2A04	6	6	3V	150	28.00	21.88	17.75	196*	939	UU	WS57MI
30	G030K5RH2A04	6	6	3V	150	36.88	24.88	21.13	308*	940	UU	WS58MI
45	G045K5RH2A04	6	6	3V	150	36.88	24.88	21.13	331*	940	UU	WS58MI
75	G075K5RH2A04	6	6	3V	150	43.00	30.50	24.00	513*	942	UU	WS59MI
112.5	G112K5RH2A04	6	6	3V	150	51.00	34.50	31.50	650*	943	UU	WS60MI
150	G150K5RH2A04	6	6	3V	150	51.00	34.50	31.50	770*	943	UU	WS60MI
225	G225K5RH2A04	6	6	3V	150	60.00	38.00	33.50	1300*	944	UU	WS61MI
300	G300K5RH2A04	6	6	3V	150	66.18	42.18	33.50	2400*	945	UU	WS62MI

(10) 2 @-2.5%; (6) 2 @+2.5%, 4@-2.5%

*EST

KVA	CATALOG NUMBER	TAPS FCAN	TAPS FCBN	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER	WIRING DIAGRAM	WEATHER SHIELD
	GROUP "O": PRI: 600Δ SEC: 240Δ 60HZ											
30	G030K4RJ2A03	6	6	3E	115	26.58	21.81	11.65	422	243	WW	
45	G045K4RJ2A03	6	6	3E	115	26.58	24.81	13.53	660	244	WW	

(6) 2 @+2.5%, 4@-2.5%

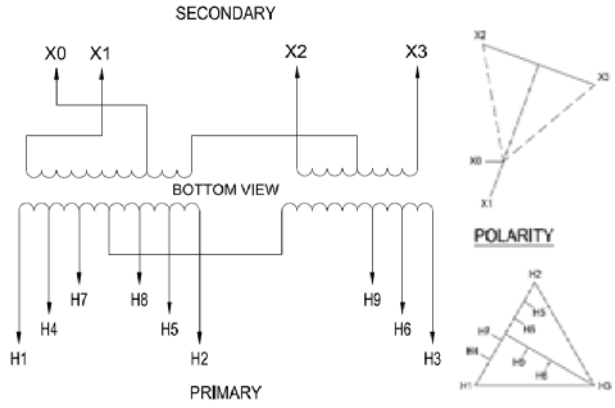
DIAGRAM "SS"

WDG	VOLTS	LINE
PRI	600	H1-H2-H3
	570	H4-H5-H6
	540	H7-H8-H9

Three phase 3 wire to three phase 4 wire
For step up, do not connect neutral "X0"

DIAGRAM "TT"

VOLTS	CONNECT	LINE
630	1-6	H1-H2-H3
615	1-5	
600	1-4	
585	2-5	
570	2-4	
555	3-5	
540	3-4	



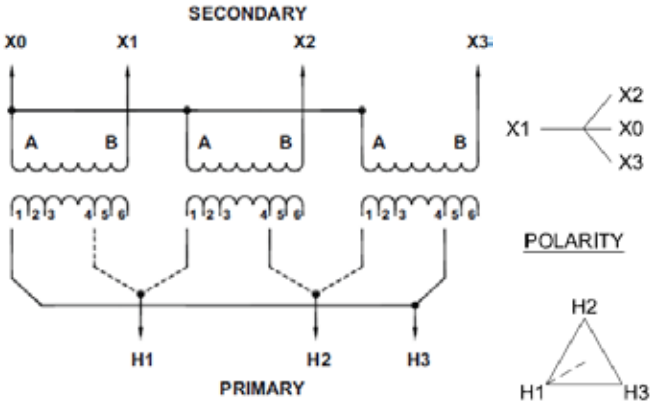


DIAGRAM “UU”

VOLTS	CONNECT
630	4 TO 5
615	4 TO 6
600	4 TO 7
585	3 TO 6
570	3 TO 7
555	2 TO 6
540	2 TO 7

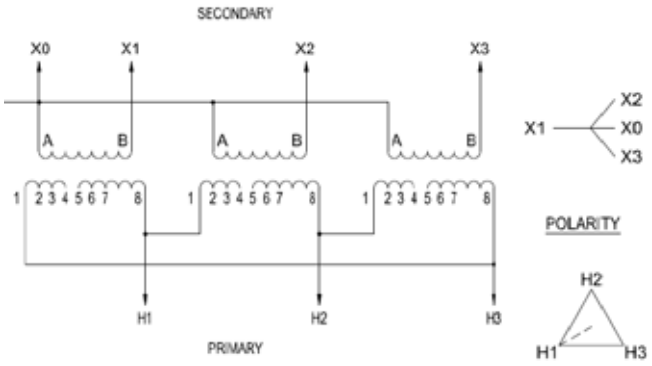
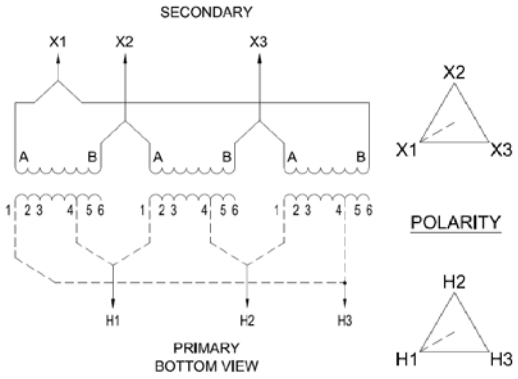


DIAGRAM “WW”

VOLTS	CONNECT	LINE
630	1-6	H1-H2-H3
615	1-5	
600	1-4	
585	2-5	
570	2-4	
555	3-5	
540	3-4	



Transformer Accessories

Wall Mounting Brackets are used to wall mount most 15 through 75Kva and some 100 and 112.5Kva Type 1-V and 3-V transformers. this bracket allows for 6" Clearance from the wall as recommended by Micron.

A Weathershield Kit consisting of a front and rear cover shield must be installed on all ventilated dry-type transformers when the unit is located outdoors. The shields protect the transformer top ventilation openings against rain but allow for proper ventilation. Field installation hardware is not required. Proper installation provides a NEMA 3R rating.
Refer to the specific transformer listing for selection of the proper kit.

Rodent Screens deter small animals and birds from entering the transformer enclosure.

Frame	Weathershield	Rodent Screen	Wallmount Brkt
816	WS11MI	RS13MI	WMB01MI
818	WS11MI	RS14MI	WMB01MI
819	WS16MI	RS15MI	WMB01MI
820	WS16MI	RS15MI	WMB01MI
821	WS13MI	RS11MI	WMB01MI
939	WS57MI	RS57MI	WMB05MI
940	WS58MI	RS58MI	WMB05MI
942	WS59MI	RS59MI	WMB04MI
943	WS60MI	RS60MI	WMB04MI
944	WS61MI	RS61MI	N/A
945	WS62MI	RS62MI	N/A

BUCK - BOOST **By Micron Power Delivery**

Advanced transformers built for the industrial environment

BUCK-BOOST TRANSFORMERS

Single and Three Phase Applications – 60Hz

Buck-Boost Transformers are used to provide an economical method of correcting a lower or higher voltage to a voltage rating more suitable for efficient operation of electrical equipment, or as small kVA, single phase, 600 volt class insulating transformers with dual primary and dual secondary windings.

If wired as an isolation transformer, they can be utilized to provide for applications requiring 12, 16, 24, 32 or 48 Vac up through 7.5kVA. However, they are usually connected as autotransformers by utilizing one unit for single phase applications and either two or three units banked for three phase operation.

They are primarily used for motor operation and should not be used for motor control circuits, to correct fluctuating line voltage or to obtain a neutral on a delta system. These applications require transformers especially designed for these specific applications.

The following formulas can be used to calculate specific requirements.

For Single Phase:

$$\text{LOAD KVA} = \frac{\text{Load Voltage} \times \text{Full Load Amps}}{1000}$$

For Three Phase:

$$\text{LOAD KVA} = \frac{\text{Load Voltage} \times \text{Full Load Amps} \times 1.732}{1000}$$

Selection Requirements

First, you should have this information before selecting a buck-boost transformer.

Line Voltage- The voltage that you want to buck (decrease) or boost (increase). This can be found by measuring the supply line voltage with a voltmeter.

Load Voltage- The voltage at which your equipment is designed to operate. This is listed on the nameplate of the equipment.

Load Amps or Load Kva- You do not need to know both – one or the other is sufficient for selection purposes. This information usually can be found on the nameplate of the equipment that you want to operate.

Frequency- The supply line frequency must be the same as the frequency of the equipment being operated. Micron Buck-Boost transformers operate at 60 Hertz only.

Phase- The supply line should be the same as the equipment to be operated – either single or three phase.

Transformer Interconnection

For three phase applications, interconnections of transformers should be made in a junction box. Two or three transformers may be used depending on an open delta (2) or wye (3) connection.

See the 5-step selection example in red

Selection Example

The tables which follow will simplify the selection of the buck-boost transformers. There are no calculations needed; simply follow these **5** steps.

1. Refer to the table having the same output voltage as the equipment that you want to operate. For example, if you are installing a 240 volt, 6Kva single phase load, use **Selection Table Number 4**.

2. Select the available line voltage across the top of the chart which is closest to the actual supply voltage. In the example, if the available line voltage is 213 volts, use the 212 volt Column.

3. Read down the column until you reach an output Kva or amps rating equal to or greater than the load requirements. Since 6Kva, in the example, is not listed, use the next higher rating or 7.5Kva.

4. Read across to the far left columns for the catalog number and quantity of transformers for your application. In the example, you will need (1) catalog number J001K1EB1A02.

5. Connect the selected buck-boost transformer(s) in accordance with the connection diagram specified on the bottom of the "Available Voltage" column. In the example, Diagram "F" would be used. **Test voltage BEFORE connecting load!**

NOTE: When installation is to be made on a grounded system, consideration must be given to the resulting voltage. Thus, on a 208 grounded wye/120 system the voltage can be boosted to 240 volts but the voltage to ground will be 139 volts. If 240/120 volts with a midpoint ground is needed, a standard two-winding transformer must be used.

NOTE: For 1 phase connections and 3 phase open delta connections, inputs and outputs may be reversed. Kva capacity remains constant.

Buck-Boost

Product Groups/Voltage Combinations

KVA	CATALOG NUMBER	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER
	GROUP "A": PRI: 120 X 240 SEC: 16/32 60 HZ							
.050	J050A1EB1A01	1E	115	6.50	3.88	3.50	7	52
.100	J100A1EB1A01	1E	115	6.50	3.88	3.50	7	54
.150	J150A1EB1A01	1E	115	6.50	3.88	3.50	8	55
.250	J250A1EB1A02	1E	115	6.50	5.00	3.88	12	57
.500	J500A1EB1A02	1E	115	6.50	4.88	4.63	13	57
.750	J750A1EB1A02	1E	115	8.38	6.00	5.50	21	58A
1	J001K1EB1A02	1E	115	8.38	6.00	5.50	31	67
1.5	J1X5K1EB1A02	1E	115	10.50	6.38	6.13	40	67
2	J002K1EB1A02	1E	115	10.50	6.38	6.13	40	68
3	J003K1EB1A03	1E	115	14.13	7.75	8.00	65	176
5	J005K1EB1A03	1E	115	16.00	10.38	9.88	113	177
7.5	J7X5K1EB1A03	1E	115	16.00	10.38	9.88	123	178

KVA	CATALOG NUMBER	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER
	GROUP "B": PRI: 240 X 480 SEC: 24/48 60 HZ							
.050	J050A1KC1A01	1E	115	6.50	3.88	3.50	7	52
.100	J100A1KC1A01	1E	115	6.50	3.88	3.50	7	54
.150	J150A1KC1A01	1E	115	6.50	3.88	3.50	8	55
.250	J250A1KC1A02	1E	115	6.50	5.00	3.88	12	57
.500	J500A1KC1A02	1E	115	6.50	4.88	4.63	13	57
.750	J750A1KC1A02	1E	115	8.38	6.00	5.50	21	58A
1	J001K1KC1A02	1E	115	8.38	6.00	5.50	31	67
1.5	J1X5K1KC1A02	1E	115	10.50	6.38	6.13	40	67
2	J002K1KC1A02	1E	115	10.50	6.38	6.13	40	68
3	J003K1KC1A03	1E	115	14.13	7.75	8.00	65	176
5	J005K1KC1A03	1E	115	16.00	10.38	9.88	113	177
7.5	J7X5K1KC1A03	1E	115	16.00	10.38	9.88	123	178

KVA	CATALOG NUMBER	DESIGN TYPE	TEMP RISE °C	H	W	D	W LBS	FRAME NUMBER
	GROUP "C": PRI: 120 X 240 SEC: 12/24 60 HZ							
.050	J050A1EA1A01	1E	115	6.50	3.88	3.50	7	52
.100	J100A1EA1A01	1E	115	6.50	3.88	3.50	7	54
.150	J150A1EA1A01	1E	115	6.50	3.88	3.50	8	55
.250	J250A1EA1A02	1E	115	6.50	5.00	3.88	12	57
.500	J500A1EA1A02	1E	115	6.50	4.88	4.63	13	57
.750	J750A1EA1A02	1E	115	8.38	6.00	5.50	21	58A
1	J001K1EA1A02	1E	115	8.38	6.00	5.50	31	67
1.5	J1X5K1EA1A02	1E	115	10.50	6.38	6.13	40	67
2	J002K1EA1A02	1E	115	10.50	6.38	6.13	40	68
3	J003K1EA1A03	1E	115	14.13	7.75	8.00	65	176
5	J005K1EA1A03	1E	115	16.00	10.38	9.88	113	177
7.5	J7X5K1EA1A03	1E	115	16.00	10.38	9.88	123	178

SINGLE PHASE APPLICATIONS

Need Single Phase 115 Volts, 60Hz (Table Number 1)

Unit Req'd	Unit Kva	Catalog Number	Have Available Voltage Of																			
			84		91		96		100		102		105		127		130		138		146	
			Max Load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.05	J050A1EA1A01	-	-	-	-	0.24	2.09	-	-	-	-	0.48	4.17	0.54	4.58	-	-	0.29	2.50	-	-
1	.05	J050A1EB1A01	0.13	1.14	0.18	1.56	-	-	0.31	2.70	0.36	3.13	-	-	-	-	0.41	3.54	-	-	0.23	1.98
1	.10	J100A1EA1A01	-	-	-	-	0.48	4.17	-	-	-	-	0.96	8.33	1.10	9.17	-	-	0.58	5.00	-	-
1	.10	J100A1EB1A01	0.26	2.29	0.36	3.12	-	-	0.62	5.41	0.72	6.25	-	-	-	-	0.82	7.08	-	-	0.46	3.95
1	.15	J150A1EA1A01	-	-	-	-	0.72	6.25	-	-	-	-	1.44	12.5	1.60	13.7	-	-	0.87	7.50	-	-
1	.15	J150A1EB1A01	0.39	3.44	0.54	4.69	-	-	0.93	8.12	1.08	9.37	-	-	-	-	1.30	10.6	-	-	0.69	5.93
1	.25	J250A1EA1A02	-	-	-	-	1.20	10.4	-	-	-	-	2.39	20.8	2.63	22.9	-	-	1.44	12.5	-	-
1	.25	J250A1EB1A02	0.66	5.73	0.90	7.81	-	-	1.56	13.5	1.80	15.6	-	-	-	-	2.03	17.7	-	-	1.14	9.88
1	.50	J500A1EA1A02	-	-	-	-	2.40	20.8	-	-	-	-	4.79	41.6	5.27	45.8	-	-	2.87	25	-	-
1	.50	J500A1EB1A02	1.32	11.5	1.80	15.6	-	-	3.11	27.1	3.59	31.2	-	-	-	-	4.07	35.4	-	-	2.27	19.8
1	.75	J750A1EA1A02	-	-	-	-	3.60	31.2	-	-	-	-	7.19	62.4	7.90	68.7	-	-	4.31	37.5	-	-
1	.75	J750A1EB1A02	1.98	17.2	2.70	23.4	-	-	4.67	40.6	5.39	46.8	-	-	-	-	6.10	53.1	-	-	3.41	29.6
1	1.0	J001K1EA1A02	-	-	-	-	4.79	41.7	-	-	-	-	9.58	83.3	10.5	91.7	-	-	5.75	50	-	-
1	1.0	J001K1EB1A02	2.64	22.9	3.59	31.2	-	-	6.23	54.1	7.19	62.5	-	-	-	-	8.14	70.8	-	-	4.55	39.5
1	1.5	J1X5K1EA1A02	-	-	-	-	7.20	62.5	-	-	-	-	14.4	125	15.8	137	-	-	8.62	75	-	-
1	1.5	J1X5K1EB1A02	3.95	34.4	5.39	46.9	-	-	9.34	81.2	10.8	93.7	-	-	-	-	12.2	106	-	-	6.82	59.3
1	2.0	J002K1EA1A02	-	-	-	-	9.58	83.3	-	-	-	-	19.2	16.7	21.1	183	-	-	11.5	100	-	-
1	2.0	J002K1EB1A02	5.27	45.8	7.19	62.5	-	-	12.5	108	14.4	125	-	-	-	-	16.3	142	-	-	9.10	79.2
1	3.0	J003K1EA1A03	-	-	-	-	14.37	125.1	-	-	-	-	28.7	249.9	31.5	275.1	-	-	17.3	150	-	-
1	3.0	J003K1EB1A03	7.92	68.7	10.77	93.6	-	-	18.69	162.3	21.57	187.5	-	-	-	-	24.4	212.4	-	-	13.6	118.5
1	5.0	J005K1EA1A03	-	-	-	-	23.95	208.5	-	-	-	-	47.9	416.5	52.5	458.5	-	-	28.7	250	-	-
1	5.0	J005K1EB1A03	13.2	115	18	156	-	-	31.15	270.5	35.95	312.5	-	-	-	-	40.7	354	-	-	22.7	197.5
1	7.5	J7X5K1EA1A03	-	-	-	-	36	312	-	-	-	-	71.9	624	79	687	-	-	43.1	357	-	-
1	7.5	J7X5K1EB1A03	19.8	172	27	234	-	-	46.7	406	53.9	468	-	-	-	-	61	531	-	-	34.1	296
Connection Diagram			D		B		B		C		A		A		A		A		B		B	

Need Single Phase 120 Volts, 60Hz (Selection Table Number 2)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																			
			88		95		100		104		106		109		132		136		144		152	
			Max Load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.05	J050A1EA1A01	-	-	-	-	0.25	2.09	-	-	-	-	0.50	4.17	0.55	4.58	-	-	0.30	2.50	-	-
1	.05	J050A1EB1A01	0.14	1.15	0.19	1.56	-	-	0.33	2.70	0.38	3.13	-	-	-	-	0.43	3.54	-	-	0.24	1.98
1	.10	J100A1EA1A01	-	-	-	-	0.50	4.17	-	-	-	-	1.00	8.33	1.10	9.17	-	-	0.60	5.00	-	-
1	.10	J100A1EB1A01	0.29	2.29	0.38	3.12	-	-	0.65	5.41	0.75	6.25	-	-	-	-	0.85	7.08	-	-	0.48	3.95
1	.15	J150A1EA1A01	-	-	-	-	0.75	6.25	-	-	-	-	1.50	12.5	1.60	13.7	-	-	0.90	7.50	-	-
1	.15	J150A1EB1A01	0.41	3.44	0.56	4.69	-	-	0.98	8.12	1.12	9.37	-	-	-	-	1.27	10.6	-	-	0.71	5.93
1	.25	J250A1EA1A02	-	-	-	-	1.25	10.4	-	-	-	-	2.50	20.8	2.75	22.9	-	-	1.50	12.5	-	-
1	.25	J250A1EB1A02	0.69	5.73	0.94	7.81	-	-	1.62	13.5	1.87	15.6	-	-	-	-	2.12	17.7	-	-	1.19	9.88
1	.50	J500A1EA1A02	-	-	-	-	2.50	20.8	-	-	-	-	5.00	41.6	5.50	45.8	-	-	3.00	25	-	-
1	.50	J500A1EB1A02	1.37	11.5	1.87	15.6	-	-	3.25	27.1	3.75	31.2	-	-	-	-	4.25	35.4	-	-	2.37	19.8
1	.75	J750A1EA1A02	-	-	-	-	3.75	31.2	-	-	-	-	7.50	62.4	8.25	68.7	-	-	4.50	37.5	-	-
1	.75	J750A1EB1A02	2.06	17.2	2.82	23.4	-	-	4.87	40.6	5.62	46.8	-	-	-	-	6.37	53.1	-	-	3.56	29.6
1	1.0	J001K1EA1A02	-	-	-	-	5.00	41.7	-	-	-	-	10	83.3	11	91.7	-	-	6.00	50	-	-
1	1.0	J001K1EB1A02	2.75	22.9	3.75	31.2	-	-	6.50	54.1	7.50	62.5	-	-	-	-	8.50	70.8	-	-	4.75	39.5
1	1.5	J1X5K1EA1A02	-	-	-	-	7.50	62.5	-	-	-	-	15	125	16.5	137	-	-	9.00	75	-	-
1	1.5	J1X5K1EB1A02	4.12	34.4	5.62	46.9	-	-	9.75	81.2	11.2	93.7	-	-	-	-	12.7	106	-	-	7.12	59.3
1	2.0	J002K1EA1A02	-	-	-	-	10	83.3	-	-	-	-	20	167	22	183	-	-	12	100	-	-
1	2.0	J002K1EB1A02	5.50	45.8	7.50	62.5	-	-	13	108	15	125	-	-	-	-	17	142	-	-	9.50	79.2
1	3.0	J003K1EA1A03	-	-	-	-	15	125.1	-	-	-	-	30	249.9	33	275.1	-	-	18	150	-	-
1	3.0	J003K1EB1A03	8.25	68.7	11.25	93.6	-	-	19.5	162.3	22.5	187.5	-	-	-	-	25.5	212.4	-	-	14.25	118.5
1	5.0	J005K1EA1A03	-	-	-	-	25	208.5	-	-	-	-	50	416.5	55	458.5	-	-	30	250	-	-
1	5.0	J005K1EB1A03	13.75	114.5	18.75	156	-	-	32.5	270.5	37.5	312.5	-	-	-	-	42.5	354	-	-	23.7	197.5
1	7.5	J7X5K1EA1A03	-	-	-	-	37.5	312	-	-	-	-	75	624	82.5	687	-	-	45	375	-	-
1	7.5	J7X5K1EB1A03	20.6	172	28.2	234	-	-	48.7	406	56.2	468	-	-	-	-	63.7	531	-	-	35.6	296
Connection Diagram			D		B		B		C		A		A		A		A		B		B	

DIAGRAM "A"

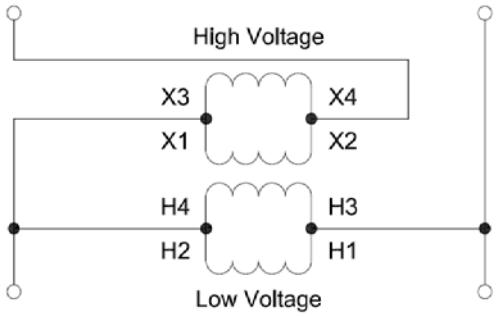
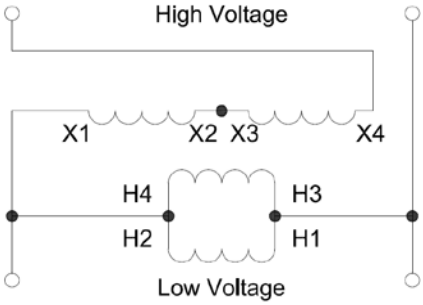


DIAGRAM "B"



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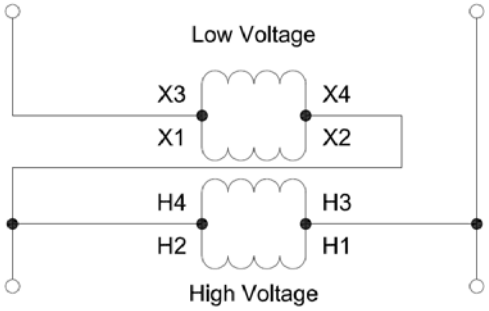
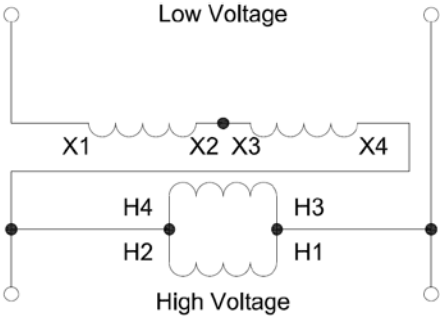


DIAGRAM "D"



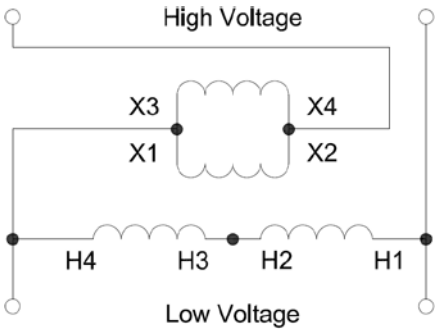
Need Single Phase 230 Volts, 60Hz (Selection Table Number 3)

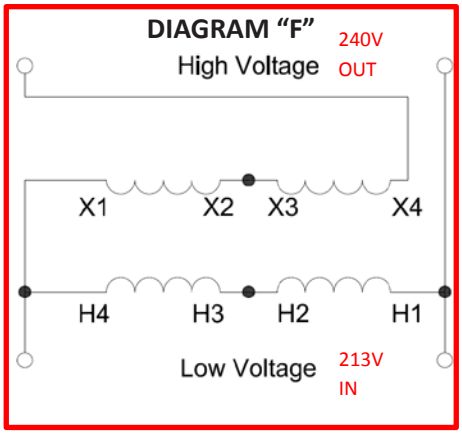
Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																	
			199		203		207		209		216		219		242		246		253		260	
			Max Load																	
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.05	**J050A1EA1A01**	-	-	-	-	0.43	1.88	0.48	2.08	-	-	0.96	4.16	1.00	4.38	-	-	0.53	2.29	-	-
1	.05	**J050A1EB1A01**	0.31	1.36	0.36	1.56	-	-	-	-	0.72	3.12	-	-	-	-	0.77	3.34	-	-	0.41	1.77
1	.10	**J100A1EA1A01**	-	-	-	-	0.86	3.75	0.96	4.17	-	-	1.92	8.33	2.01	8.75	-	-	1.05	4.58	-	-
1	.10	**J100A1EB1A01**	0.62	2.71	0.72	3.12	-	-	-	-	1.44	6.25	-	-	-	-	1.53	6.67	-	-	0.82	3.54
1	.15	**J150A1EA1A01**	-	-	-	-	1.29	5.62	1.44	6.25	-	-	2.87	12.5	3.02	13.1	-	-	1.58	6.87	-	-
1	.15	**J150A1EB1A01**	0.93	4.06	1.08	4.69	-	-	-	-	2.16	9.37	-	-	-	-	2.30	10	-	-	1.22	5.31
1	.25	**J250A1EA1A02**	-	-	-	-	2.15	9.37	2.39	10.4	-	-	4.79	20.8	5.03	21.9	-	-	2.63	11.5	-	-
1	.25	**J250A1EB1A02**	1.55	6.77	1.80	7.81	-	-	-	-	3.59	15.6	-	-	-	-	3.83	16.7	-	-	2.04	8.85
1	.50	**J500A1EA1A02**	-	-	-	-	4.31	18.7	4.79	20.8	-	-	9.58	41.6	10.1	43.7	-	-	5.27	22.9	-	-
1	.50	**J500A1EB1A02**	3.11	13.5	3.60	15.6	-	-	-	-	7.19	31.2	-	-	-	-	7.67	33.3	-	-	4.07	17.7
1	.75	**J750A1EA1A02**	-	-	-	-	6.46	28.2	7.19	31.2	-	-	14.4	62.4	15.1	65.6	-	-	7.90	34.4	-	-
1	.75	**J750A1EB1A02**	4.66	20.3	5.40	23.4	-	-	-	-	10.8	46.8	-	-	-	-	11.5	50	-	-	6.11	26.6
1	1.0	**J001K1EA1A02**	-	-	-	-	8.62	37.5	9.58	41.7	-	-	19.2	83.3	20.1	87.5	-	-	10.5	45.8	-	-
1	1.0	**J001K1EB1A02**	6.23	27.1	7.2	31.2	-	-	-	-	14.4	62.5	-	-	-	-	15.3	66.7	-	-	8.15	35.4
1	1.5	**J1X5K1EA1A02**	-	-	-	-	12.9	56.2	14.4	62.5	-	-	28.7	125	30.2	131	-	-	15.8	68.7	-	-
1	1.5	**J1X5K1EB1A02**	9.34	40.6	10.8	46.9	-	-	-	-	21.6	93.7	-	-	-	-	23	100	-	-	12.2	53.1
1	2.0	**J002K1EA1A02**	-	-	-	-	17.2	75	19.2	83.3	-	-	38.3	167	40.2	175	-	-	21.1	91.7	-	-
1	2.0	**J002K1EB1A02**	12.5	54.2	14.4	62.5	-	-	-	-	28.7	125	-	-	-	-	30.7	133	-	-	16.3	70.8
1	3.0	**J003K1EA1A03**	-	-	-	-	25.8	112.5	28.7	125.1	-	-	57.6	249.9	60.3	262.5	-	-	31.5	137.4	-	-
1	3.0	**J003K1EB1A03**	18.6	81.3	21.6	93.6	-	-	-	-	43.2	187.5	-	-	-	-	45.9	200.1	-	-	24.4	106.2
1	5.0	**J005K1EA1A03**	-	-	-	-	43.1	187.5	47.9	208.5	-	-	96	416.5	100.5	437.5	-	-	52.5	229	-	-
1	5.0	**J005K1EB1A03**	31.1	135.5	36	156	-	-	-	-	72	312.5	-	-	-	-	76.5	333.5	-	-	40.7	177
1	7.5	**J7X5K1EA1A03**	-	-	-	-	64.6	282	71.9	312	-	-	144	624	151	656	-	-	79	344	-	-
1	7.5	**J7X5K1EB1A03**	46.6	203	54	234	-	-	-	-	108	468	-	-	-	-	115	500	-	-	61.1	266
Connection Diagram			**G**		**F**		**G**		**F**		**E**		**E**		**E**		**E**		**F**		**F**	

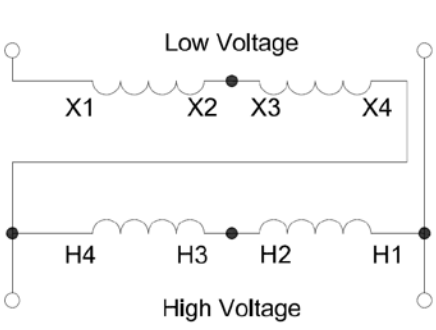
FROM EXAMPLE OF BUCK-BOOST SELECTION PROCESS

Need Single Phase 240 Volts, 60Hz (Selection Table Number 4)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																	
			208		212		216		218		225		229		252		256		264		272	
			Max Load																	
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.05	J050A1EA1A01	-	-	-	-	0.45	1.88	0.50	2.08	-	-	1.00	4.16	1.05	4.38	-	-	0.55	2.29	-	-
1	.05	J050A1EB1A01	0.32	1.35	0.38	1.56	-	-	-	-	0.75	3.12	-	-	-	-	0.80	3.33	-	-	0.42	1.77
1	.10	J100A1EA1A01	-	-	-	-	0.90	3.75	1.00	4.17	-	-	2.00	8.33	2.10	8.75	-	-	1.10	4.58	-	-
1	.10	J100A1EB1A01	0.65	2.71	0.75	3.12	-	-	-	-	1.50	6.25	-	-	-	-	1.60	6.67	-	-	0.85	3.54
1	.15	J150A1EA1A01	-	-	-	-	1.35	5.62	1.50	6.25	-	-	3.00	12.5	3.15	13.1	-	-	1.65	6.87	-	-
1	.15	J150A1EB1A01	0.98	4.06	1.12	4.69	-	-	-	-	2.25	9.37	-	-	-	-	2.40	10	-	-	1.27	5.31
1	.25	J250A1EA1A02	-	-	-	-	2.25	9.37	2.50	10.4	-	-	5.00	20.8	5.25	21.9	-	-	2.75	11.5	-	-
1	.25	J250A1EB1A02	1.62	6.77	1.87	7.81	-	-	-	-	3.75	15.6	-	-	-	-	4.00	16.7	-	-	2.12	8.85
1	.50	J500A1EA1A02	-	-	-	-	4.50	18.7	5.00	20.8	-	-	10	41.6	10.5	43.7	-	-	5.50	22.9	-	-
1	.50	J500A1EB1A02	3.25	13.5	3.75	15.6	-	-	-	-	7.50	31.2	-	-	-	-	8.00	33.3	-	-	4.25	17.7
1	.75	J750A1EA1A02	-	-	-	-	6.75	28.2	7.5	31.2	-	-	15	62.4	15.7	65.6	-	-	8.25	34.4	-	-
1	.75	J750A1EB1A02	4.87	20.3	5.62	23.4	-	-	-	-	11.2	46.8	-	-	-	-	12	50	-	-	6.37	26.6
1	1.0	J001K1EA1A02	-	-	-	-	9.00	37.5	10	41.7	-	-	20	83.3	21	87.5	-	-	11	45.8	-	-
1	1.0	J001K1EB1A02	6.50	27.1	7.50	31.2	-	-	-	-	15	62.5	-	-	-	-	16	66.7	-	-	8.5	35.4
1	1.5	J1X5K1EA1A02	-	-	-	-	13.5	56.2	15	62.5	-	-	30	125	31.5	131	-	-	16.5	68.7	-	-
1	1.5	J1X5K1EB1A02	9.75	40.6	11.2	46.9	-	-	-	-	22.5	93.7	-	-	-	-	24	100	-	-	12.7	53.1
1	2.0	J002K1EA1A02	-	-	-	-	18	75	20	83.3	-	-	40	167	42	175	-	-	22	91.7	-	-
1	2.0	J002K1EB1A02	13	54.2	15	62.5	-	-	-	-	30	125	-	-	-	-	32	133	-	-	17	70.8
1	3.0	J003K1EA1A03	-	-	-	-	27	112.5	30	125.1	-	-	60	249.9	63	262.5	-	-	33	137.4	-	-
1	3.0	J003K1EB1A03	19.5	81.3	22.5	93.6	-	-	-	-	45	187.5	-	-	-	-	48	200.1	-	-	25.5	106.2
1	5.0	J005K1EA1A03	-	-	-	-	45	187	50	208	-	-	100	416.5	105	437.5	-	-	55	229	-	-
1	5.0	J005K1EB1A03	32.5	135	37.5	156	-	-	-	-	75	312	-	-	-	-	80	333	-	-	42.5	177
1	7.5	J7X5K1EA1A03	-	-	-	-	67.5	282	75	312	-	-	150	624	157	656	-	-	82.5	344	-	-
1	7.5	J7X5K1EB1A03	48.7	203	56.2	234	-	-	-	-	112	468	-	-	-	-	120	500	-	-	63.7	266
Connection Diagram			G		F		G		F		E		E		E		E		F		F	







THREE PHASE APPLICATIONS

WARNING! THREE PHASE AUTOTRANSFORMERS SHOULD NEVER BE USED TO OBTAIN 4-WIRE OUTPUT WITH 3-WIRE INPUT. 4-WIRE OUTPUT REQUIRES 4-WIRE WYE INPUT.

Need Three Phase Open Delta 230 Volts, 60Hz (Selection Table Number 5)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																			
			199		203		207		209		216		219		242		246		253		260	
			Max Load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
2	.05	J050A1EA1A01	-	-	-	-	0.75	1.87	0.83	2.08	-	-	1.66	4.17	1.74	4.37	-	-	0.91	2.29	-	-
2	.05	J050A1EB1A01	0.54	1.35	0.62	1.56	-	-	-	-	1.24	3.12	-	-	-	-	1.33	3.33	-	-	0.70	1.77
2	.10	J100A1EA1A01	-	-	-	-	1.49	3.75	1.66	4.17	-	-	3.32	8.33	3.48	8.75	-	-	1.83	4.58	-	-
2	.10	J100A1EB1A01	1.08	2.71	1.24	3.12	-	-	-	-	2.49	6.25	-	-	-	-	2.65	6.67	-	-	1.41	3.54
2	.15	J150A1EA1A01	-	-	-	-	2.24	5.62	2.49	6.25	-	-	4.98	12.5	5.23	13.1	-	-	2.74	6.87	-	-
2	.15	J150A1EB1A01	1.62	4.06	1.87	4.69	-	-	-	-	3.73	9.37	-	-	-	-	3.98	10	-	-	2.12	5.13
2	.25	J250A1EA1A02	-	-	-	-	3.30	9.37	4.15	10.4	-	-	8.30	20.8	8.71	21.9	-	-	4.56	11.5	-	-
2	.25	J250A1EB1A02	2.70	6.77	3.11	7.81	-	-	-	-	6.22	15.6	-	-	-	-	6.64	16.7	-	-	3.52	8.85
2	.50	J500A1EA1A02	-	-	-	-	7.47	18.7	8.30	20.8	-	-	16.6	41.7	17.4	43.7	-	-	9.73	22.9	-	-
2	.50	J500A1EB1A02	5.39	13.5	6.22	15.6	-	-	-	-	12.4	31.2	-	-	-	-	13.3	33.3	-	-	7.05	17.7
2	.75	J750A1EA1A02	-	-	-	-	11.2	28.2	12.4	31.2	-	-	24.9	62.4	26.1	65.6	-	-	13.7	34.4	-	-
2	.75	J750A1EB1A02	8.09	20.3	9.33	23.4	-	-	-	-	18.7	46.8	-	-	-	-	19.9	50	-	-	10.6	26.6
2	1.0	J001K1EA1A02	-	-	-	-	14.9	37.5	16.6	41.7	-	-	33.2	83.3	34.8	87.5	-	-	18.3	45.8	-	-
2	1.0	J001K1EB1A02	10.8	27.1	12.4	31.2	-	-	-	-	24.9	62.5	-	-	-	-	26.5	66.7	-	-	14.1	35.4
2	1.5	J1X5K1EA1A02	-	-	-	-	22.4	56.2	24.9	62.5	-	-	49.8	125	52.3	131	-	-	27.4	68.7	-	-
2	1.5	J1X5K1EB1A02	16.2	40.6	18.7	46.9	-	-	-	-	37.3	93.7	-	-	-	-	39.8	100	-	-	21.2	53.1
2	2.0	J002K1EA1A02	-	-	-	-	29.9	75	33.2	83.3	-	-	66.4	167	69.7	175	-	-	36.5	91.7	-	-
2	2.0	J002K1EB1A02	21.6	54.2	24.9	62.5	-	-	-	-	49.8	125	-	-	-	-	53.1	133	-	-	28.2	70.8
2	3.0	J003K1EA1A03	-	-	-	-	44.7	112.5	49.8	125.1	-	-	99.6	249.9	104.4	262.5	-	-	54.9	137.4	-	-
2	3.0	J003K1EB1A03	32.4	81.3	32.7	93.6	-	-	-	-	74.7	187.5	-	-	-	-	79.5	200	-	-	42.3	106.2
2	5.0	J005K1EA1A03	-	-	-	-	74.7	187	83	208	-	-	166	417	174	437	-	-	91.3	229	-	-
2	5.0	J005K1EB1A03	53.9	135	62.2	156	-	-	-	-	124	312.5	-	-	-	-	133	333	-	-	70.5	177
2	7.5	J7X5K1EA1A03	-	-	-	-	112	282	124	312	-	-	249	624	261	656	-	-	137	344	-	-
2	7.5	J7X5K1EB1A03	80.9	203	93.3	234	-	-	-	-	187	468	-	-	-	-	199	500	-	-	106	266
Connection Diagram			L		K		L		K		I		I		I		I		K		K	

Need Three Phase Open Delta 240 Volts, 60 Hz (Selection Table Number 6)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																			
			208		212		216		218		225		229		252		256		264		272	
			Max Load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
2	.05	J050A1EA1A01	-	-	-	-	0.73	1.87	0.87	2.08	-	-	1.73	4.16	1.82	4.37	-	-	0.95	2.29	-	-
2	.05	J050A1EB1A01	0.56	1.35	0.65	1.56	-	-	-	-	1.30	3.12	-	-	-	-	1.38	3.33	-	-	0.74	1.77
2	.10	J100A1EA1A01	-	-	-	-	1.56	3.75	1.73	4.17	-	-	3.46	8.33	3.64	8.75	-	-	1.91	4.58	-	-
2	.10	J100A1EB1A01	1.13	2.71	1.30	3.12	-	-	-	-	2.60	6.25	-	-	-	-	2.77	6.67	-	-	1.47	3.54
2	.15	J150A1EA1A01	-	-	-	-	2.34	5.62	2.60	6.25	-	-	5.19	12.5	5.45	13.1	-	-	2.86	6.87	-	-
2	.15	J150A1EB1A01	1.69	4.06	1.95	4.69	-	-	-	-	3.90	9.37	-	-	-	-	4.15	10	-	-	2.21	5.31
2	.25	J250A1EA1A02	-	-	-	-	3.90	9.37	4.33	10.4	-	-	8.66	20.8	9.09	21.9	-	-	4.76	11.5	-	-
2	.25	J250A1EB1A02	2.81	6.77	3.25	7.81	-	-	-	-	6.49	15.6	-	-	-	-	6.92	16.7	-	-	3.68	8.85
2	.50	J500A1EA1A02	-	-	-	-	7.79	18.7	8.66	20.8	-	-	17.3	41.6	18.2	43.7	-	-	9.53	22.9	-	-
2	.50	J500A1EB1A02	5.63	13.5	6.50	15.6	-	-	-	-	13	31.2	-	-	-	-	13.8	33.3	-	-	7.36	17.7
2	.75	J750A1EA1A02	-	-	-	-	11.7	28.2	13	31.2	-	-	26	62.4	27.3	65.6	-	-	14.3	34.4	-	-
2	.75	J750A1EB1A02	8.44	20.3	9.75	23.4	-	-	-	-	19.5	46.8	-	-	-	-	20.8	50	-	-	11	26.6
2	1.0	J001K1EA1A02	-	-	-	-	15.6	37.5	17.3	41.7	-	-	34.6	83.3	36.4	87.5	-	-	19.1	45.8	-	-
2	1.0	J001K1EB1A02	11.3	27.1	13	31.2	-	-	-	-	26	62.5	-	-	-	-	27.7	66.7	-	-	14.7	35.4
2	1.5	J1X5K1EA1A02	-	-	-	-	23.4	56.2	26	62.5	-	-	51.9	125	54.5	131	-	-	28.6	68.7	-	-
2	1.5	J1X5K1EB1A02	16.9	40.6	19.5	46.9	-	-	-	-	39	93.7	-	-	-	-	41.5	100	-	-	22.1	53.1
2	2.0	J002K1EA1A02	-	-	-	-	31.2	75	34.6	83.3	-	-	69.3	167	72.7	175	-	-	38.1	91.7	-	-
2	2.0	J002K1EB1A02	22.5	54.2	26	62.5	-	-	-	-	25	125	-	-	-	-	55.4	133	-	-	29.4	70.8
2	3.0	J003K1EA1A03	-	-	-	-	46.8	112.5	51.9	125.1	-	-	103.8	249.9	109.2	262.5	-	-	57.3	137.4	-	-
2	3.0	J003K1EB1A03	33.9	81.3	39	93.6	-	-	-	-	78	187.5	-	-	-	-	83.1	200	-	-	44.1	106.2
2	5.0	J005K1EA1A03	-	-	-	-	77.9	187	86.6	208	-	-	173	416	182	437	-	-	95.3	229	-	-
2	5.0	J005K1EB1A03	56.3	135	65	156	-	-	-	-	130	312	-	-	-	-	138	333	-	-	73.6	177
2	7.5	J7X5K1EA1A03	-	-	-	-	117	282	130	312	-	-	260	624	273	656	-	-	143	344	-	-
2	7.5	J7X5K1EB1A03	84.4	203	97.5	234	-	-	-	-	195	468	-	-	-	-	208	500	-	-	110	266
Connection Diagram			L		K		L		K		I		I		I		I		K		K	

Need Three Phase Wye 208 Volts, 60Hz (Selection Table Number 7)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																	
			152		265		173		180		184		189		229		236		250		264	
			Max Load																	
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
3	.05	**J050A1EA1A01**	-	-	-	-	0.75	2.08	-	-	-	-	1.50	4.16	1.65	4.58	-	-	0.90	2.50	-	-
3	.05	**J050A1EB1A01**	0.41	1.15	0.56	1.56	-	-	0.98	2.71	1.12	3.12	-	-	-	-	1.27	3.54	-	-	0.71	1.98
3	.10	**J100A1EA1A01**	-	-	-	-	1.50	4.17	-	-	-	-	3.00	8.33	3.30	9.17	-	-	1.80	5.00	-	-
3	.10	**J100A1EB1A01**	0.82	2.29	1.12	3.12	-	-	1.95	5.41	2.25	6.25	-	-	-	-	2.55	7.08	-	-	1.42	3.95
3	.15	**J150A1EA1A01**	-	-	-	-	2.25	6.25	-	-	-	-	4.50	12.5	4.95	13.7	-	-	2.70	7.50	-	-
3	.15	**J150A1EB1A01**	1.24	3.44	1.69	4.69	-	-	2.92	8.12	3.73	9.37	-	-	-	-	3.82	10.6	-	-	2.14	5.93
3	.25	**J250A1EA1A02**	-	-	-	-	3.75	104	-	-	-	-	7.50	20.8	8.25	22.9	-	-	4.50	12.5	-	-
3	.25	**J250A1EB1A02**	2.06	5.73	2.81	7.81	-	-	4.87	13.5	5.62	15.6	-	-	-	-	6.35	17.7	-	-	3.56	9.88
3	.50	**J500A1EA1A02**	-	-	-	-	7.50	20.8	-	-	-	-	15	41.6	16.5	45.8	-	-	9.0	25	-	-
3	.50	**J500A1EB1A02**	4.12	11.5	5.62	15.6	-	-	9.75	27.1	11.2	31.2	-	-	-	-	12.7	35.4	-	-	7.12	19.3
3	.75	**J750A1EA1A02**	-	-	-	-	11.2	31.2	-	-	-	-	22.5	62.4	24.7	68.7	-	-	13.5	37.5	-	-
3	.75	**J750A1EB1A02**	6.19	17.2	8.44	23.4	-	-	14.6	40.6	16.8	46.8	-	-	-	-	19	53.1	-	-	10.7	29.3
3	1.0	**J001K1EA1A02**	-	-	-	-	15	41.7	-	-	-	-	30	83.3	33	91.7	-	-	18	50	-	-
3	1.0	**J001K1EB1A02**	8.25	22.9	11.2	31.2	-	-	19.5	54.1	22.5	62.5	-	-	-	-	25.5	70.8	-	-	14.2	39.5
3	1.5	**J1X5K1EA1A02**	-	-	-	-	22.5	62.5	-	-	-	-	45	125	49.5	137	-	-	27	75	-	-
3	1.5	**J1X5K1EB1A02**	12.4	34.4	16.9	46.9	-	-	29.2	81.2	33.7	93.7	-	-	-	-	38.2	106	-	-	21.4	59.3
3	2.0	**J002K1EA1A02**	-	-	-	-	30	83.3	-	-	-	-	60	167	66	183	-	-	361	100	-	-
3	2.0	**J002K1EB1A02**	16.5	45.8	22.5	62.5	-	-	39	108	45	125	-	-	-	-	51	142	-	-	28.5	79.2
3	3.0	**J003K1EA1A03**	-	-	-	-	45	125	-	-	-	-	90	249.9	99	275.1	-	-	54	150	-	-
3	3.0	**J003K1EB1A03**	24.7	68.7	33.6	93.6	-	-	58.5	162.3	67.5	187.5	-	-	-	-	76.5	212.4	-	-	46.2	118.5
3	5.0	**J005K1EA1A03**	-	-	-	-	75	208	-	-	-	-	150	416	165	458	-	-	90	250	-	-
3	5.0	**J005K1EB1A03**	41.2	115	56.2	156	-	-	97.5	271	112	312	-	-	-	-	127	354	-	-	71.2	198
3	7.5	**J7X5K1EA1A03**	-	-	-	-	112	312	-	-	-	-	225	624	274	687	-	-	135	375	-	-
3	7.5	**J7X5K1EB1A03**	61.9	172	84.4	234	-	-	146	406	168	468	-	-	-	-	190	531	-	-	107	293
Connection Diagram			**P**		**N**		**N**		**O**		**M**		**M**		**M**		**M**		**N**		**N**	

DIAGRAM "I"

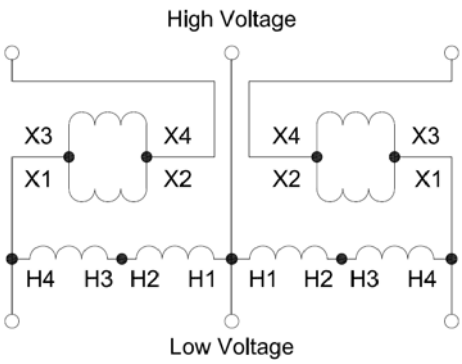
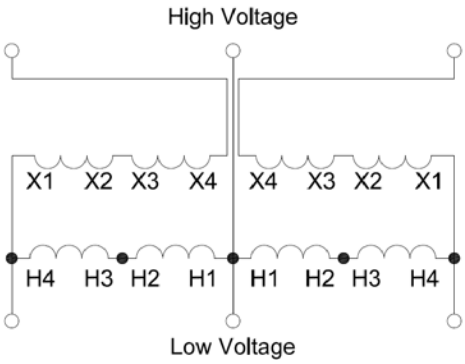


DIAGRAM "K"



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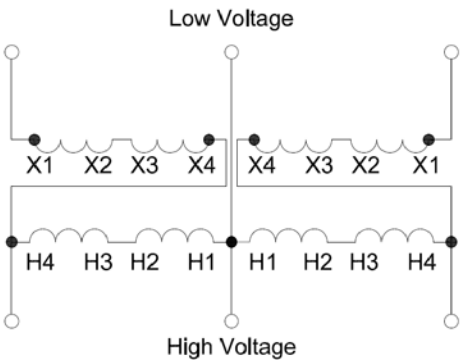

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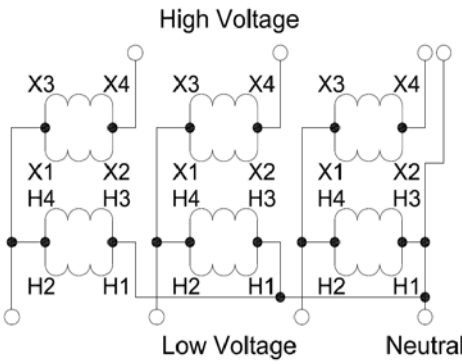

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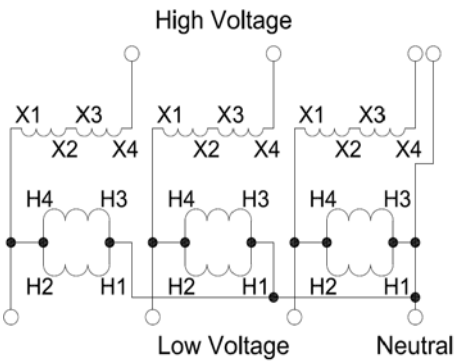
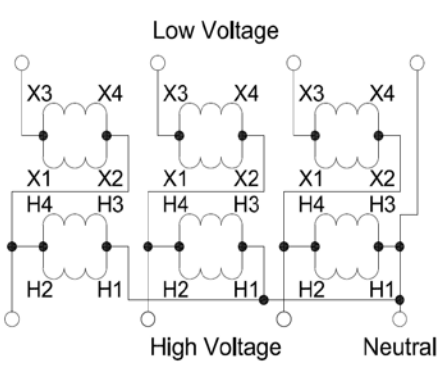


DIAGRAM "O"



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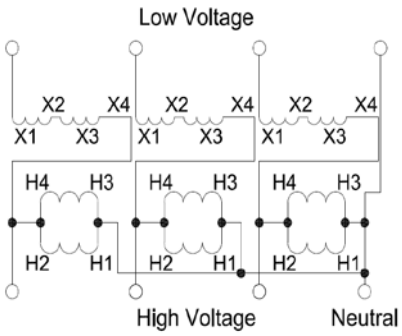

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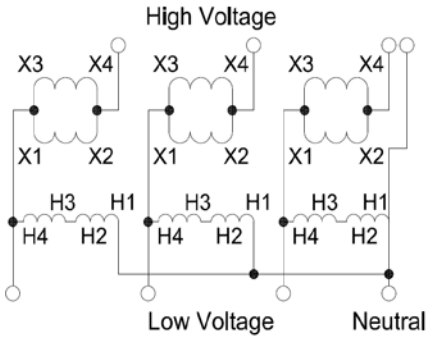

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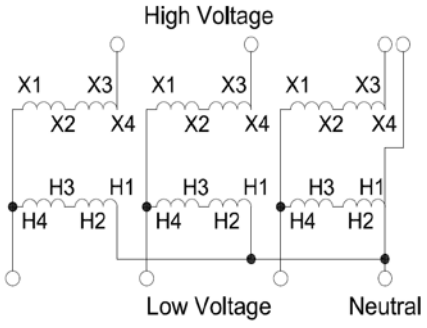

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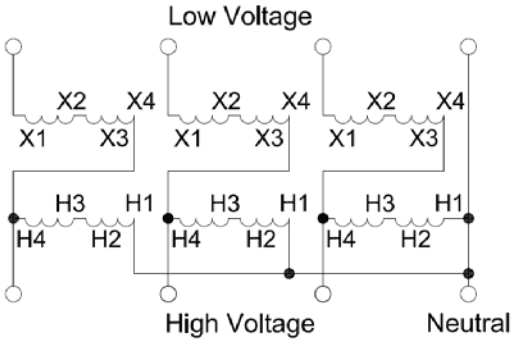


Need Three Phase Wye 230 Volts, 60Hz (Selection Table Number 8)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																			
			183		192		199		208		218		241		245		253		260		265	
			Max load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
3	.05	**J050A1EA1A01**	-	-	.083	2.08	-	-	1.65	4.58	1.66	4.17	1.74	4.37	-	-	0.91	2.29	-	-	-	-
3	.05	**J050A1EB1A01**	0.62	1.56	-	-	0.54	1.35	-	-	-	-	-	-	1.33	3.33	-	-	0.70	1.77	0.62	1.56
3	.10	**J100A1EA1A01**	-	-	1.66	4.17	-	-	3.30	9.17	3.32	8.35	3.48	8.75	-	-	1.83	4.58	-	-	-	-
3	.10	**J100A1EB1A01**	1.25	3.12	-	-	1.08	2.71	-	-	-	-	-	-	2.65	6.67	-	-	1.41	3.54	1.25	3.12
3	.15	**J150A1EA1A01**	-	-	2.49	6.25	-	-	4.95	13.7	4.98	12.5	5.23	13.1	-	-	2.74	6.87	-	-	-	-
3	.15	**J150A1EB1A01**	1.87	4.69	-	-	1.62	4.06	-	-	-	-	-	-	3.98	10	-	-	2.12	5.31	1.87	4.69
3	.25	**J250A1EA1A02**	-	-	4.15	10.4	-	-	8.20	22.9	8.30	20.9	8.71	21.9	-	-	4.56	11.5	-	-	-	-
3	.25	**J250A1EB1A02**	3.11	7.81	-	-	2.70	6.77	-	-	-	-	-	-	6.63	16.7	-	-	3.52	8.85	3.11	7.81
3	.50	**J500A1EA1A02**	-	-	8.30	20.8	-	-	16.5	45.8	16.6	41.7	17.4	43.7	-	-	9.31	22.9	-	-	-	-
3	.50	**J500A1EB1A02**	6.22	15.6	-	-	5.39	13.5	-	-	-	-	-	-	13.3	33.3	-	-	7.05	17.7	6.22	15.6
3	.75	**J750A1EA1A02**	-	-	12.4	31.2	-	-	24.7	68.8	24.9	62.6	26.1	65.5	-	-	13.7	34.4	-	-	-	-
3	.75	**J750A1EB1A02**	9.33	23.4	-	-	8.09	20.3	-	-	-	-	-	-	19.9	50	-	-	10.6	26.6	9.33	23.4
3	1.0	**J001K1EA1A02**	-	-	16.6	41.7	-	-	33	91.7	33.2	83.5	34.8	87.5	-	-	18.3	45.8	-	-	-	-
3	1.0	**J001K1EB1A02**	12.5	31.2	-	-	10.8	27.1	-	-	-	-	-	-	26.5	66.7	-	-	14.1	35.4	12.5	31.2
3	1.5	**J1X5K1EA1A02**	-	-	24.9	62.5	-	-	49.5	137	49.8	125	52.3	131	-	-	27.4	68.7	-	-	-	-
3	1.5	**J1X5K1EB1A02**	18.7	46.9	-	-	16.2	40.6	-	-	-	-	-	-	39.8	100	-	-	21.2	53.1	18.7	46.9
3	2.0	**J002K1EA1A02**	-	-	33.2	83.3	-	-	66	183	66.4	167	69.7	175	-	-	36.6	91.6	-	-	-	-
3	2.0	**J002K1EB1A02**	24.9	62.5	-	-	21.6	54.2	-	-	-	-	-	-	53.1	133	-	-	28.2	70.8	24.9	62.5
3	3.0	**J003K1EA1A03**	-	-	49.8	125.1	-	-	99	275	99.6	250.5	104.4	262.5	-	-	54.9	137.4	-	-	-	-
3	3.0	**J003K1EB1A03**	37.5	93.6	-	-	32.4	81.3	-	-	-	-	-	-	79.5	200	-	-	42.3	106.2	37.5	93.6
3	5.0	**J005K1EA1A03**	-	-	83	208	-	-	165	458	166	417	174	437	-	-	91.3	229	-	-	-	-
3	5.0	**J005K1EB1A03**	62.2	156	-	-	53.9	135	-	-	-	-	-	-	133	333	-	-	70.5	177	62.2	156
3	7.5	**J7X5K1EA1A03**	-	-	124	312	-	-	247	688	249	626	261	656	-	-	137	344	-	-	-	-
3	7.5	**J7X5K1EB1A03**	93.3	234	-	-	80.9	203	-	-	-	-	-	-	199	500	-	-	106	266	93.3	234
Connection Diagram			**N**		**N**		**S**		**M**		**Q**		**Q**		**Q**		**R**		**R**		**S**	

Need Three Phase Wye 240 Volts, 60Hz (Selection Table Number 9)

Units Req'd	Unit Kva	Use Catalog Number	Have Available Voltage Of																			
			190		200		208		218		228		252		256		264		272		277	
			Max Load																			
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
3	.05	J050A1EA1A01	-	-	0.86	2.08	-	-	0.86	2.08	1.73	4.17	1.85	4.37	-	-	0.95	2.29	-	-	-	-
3	.05	J050A1EB1A01	0.65	1.65	-	-	1.27	3.05	-	-	-	-	-	-	1.39	3.33	-	-	0.74	1.77	0.65	1.56
3	.10	J100A1EA1A01	-	-	1.73	4.17	-	-	1.73	4.17	3.46	8.34	3.64	8.75	-	-	1.91	4.58	-	-	-	-
3	.10	J100A1EB1A01	1.30	3.12	-	-	2.55	6.12	-	-	-	-	-	-	2.77	6.67	-	-	1.47	3.54	1.30	3.12
3	.15	J150A1EA1A01	-	-	2.59	6.25	-	-	2.59	6.25	5.20	12.50	5.46	13.10	-	-	2.86	6.87	-	-	-	-
3	.15	J150A1EB1A01	1.95	4.69	-	-	3.82	9.16	-	-	-	-	-	-	4.16	10	-	-	2.21	5.31	1.95	4.69
3	.25	J250A1EA1A02	-	-	4.32	10.40	-	-	4.32	10.40	8.66	20.90	9.09	21.90	-	-	4.76	11.50	-	-	-	-
3	.25	J250A1EB1A02	3.25	7.81	-	-	6.30	15.10	-	-	-	-	-	-	6.93	16.70	-	-	3.68	8.85	3.25	7.81
3	.50	J500A1EA1A02	-	-	8.65	20.80	-	-	8.65	20.80	17.30	41.70	18.20	43.70	-	-	9.53	22.90	-	-	-	-
3	.50	J500A1EB1A02	6.50	15.60	-	-	12.70	30.40	-	-	-	-	-	-	13.90	33.30	-	-	7.36	17.70	6.50	15.60
3	.75	J750A1EA1A02	-	-	13.0	31.20	-	-	13.0	31.20	26.0	62.60	27.30	65.60	-	-	14.30	34.40	-	-	-	-
3	.75	J750A1EB1A02	9.75	23.40	-	-	19.2	46	-	-	-	-	-	-	20.8	50	-	-	11	26.6	9.75	23.40
3	1.0	J001K1EA1A02	-	-	17.3	41.7	-	-	17.3	41.7	34.6	83.4	36.4	87.5	-	-	19.1	45.8	-	-	-	-
3	1.0	J001K1EB1A02	13	31.2	-	-	25.5	61.2	-	-	-	-	-	-	27.7	66.7	-	-	14.7	35.4	13	31.2
3	1.5	J1X5K1EA1A02	-	-	25.9	62.5	-	-	25.9	62.5	52	125	54.6	131	-	-	28.6	68.7	-	-	-	-
3	1.5	J1X5K1EB1A02	19.5	46.9	-	-	38.2	91.6	-	-	-	-	-	-	41.6	100	-	-	22.1	53.1	19.5	46.9
3	2.0	J002K1EA1A02	-	-	34.6	83.3	-	-	34.6	83.3	69.3	167	72.8	175	-	-	38.1	91.7	-	-	-	-
3	2.0	J002K1EB1A02	26	62.5	-	-	51	122.4	-	-	-	-	-	-	55.4	133	-	-	29.5	70.8	26	62.5
3	3.0	J003K1EA1A03	-	-	51.9	125.1	-	-	51.9	125.1	103.8	250.2	109.2	262.5	-	-	57.3	137.4	-	-	-	-
3	3.0	J003K1EB1A03	39	93.6	-	-	76.5	183.6	-	-	-	-	-	-	83.1	200	-	-	44.1	106.2	39	93.6
3	5.0	J005K1EA1A03	-	-	86.5	208	-	-	86.5	208	173	417	182	437	-	-	95.3	229	-	-	-	-
3	5.0	J005K1EB1A03	65	156	-	-	127.2	305.2	-	-	-	-	-	-	139	333	-	-	73.6	177	65	156
3	7.5	J7X5K1EA1A03	-	-	130	312	-	-	130	312	260	626	273	656	-	-	143	344	-	-	-	-
3	7.5	J7X5K1EB1A03	97.5	234	-	-	192	460	-	-	-	-	-	-	208	500	-	-	110	266	97.5	234
Connection Diagram			N		N		M		R		Q		Q		Q		R		R		S	

Need Three Phase Wye 460Volts, 60Hz (Selection Table #10) ----- 480 Volts, 60Hz selection Table #11)

# Units	Unit Kva	Use Catalog Number	Have Available Voltage Of								# Units	Unit Kva	Use Catalog Number	Have Available Voltage Of					
			406		418		432		438					424		436		450	
			Max Load											Max Load					
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps					Kva-Amps		Kva-Amps		Kva-Amps	
3	.05	J050A1EA1A01	-	-	1.66	2.08	-	-	3.22	4.04	3	.05	J050A1EA1A01	-	-	1.7	2.1	-	-
3	.05	J050A1EB1A01	1.25	1.57	-	-	2.49	3.12	-	-	3	.05	J050A1EB1A01	1.3	1.56	-	-	2.6	3.13
3	.10	J100A1EA1A01	-	-	3.31	4.15	-	-	6.62	8.31	3	.10	J100A1EA1A01	-	-	3.5	4.2	-	-
3	.10	J100A1EB1A01	2.49	3.12	-	-	4.97	6.24	-	-	3	.10	J100A1EB1A01	2.6	3.12	-	-	5.2	6.25
3	.15	J150A1EA1A01	-	-	4.97	6.24	-	-	9.94	12.48	3	.15	J150A1EA1A01	-	-	5.2	6.25	-	-
3	.15	J150A1EB1A01	3.73	4.68	-	-	7.46	9.36	-	-	3	.15	J150A1EB1A01	3.9	4.68	-	-	7.8	9.38
3	.25	J250A1EA1A02	-	-	8.28	10.39	-	-	16.6	20.84	3	.25	J250A1EA1A02	-	-	8.7	10.4	-	-
3	.25	J250A1EB1A02	6.22	7.81	-	-	12.4	15.56	-	-	3	.25	J250A1EB1A02	6.5	7.82	-	-	13	15.6
3	.50	J500A1EA1A02	-	-	16.6	20.84	-	-	33.2	41.67	3	.50	J500A1EA1A02	-	-	17.4	20.9	-	-
3	.50	J500A1EB1A02	12.5	15.69	-	-	24.69	31.25	-	-	3	.50	J500A1EB1A02	13	15.6	-	-	26	31.2
3	.75	J750A1EA1A02	-	-	24.8	31.12	-	-	49.6	62.25	3	.75	J750A1EA1A02	-	-	26	31.2	-	-
3	.75	J750A1EB1A02	18.7	23.47	-	-	37.3	46.82	-	-	3	.75	J750A1EB1A02	19.5	23.4	-	-	39	46.9
3	1.0	J001K1EA1A02	-	-	33.1	41.54	-	-	66.2	83.09	3	1.0	J001K1EA1A02	-	-	35	42	-	-
3	1.0	J001K1EB1A02	24.9	31.25	-	-	49.7	62.38	-	-	3	1.0	J001K1EB1A02	26	31.2	-	-	52	62.5
3	1.5	J1X5K1EA1A02	-	-	49.7	62.38	-	-	99.4	124.75	3	1.5	J1X5K1EA1A02	-	-	52	62.5	-	-
3	1.5	J1X5K1EB1A02	37.3	46.94	-	-	74.6	93.63	-	-	3	1.5	J1X5K1EB1A02	39	46.8	-	-	78	93.8
3	2.0	J002K1EA1A02	-	-	66.3	83.22	-	-	133	166.93	3	2.0	J002K1EA1A02	-	-	69	82.9	-	-
3	2.0	J002K1EB1A02	49.7	62.38	-	-	99.5	124.88	-	-	3	2.0	J002K1EB1A02	52	62.5	-	-	104	125
3	3.0	J003K1EA1A03	-	-	99.3	124.64	-	-	198.6	249.27	3	3.0	J003K1EA1A03	-	-	104	125	-	-
3	3.0	J003K1EB1A03	74.6	93.93	-	-	149	187.01	-	-	3	3.0	J003K1EB1A03	78	93.8	-	-	156	187.6
3	5.0	J005K1EA1A03	-	-	166	208.35	-	-	322	404.16	3	5.0	J005K1EA1A03	-	-	174	209.2	-	-
3	5.0	J005K1EB1A03	125	156.89	-	-	249	312.53	-	-	3	5.0	J005K1EB1A03	130	156.3	-	-	260	312.7
3	7.5	J7X5K1EA1A03	-	-	248	311	-	-	496	622	3	7.5	J7X5K1EA1A03	-	-	260	312	-	-
3	7.5	J7X5K1EB1A03	187	235	-	-	373	468	-	-	3	7.5	J7X5K1EB1A03	195	234	-	-	390	469
Connection Diagram			R		R		Q		Q					R		R		Q	

Single Phase Group “B” Applications, 60Hz (Selection Table Number 12)

# Units	Unit kVA	Use Catalog Number	Available Voltage/Output Voltage											
			200/240		230/277		346/380		362/380		378/416		416/457	
			Max Load											
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.25	J250A1KC1A02	1.25	5.2	1.44	5.2	1.98	5.2	3.95	10.4	2.16	5.2	2.38	5.2
1	.50	J500A1KC1A02	2.5	10.4	2.88	10.4	3.95	10.4	7.9	20.8	4.33	10.4	4.76	10.4
1	.75	J750A1KC1A02	3.75	15.6	4.32	15.6	5.93	15.6	11.9	31.2	6.49	15.6	7.14	15.6
1	1.0	J001K1KC1A02	5.0	20.8	5.76	20.8	7.9	20.8	15.8	41.6	8.65	20.8	9.52	20.8
1	1.5	J1X5K1KC1A02	7.5	31.2	8.64	31.2	11.9	31.2	23.8	62.5	13	31.2	14.3	31.2
1	2.0	J002K1KC1A02	10	41.6	11.5	41.6	15.8	41.6	31.6	83.3	17.3	41.6	19	41.6
1	3.0	J003K1KC1A03	15	62.5	17.3	62.5	23.8	62.5	47.5	125	26	62.5	28.6	62.5
1	5.0	J005K1KC1A03	25	104	28.8	104	39.5	104	79	208	43.3	104	47.6	104
1	7.5	J7X5K1KC1A03	37.5	156	43.2	156	59.3	156	118.6	312	64.9	156	71.4	156
Connection Diagram			B		B		F		E		F		F	

# Units	Unit kVA	Use Catalog Number	Available Voltage/Output Voltage											
			436/480		458/480		277/230		480/456		504/480		528/480	
			Max Load											
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
1	.25	J250A1KC1A02	2.5	5.2	4.99	10.4	1.44	6.26	5.23	11.4	5.47	11.4	2.75	5.72
1	.50	J500A1KC1A02	4.99	10.4	9.98	20.8	2.88	12.5	10.4	22.8	10.9	22.8	5.49	11.4
1	.75	J750A1KC1A02	7.49	15.6	15	31.2	4.33	18.8	15.7	34.2	16.4	34.2	8.24	17.2
1	1.0	J001K1KC1A02	9.98	20.8	20	41.6	5.76	25	20.9	45.6	21.8	45.6	11	22.9
1	1.5	J1X5K1KC1A02	15	31.2	30	62.5	8.64	37.6	31.3	68.4	32.8	68.4	16.5	34.3
1	2.0	J002K1KC1A02	20	41.6	40	83.3	11.5	50.1	41.8	91.2	43.7	91.2	22	45.8
1	3.0	J003K1KC1A03	30	62.5	60	125	17.3	75.3	62.7	136	65.2	136	33	68.8
1	5.0	J005K1KC1A03	49.9	104	99.8	208	28.8	125.3	104.5	227	108	227	54.9	114.4
1	7.5	J7X5K1KC1A03	74.9	156	149.8	312	43.2	187.9	156.8	341	163	341	82.4	171.6
Connection Diagram			F		E		B		E		E		F	

DAIGRAM “B”

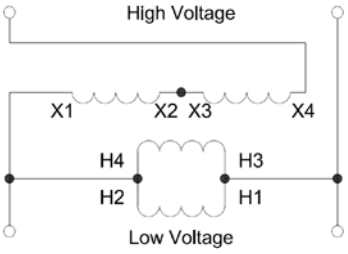


DIAGRAM “E”

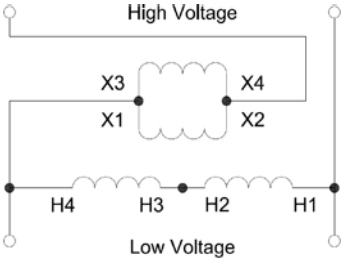
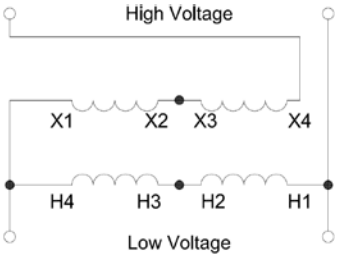


DIAGRAM “F”



Three Phase Group "B" Applications, 60Hz (Selection Table Number 13)

	Unit Kva	Use Catalog Number	Available Voltage/Output Voltage															
			362/380		346/416		430/473		400/480		436/380		460/483		457/380		504/480		528/480	
			Max Load															
			Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps		Kva-Amps	
	.25	J250A1KC1A02	6.52	10.4	3.75	5.2	4.26	5.2	4.33	5.2	4.33	5.2	8.7	10.4	4.12	6.25	9.08	10.9	4.76	5.72
	.50	J500A1KC1A02	13.0	20.8	7.5	10.4	8.52	10.4	8.65	10.4	8.65	10.4	17.4	20.8	8.23	12.5	18.2	21.8	9.51	11.4
	.75	J750A1KC1A02	19.6	31.2	11.2	15.6	12.8	15.6	13	15.6	13	15.6	26.1	31.2	12.3	18.8	27.2	32.8	14.3	17.2
	1.0	J001K1KC1A02	26.1	41.6	15	20.8	17	20.8	.17.3	20.8	17.3	20.8	34.8	41.6	16.5	25	36.3	43.7	19	22.9
	1.5	J1X5K1KC1A02	39.1	62.4	22.5	31.2	25.5	31.2	26	31.2	26	31.2	52.2	62.4	24.7	37.5	54.5	65.5	28.5	34.3
	2.0	J002K1KC1A02	52.2	83.2	30	41.6	34.1	41.6	34.6	41.6	34.6	41.6	69.6	83.2	32.9	50	72.6	87.4	38	45.8
	3.0	J003K1KC1A03	78.4	125	45	62.5	51.2	62.5	52	62.5	52	62.5	104.6	125	49.5	75.2	109.7	131.3	57.2	68.8
	5.0	J005K1KC1A03	130.4	208	75.1	104	85.2	104	86.6	104	86.6	104	174	208	82.3	125.1	181.6	218.4	95.1	114.4
	7.5	J7X5K1KC1A03	195.6	312	112.6	156	127.8	156	129.9	156	129.9	156	261	312	123.5	187.6	272.4	327.6	142.7	171.6
Connection Diagram			I		N		K		N		K		I		N		I		K	
Units Required			2		3		2		3		2		2		3		2		2	

DIAGRAM "I"

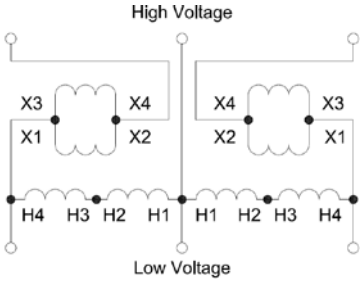


DIAGRAM "K"

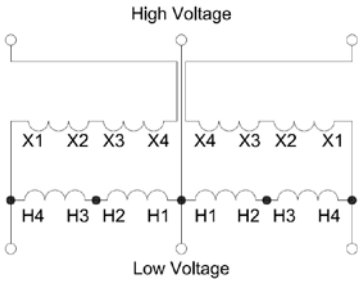
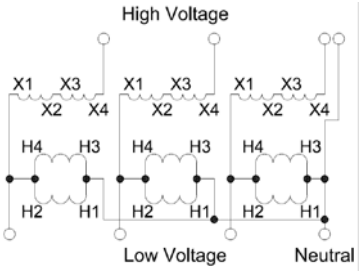


DIAGRAM "N"



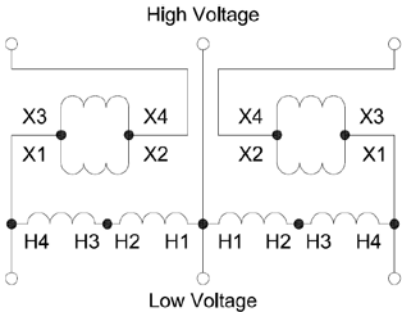
Need Three Phase Open Delta 480 Volts, 60Hz (Selection Table Number 14)

Units Req'd	Use Catalog Number	Have Available Volts Of					
		600		575		575	
		Max Load					
		Kva-Amps		Kva-Amps		Kva-Amps	
2	G500A1KF1A02	4.3	5.1	-	-	-	-
2	G001K1RF8A02	-	-	-	-	4.1	4.9
2	G750A1KF1A02	6.5	7.8	-	-	-	-
2	G001K1RF8A02	-	-	-	-	6.2	7.4
2	G001K1KF1A02	8.6	10.3	-	-	-	-
2	G001K1RF8A02	-	-	-	-	8.3	9.9
2	G1X5K1KF1A02	13	15.6	-	-	-	-
2	G1X5K1RF8A02	-	-	-	-	12.4	14.9
2	G002K1KF1A02	17.2	20.6	-	-	-	-
2	G002K1RF8A02	-	-	-	-	16.5	19.8
2	G003K1KF7A03	25.8	31	-	-	-	-
2	G003K1RF8A03	-	-	-	-	24.8	29.8
2	G005K1KF7A03	43.2	51.9	-	-	-	-
2	G005K1RF8A03	-	-	-	-	41	49.3
2	G7X5K1KF7A03	65	78.1	-	-	-	-
2	G7X5K1RF8A03	-	-	-	-	62	74.5
2	G010K1KF7A03	86	103.4	-	-	-	-
2	G010K1RF8A03	-	-	83	99.8	-	-
2	G015K1KF6A03	130	156.3	-	-	-	-
2	G015K1RF8A03	-	-	124	149.1	-	-
Connection Diagram		I		J		T	

Need Single Phase 480 Volts, 60Hz (Selection Table Number 15)

Units Req'd	Use Catalog Number	Have Available Volts Of					
		600		575		575	
		Max Load					
		Kva-Amps		Kva-Amps		Kva-Amps	
1	G500A1KF1A02	2.5	5.2	-	-	-	-
1	G001K1RF8A02	-	-	-	-	2.4	5.0
1	G750A1KF1A02	3.7	7.7	-	-	-	-
1	G001K1RF8A02	-	-	-	-	3.6	7.5
1	G001K1KF1A02	5.0	10.4	-	-	-	-
1	G001K1RF8A02	-	-	-	-	4.8	10
1	G1X5K1KF1A02	7.5	15.6	-	-	-	-
1	G1X5K1RF8A02	-	-	-	-	7.2	15
1	G002K1KF1A02	10	20.8	-	-	-	-
1	G002K1RF8A02	-	-	-	-	9.6	20
1	G003K1KF7A03	15	31.2	-	-	-	-
1	G003K1RF8A03	-	-	-	-	14.3	29.7
1	G005K1KF7A03	25	52	-	-	-	-
1	G005K1RF8A03	-	-	-	-	24	50
1	G7X5K1KF7A03	37.5	78.1	-	-	-	-
1	G7X5K1RF8A03	-	-	-	-	36	75
1	G010K1KF7A03	50	104.1	-	-	-	-
1	G010K1RF8A03	-	-	48	100	-	-
1	G015K1KF6A03	75	156.2	-	-	-	-
1	G015K1RF8A03	-	-	72	150	-	-
Connection Diagram		E		H		U	

DIAGRAM "I"



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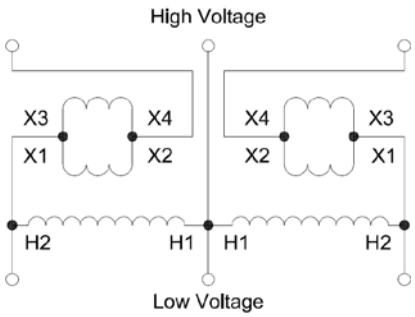


DIAGRAM "T"

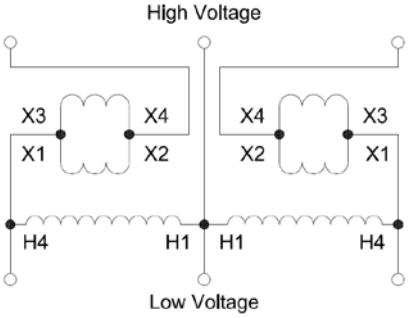


DIAGRAM "E"

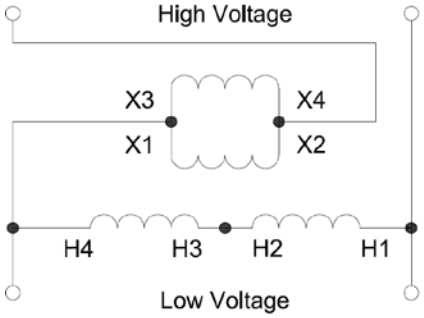


DIAGRAM "H"

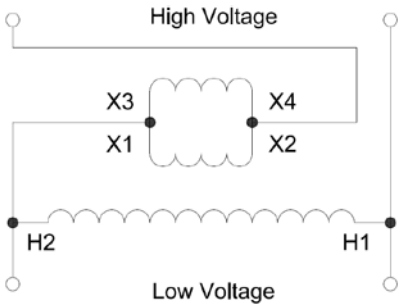
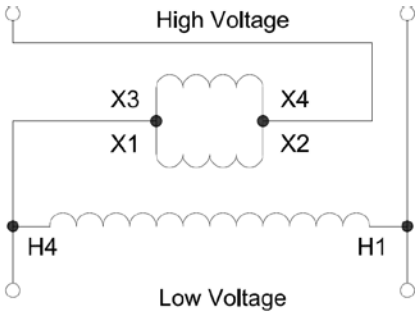


DIAGRAM "U"



NOTES

What is a Transformer:

Transformers are AC to AC devices. You cannot transform DC. Transformers change and/or isolate one voltage value from another. This is accomplished via electromagnetic induction, the magnetic field caused when alternating current passing through the primary coil is induced into the secondary coil. By varying the number of turns of wire within one coil with respect to the other, the voltage seen at the secondary coil differs from that of the primary. The laminations or core are in place to make the process more efficient.

What is a Control Transformer:

DEFINITION:

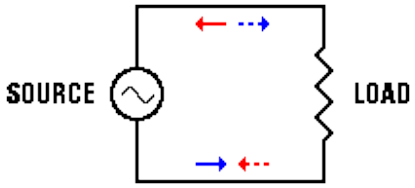
Control Transformers are virtually always single phase. They are also called "CPTs", Control Power Transformers, High Inrush Transformers, Step-Down and Power Transformers. They are designed to provide a stable secondary voltage at high initial energizing or inrush currents typically 5 to 15 times normal operating load current.

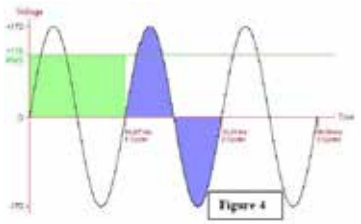
TERMS:

Sinusoidal: Or sine wave. A mathematical function that describes a smooth repetitive oscillation. The phase is defined where in the cycle the oscillation begins. See following definition of AC.

AC: Alternating current is the most common transmitted type of electricity. The flow begins by building up a voltage which is positive on top and negative on the bottom, and therefore pushes electrons through the circuit in the direction indicated by the solid arrows. However, then the source voltage starts falling off, and eventually reverses polarity. Now current will still flow through the circuit, but this time in the direction shown by the dotted arrows. The cycle repeats itself endlessly and as a result the current through the circuit reverses direction repeatedly.

The number of alterations per second is called frequency. If viewed on an oscilloscope, the cycles would form a **Sine wave** (fig. 4).





Hertz (Hz): The frequency (cycles) that AC reverses direction per second. 60Hz is common in NA, 50Hz in EU.

AMPS: The volume of electrical charge passing a point per unit of time. This "'flow rate" called current, is measured in amps.

Volts: The velocity of the electrical charge passing through a conductor.

Ambient: Refers to the ambient temperature of the air surrounding the transformer. Expressed in degrees Celsius (Centigrade).
The established industrial ambient is 40°C. Typically environments above this require component derating.

Regulation: The variation of transformer secondary voltage from no load to full load. In smaller sizes like 50VA, the difference between no load and full load voltage may be as high as 12%-13%.

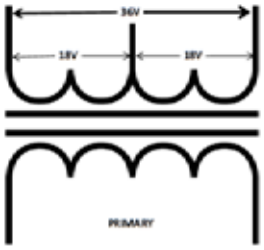
Inrush: The initial peak current (amp draw) measured as the transformer or the load becomes energized. This peak lasts only a few cycles but can equal as much as 40 times the normal operating current. As the current spikes the voltage dips. Think of why your house lights dim when the air conditioner compressor turns on. Control transformers are designed to minimize the voltage drop at inrush. Magnetizing the laminations and coil of the transformer itself also produces inrush. This causes a similar amperage peak on the line feeding the transformer and may cause premature or nuisance tripping of fuses and breakers. The worst case inrush is always at the peak of a cycle.

Compensated windings: The transformer is designed to provide label voltage at full load. At less than full load the measured output voltage is higher. This design feature is called a compensated winding. At 5Kva and above, compensation no longer is designed in.

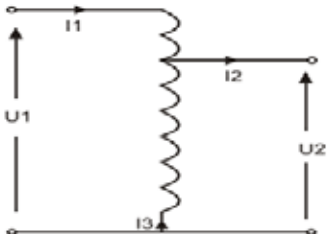
Shielding: Also called a Faraday Shield. A grounded conductor placed between primary and secondary windings to mitigate line-to-line or line-to-ground noise.

Lighting Tap: Typically a 120V single-phase secondary tap which is limited to 5% of the transformer rating.

Center Tap: Is a tap at the midpoint of a winding. A typical example would be a 36 volt center tap. You could derive 18 volts from each corner of the winding to the center OR 36 volts across the entire winding.



Autotransformer: An Autotransformer is designed with a single winding that acts as both primary and secondary. The secondary voltage can be tapped anywhere between the start and finish of the single winding. See I_2 - I_3 on adjacent drawing. Although smaller than a two-winding transformer, an autoformer cannot provide electrical isolation between primary and secondary voltages.



Types of Loads: The reversing action of alternating current makes no difference to some kinds of loads. For example, the light bulbs in your home don't care which way the current flows through them. When the circuit is closed by turning on the switch, the light turns on without regard for the direction of the current flow.

Resistive: Also described as linear. Loads that cause little or no initial energizing (inrush) current. Examples include incandescent lighting or heating resistors. Since there is no inrush, source current and source voltage rise and fall in sync with each other. **(see Unity Power Factor)**

Inductive: Typically caused by energizing a magnetic field such as solenoids, relays, transformers, motors or magnetic starters. Initial energizing (inrush) current is high which causes voltage to initially sag. After energizing occurs the current draw drops causing voltage to again rise. This point defines "steady state" or "sealed" VA. Inductive loads require more current than voltage initially in order to build the necessary magnetic field. The extra time it takes for the current in an inductor to build to its maximum before falling causes the source current to lag the source voltage. **(see Lagging Power Factor)**

Capacitive: The load presents a very high initial current draw similar to charging a capacitor. The initial high current draw causes a momentary voltage sag. In this way it is similar to inductive power. However, capacitive power is the opposite of inductive power in that it energizes an *electrical field* as opposed to a *magnetic field*. Because of the charging/discharging action of a capacitor the current always leads the voltage in the sine wave by 90°. This phenomenon causes the source current to lead the source voltage. Examples are capacitors, power supplies and variable frequency devices. At high switching frequencies all loads contain some capacitive value.
(see Leading Power Factor)

What is Power Factor:

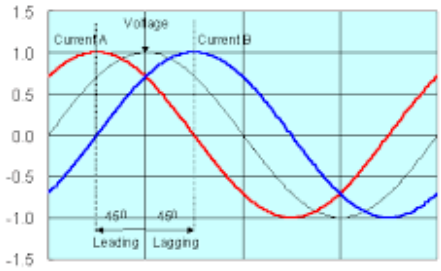
Power Factor is the timing difference in % of delivered voltage VS delivered amps.

- A power factor of 1 equates to **Unity**: Timing of delivered voltage % = timing of delivered amps %.
- A power factor of <1 equates to **Lagging**: Timing of delivered voltage reaches peak before delivered amps.
  - Power lines & motor windings cause energy losses that draw excess current.
  - High inrush loads initially draw more current than volts.
- A power factor of >1 equates to **Leading**: Timing of delivered voltage reaches peak after delivered amps.
  - Capacitors (once charged) store energy (amps) and can compensate for losses (power factor correction capacitors).

In the diagram to the right,

Blue = voltage reached peak before current (lag)

Red = current reached peak before voltage (lead)



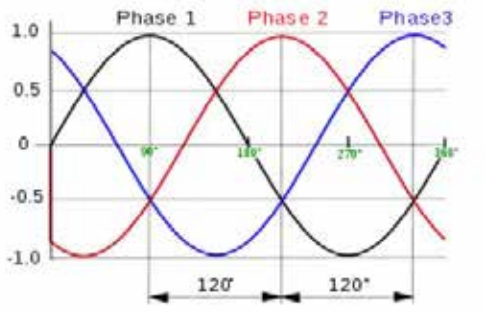
Time →

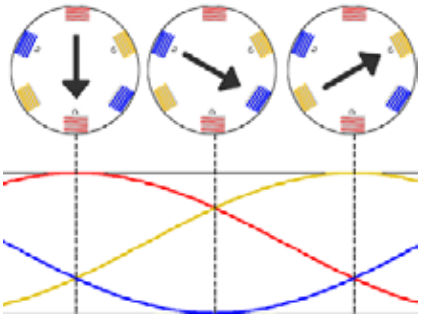
What is an LVGP Transformer:

Enclosed Power Transformers can be either single or three-phase. They are also called "LVGPs" or "Dry Types". These are always in a potted or ventilated enclosure.

TERMS:

Three Phase: The common method of electrical power generation and transmission. The generator at the power station converts mechanical power into a set of alternating electrical currents, one from each electromagnetic coil or winding of the generator. The currents are sinusoidal functions of time, all at the same frequency but with different phases. The phases are equally spaced and separated from each other by 120 degrees. 3 cycles 120° apart = 360° or one revolution of the generator. It is the revolving magnetic field caused by the three phases that causes an electric motor to start turning.





2-Pole/Phase Three Phase Motor

Single Phase: Single phase power is produced from a three phase source by connecting either between a phase and neutral or connecting phase-to-phase. Interestingly, single phase cannot produce necessary revolving magnetic field to start an electric motor turning. All single phase motors need additional circuits for starting. A single-phase sine wave is depicted as is a 2-Pole Single-Phase motor. as opposed to the rotating field produced by three phase, the single phase fields merely oscillates. Once rotation begins the momentum of the rotor allows rotation through the "dead areas". A phase-leading current is necessary to begin rotation and is developed by the added resistance of a start winding or by a capacitor.

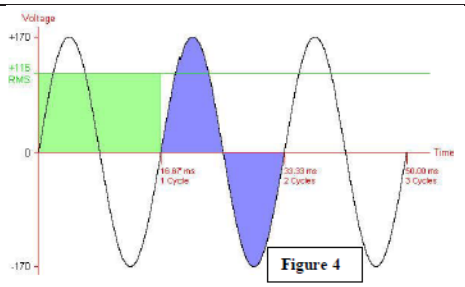
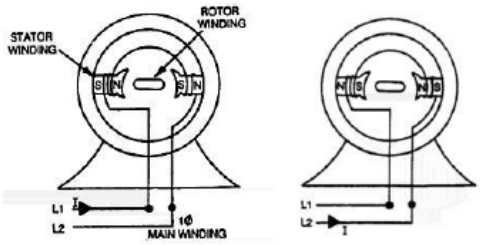


Figure 4



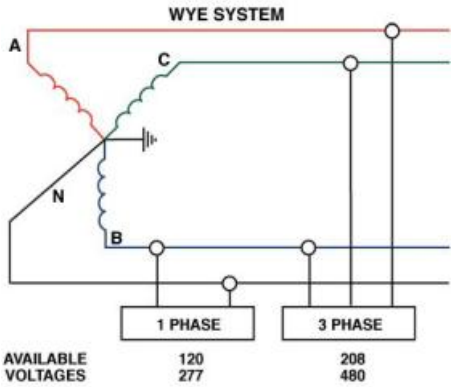
Neutral: The neutral is the point on a three phase system where each of the phase points are equal in magnitude and equally spaced in phase. It is the mathematical center of an equilateral triangle formed by the three phase points. Because of this, the phase-to-phase voltage is √3 (1.732) times the phase-to-neutral voltage.

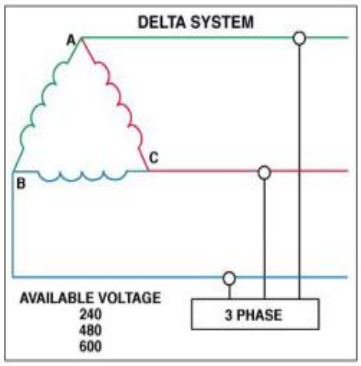
Example: 120V phase-to-neutral X 1.732 = 208V phase-to-phase. G015K5QH2A04 has a secondary of 208Y/120 The neutral allows the balancing of single phase loads between any/all of the individual three phase legs and the neutral point while still allowing for normal three phase loading. The neutral is also a grounded conductor which typically ties to the system's earth ground at the breaker panel.

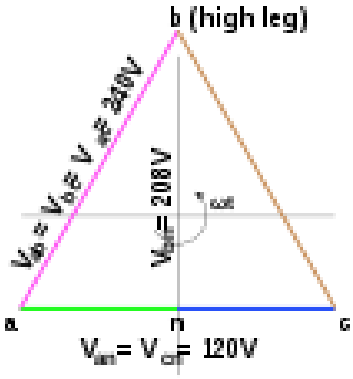
FCAN/FCBN: An acronym for Full Capacity Above Normal and Full Capacity Below Normal. These are taps on the primary side to adjust for slightly low or high line voltage. Expressed in % of adjustment.
Example: FCAN: 2 @ +2.5% / FCBN: 4 @ -2.5%.

Phase-to-Phase: Voltage measured between any two "corners" of a Delta connection or between any two "legs" of a Wye connection.

Wye: Also called “Star”. All phase windings are connected at a common point (resembles a star) which is typically where a fourth wire (neutral) and a ground is connected. Three phase loads are connected to the “A”, “B” and “C” (line-to-line) terminations while single phase loads are typically connected line-to-neutral. Unless they are light, connecting single phase loads line-to-line unevenly loads two windings, may unbalance the phases and derates the transformer more than connecting line-to-neutral.







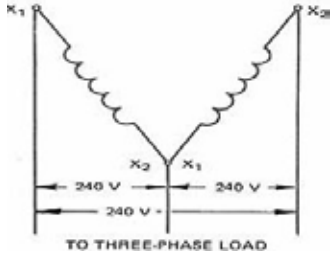
Delta: A common three-wire, three phase system in which the voltage potential between each pair of wires is the actual transformer voltage. Although typically ungrounded, a “grounded reference” can be developed by center-tapping the “A”-“C” winding (see High Leg) allowing for more load flexibility.

High Leg: Also called a “Wild Leg” or “Stinger”. On a three phase Delta system, a mid-point or center tap of the “A” to “C” phase winding is labeled “N” and becomes a grounded reference (sometimes referenced to as neutral). Voltage measurements between possible connection points on the above diagram are as follows:

Phase-to-Phase	**Phase-to-Neutral**
“A”-“B” = 240V	“A”-“N” = 120V (240/2)
“B”-“C” = 240V	“B”-“N” = 208V (240/2 X √3)
“C”-“A” = 240V	“C”-“N” = 120V (240/2)

High Leg Delta systems provide increased voltage flexibility over similar Wye systems because, in addition to a ground and 120 volt single phase, they offer a higher (240V) three phase connection. The disadvantage is that no single phase 120 volt load can be connected to the "B" leg and this may unbalance the total load.

Open Delta: A three phase transformer bank using two transformers. Although one side of the Delta is physically not there, an electrical measurement is possible across the missing side (diagram below)



An Open Delta is not as efficient as a three transformer system and is normally reserved for smaller loads. An Open Delta is capable of 57.7% of a true Delta load. Many three phase buck-boost applications are wired in Open Delta configuration.

Buck-Boost: Refers to a transformer used to make slight (typically <48 volts) adjustment to line voltage. Because the adjusting transformer only carries the current related to the actual % change made, it is typically much smaller that would normally be required for the entire load. Adjustments can be made to both single and three phase systems. The transformer(s) are wired with one leg of the line power running through either the adjusting transformer primary and secondary or reverse depending on whether the adjustment is up (boost) or down (buck). Almost any transformer can be used for this application. Adjustments up to 120 volts are possible when using transformers with higher secondaries than the typical 12/24, 16/32 and 24/48 found in buck-boost transformers.
Remember: Buck boost transformers can also be used in a conventional way to provide low voltage output beyond the VA range of typical CPTs.

What is DOE 2016: The new US Department of Energy (DOE) efficiency standards for distribution transformers, effective January 1st, 2016 require an increase in the electrical efficiency of certain categories of power distribution equipment. Understanding the standard and its impact will help ensure a seamless transition to compliant designs.

Benefit of Greater Efficiency: Small increases in transformer efficiency can result in substantial savings because transformers typically operate continuously. The primary benefit to this increase of efficiency will be seen as a reduction in overall greenhouse gas emissions.

Over the next 30 years, the national benefits of increasing transformer efficiency are expected to eliminate the need for in excess of 3 quadrillion Btu of energy. This can be roughly equated to the energy consumed by 40 million American households in one year. Approximately 265 million metric tons of carbon dioxide emissions will also be avoided; comparable to the removal of 51 million passenger vehicles from the roads for one year. Additional benefits include:
The removal of 200,000 metric tons of nitrogen oxides
The removal of 183,000 metric tons of sulfur dioxide

The Department of Energy estimates that the new efficiency standards will reduce equipment operating costs in the US by $581M - $983M per year.

What is Affected: The DOE 2016 standards will impact distribution transformers manufactured for sale in or imported into the US. It is notable that single-phase transformers will meet the DOE 2016 mandate by meeting the TP-1 standards and that product existing in local inventories can also be sold beyond January 1st, 2016 as long as it was manufactured prior to that date. This includes both medium and low-voltage dry type and liquid immersed medium-voltage distribution transformers. The required efficiencies vary by transformer type and voltage rating. The following tables depict the exemptions from DOE 2016 and typical efficiency upgrades over TP-1 for common 600 volt class three-phase dry type distribution transformers. The typical loading assumed to meet this level of efficiency is 35% of full load.

Applicable to DOE 2016	Exempt from DOE 2016	Three-Phase kVA	TP-1 Standard	DOE 2016 Standard
MFD/Imported > Jan. 1, 2016	Autotransformers			
Low Voltage Dry Type	Drive Isolation	15	97.00	97.89
K-Factor	Grounding	30	97.50	98.23
Medium Voltage Dry Type	CPT	45	97.70	98.40
Liquid Filled Distribution	Non-Ventilated	75	98.00	98.60
Single-Phase 15-333kVA	Rectifier	112.5	98.20	98.74
Three-Phase 15-2500kVA	Regulating	150	98.30	98.83
Input Voltage ≤34.5kV	Testing	225	98.50	98.94
Output Voltage ≤600V	Tap Range >20%	300	98.60	99.02
	Rebuilt/Refurbished	500	98.70	99.14
	UPS	750	98.80	99.23
	Welding			

TYPICAL CONTROL TRANSFORMER QUESTIONS

My output voltage seems high.

- ***You need this info to answer.***

- What is the measured voltage between the two wires connected to the primary?
- What voltage are you getting from the transformer?
- What is the actual load on the transformer (either amps or VA)?
- What VA size transformer do you have?

1. Typically transformers are designed to provide nameplate voltage at full rated load. When little or no load is attached the output may be as much as **13%** high. The no load to full load voltage differential decreases in proportion to the load.
2. Obtain the correct voltage measurement for the primary voltage. Just because the breaker is labeled 480 volts, **is** the actual voltage 480 volts? The secondary will be affected by the same percentage as the actual primary differs from the label primary. **492** volts applied to a **480** volt primary would cause a **2.5%** increase in the measured secondary.

EXAMPLE: "I wired up a B050BTZ13JK and see **140** volts on the secondary. Something is wrong with the transformer."

ANSWER: (using the examples above)

1. Ask what the measured primary voltage is. (**492V**)
2. Ask what the actual transformer load is. (**20VA Essentially no-load**)
3. Calculate what the actual secondary would be based on actual primary voltage and actual load.
   492V/480V = 2.5%
   120V + 13% = 135.6V
   135.6V + 2.5% = 139V
4. If your calculations do not meet that of the customer it may be worthy of further investigation. In the example, the measured primary was **492V**. Without that **2.5%** overage, the secondary voltage would have been **135.6V** which is within the specifications.

Help me size a transformer. I have 3 Size One starters plus 2 lamps. Can you help me? **(PAGE 13)** ***●You need this info to answer.***	●What is the inrush and sealed VA of each component simultaneously running? ●How often will these devices be energized per hour? Remember that you need both the inrush and sealed VA for all of the primary devices used. In this case the 3 starters, as the lamps resistive loads that draw only milliamps. The customer states that each starter draws 175VA inrush and 44VA sealed and starts simultaneously. If you add the 3 inrush VAs: (175 X 3) = 525VA the choice points to a 100VA using the 90% table. Because the 3 starters energize together as well, then the inrush calculation would also include all sealed VA values: ((170 X 3) + (40 X 3)) = 630VA, pointing to 150VA. This means the minimum available selection becomes 150VA. Alternately, the calculation can be made by applying the universal formula for inrush VA selection found on Page 13 of the catalog. The formula is: $\sqrt{((\text{inrush VA})^2+(\text{sealed VA})^2)}$ **ANSWER:** $\sqrt{((3 \times 175)^2 + (3 \times 44)^2)} = 541.34$VA which is just beyond the 100VA selection. However, the total sealed VA=132 which means that the minimum transformer available is 150VA. **NOTE:** The numbers depicted on inrush selection charts are finite. If the application meets or exceeds it is suggested to move to the next largest VA size as items may later be added and replacement parts may not have equal inrush/sealed VA. **NOTE:** If multiple starts per hour, oversize transformer VA by 20%.
I need a step-up transformer. Can the transformer be reverse connected? ***●You need this info to answer***	Read reverse connecting below. If necessary for loads under 3Kva it may be best to design a transformer to do the job or allow for the voltage drop when run backward. ●What voltage do you desire? ●What size load (VA or amps) does the caller need? **Reverse Connecting**: Typically, above 3Kva, a transformer can be wired either as a step-down or step-up device. Windings on transformers under 5Kva are typically "compensated" to provide nameplate voltage at full rated load. The compensation value can be as much as 13% on a 50Va and lessens as the VA increases. **NOTE:** Unlike running as a step-down transformer, reverse connection *lowers* the output voltage by the compensation percentage at no load and by 2X the compensation percentage at full load! **EXAMPLE:** putting 120V into the secondary of a B050BTZ13JK might yield 418V from the 480V primary at no load and 355V at full load. **EXAMPLE:** putting 120V into the secondary of a B3K0BTZ13JXH would yield 475V from the 480V primary at no load and 470V at full load.
I get a strange voltage when measuring voltage from X_1 or X_2 to ground.	The only meaningful reference is a voltage measurement between two terminals and not one or the other to ground. In this case the measurement should be X_2-X_1. A measurement between a terminal and ground is referred to as a ghost voltage and is meaningless as there is no connected ground reference between the windings. 1. Caused by a capacitive coupling and typically read by a high impedance instrument. 2. Probably would not be picked up by a device with lower impedance. 3. This type of mutual inductance is incapable of carrying significant current. **Think: holding a fluorescent tube under a high tension line and seeing it illuminate.**
I need an isolation transformer.	1. The definition of an isolation transformer is that the primary and secondary windings are connected magnetically but not physically. Also called "Double Wound". 2. An isolation transformer can also be defined as one having equal voltage primaries and secondaries. The B050LP1519JJ fits both categories of isolation.
I need a shielded transformer.	Shielding is typically a conductor wound between major windings, then bonded to the core. The shield acts to mitigate line-to-line or line-to-ground noise. Typically, US built control transformers do not have shielding. In reality, an isolation transformer with a properly grounded secondary can mitigate nearly as well as a general use shield. The type of noise should define the type or placement of shielding required.

I need to get 24Vdc out, which transformer?	Transformers are AC to AC devices. You cannot transform DC. What you are describing is a power supply.
I have a high operating ambient. Do I need a high temperature class transformer?	The standard operating environment is based at 40°C. As a rule-of-thumb, for each 10° increase over 40°C, derate the maximum load by a minimum of 10%.
Will a higher temperature class transformer solve a high ambient problem?	The standard operating environment is based at 40°C. The temperature class of the transformer is based on internal temperature rise above 40°C. Higher temperature classes run hotter and further add to the ambient. This may necessitate additional derating.

TYPICAL LVGP TRANSFORMER QUESTIONS:

I need a transformer for a 1.5HP motor, can you Can you help me choose a transformer **PAGES 14 - 15**	●Is the motor single phase or three phase? ●Ask for the motor voltage. ●Ask for the line voltage. **If Single Phase:** Refer to page 14 and choose the suggested minimum Kva value. In this case 2.4Kva. Once you know the Kva value and required voltages, the proper transformer can be chosen from the catalog pages. If the voltages and required amps are given, the proper transformer can be chosen using the chart. Please note the footnote on this chart regarding service factor (duty cycle). Alternately, given the motor volts and full load amp draw, the Kva can be calculated by multiplying Volts X Amps and dividing by 1000. **Example:** V=208, A=11 (208 X 11)/1000 = 2.29 minimum Kva (catalog equivalent 3Kva). **If Three Phase:** Refer to Page 15 and choose the suggested minimum Kva value. In this case 2.1Kva. Once you know the Kva value and required voltages, the proper transformer can be chosen from the catalog pages. If the voltages and required amps are given, the proper transformer can be chosen using the chart. Please note the footnote on this chart regarding service factor (duty cycle). Alternately, given the motor volts and full load amp draw, the Kva can be calculated by multiplying Volts X Amps and the product times 1.732 then dividing by 1000. **Example:** V=208, A=5.7, ((208 X 5.7) X 1.732)/1000 = 2.05 minimum Kva (catalog equivalent 3Kva). **Remember that the calculation yields the absolute minimum Kva so round up.**
●You need this info to answer.	

Does the transformer have taps?	Many of Micron's LVGP products allow for slight adjustment of incoming primary voltage. Refer to the catalog to see if the inquired product has FCAN and/or FCBN taps. The tap values are noted under the selection tables. **Remember that selectable taps are meant to correct long term voltage problems and not irregular fluctuations.**
Can the transformer be reverse connected? ***●You need this info to answer***	●What you will get out will depend on the size of the transformer. **Single Phase**: typically, above 3Kva, a transformer can be wired either as a step-down or step-up device. Windings on transformers under 5Kva are typically "compensated" to provide label voltage at full rated load. The compensation value can be as much as 13% on a 50Va and lessens as the VA increases. **Example:** Putting 120V into the secondary of a G050A1KF1A01 might yield 418V from the 480V primary at no load and 355V at full load. **Example:** putting 120V into the secondary of a G003K1KF7A03 would yield 475V from the 480V primary at no load and 470V at full load. **Remember to remind the customer when asked about reverse connecting.** **Three Phase**: typically the normal primary voltage is a Delta configuration. A three-phase transformer can be reverse connected as long as the transformer secondary had a Delta output. If a Wye primary must be created, the neutral (X0) must not be used because a fault current may develop on the neutral.
Can I run a 60Hz transformer at 50Hz?	**Hertz** is a measure of electrical frequency. The nameplate frequency can be run at higher, but not lower than nameplate frequency. This includes buck-boost transformers which are all 60Hz
Is the transformer weatherproof?	Encapsulated designs meet NEMA 3R and can be mounted outdoors as long as they are oriented upright. Ventilated designs meet NEMA 3R with installed weathershields.
What is NEMA 3R?	Provides a degree of protection of internal components against falling dirt, undamaged by the external formation of ice and harmful effects due to the ingress of rain, sleet or snow.
The transformer seems very hot to the touch?	For ventilated transformers, the temperature of the enclosure can reach 50°C in a 40°C ambient (total = 194°F). For encapsulated transformers, the temperature of the enclosure can reach 65°C in a 25°C Ambient (total = 194°F). As many would describe 194°F as "burning to the touch", a thermometer is the appropriate Instrument to verify enclosure temperature.

What is a DC Power Supply:

Industrial power supplies take an AC voltage input and produce a DC voltage output. Most will also take a DC input as well. A DC-DC device is commonly referred to as a CONVERTER. Industrial power supplies are typically mounted to a DIN-Rail but can be directly mounted to the controller or to the electronic board. Micron's "MDP" and "MD" Series are designed as DIN-Mountable product. The MTM Power product can be purchased as DIN-Mount, Chassis Mount or PCB-Mount. All are defined as "switching power supplies".

TERMS:

Switching power supply, Switched mode, SMPS: An electronic power supply that incorporates a switching regulator in order to be highly efficient in the conversion of electrical power.

Linear power supply: Linear power supplies do not incorporate high frequency electronic switching. They can produce less harmonic feedback (noise), but are heavier and less efficient than switchers.

Wattage: Volts X Amps. Determined from the output side. (24V X 5A=120W)

Negative voltage: A negative output in reference to ground. Negative output in combination with positive output is often used to increase on/off switching speed of transistors in digital circuits. The telecommunications industry commonly uses -48Vdc.

Hiccup, fold back, crowbar, active crowbar: As applies to power supplies, it is a protective circuit that causes the output of the power supply to drop out if there is an overcurrent, over voltage or short circuit fault. All methods describe protection circuits.

Universal (autoranging) input Vs Autoselect input VS Switch selectable input: Universal input allows any voltage within the entire tolerable range to be connect to mains. Autoselect input normally has two automatic input ranges ie: 88-136 and 200-264 but may not operate reliably at 140-260. Switch selectable input utilizes a user operated switch to operate in either low or high voltage range.

Auto-restart: the ability of a power supply to reset itself after a fault condition without manual intervention.

Chassis mount: The power supply can be bolted directly to the interior control panel. Typically fan-cooled above 200 watts. The fan is a source of failure on many units.

PCB mount: The power supply has contact pins which are directly solderable to a Printed Circuit Board.

Building automation style: Typically the same construction and approvals as Industrial power supplies but packaged in a much shallower plastic case which allows mounting within wall studs.

UL 1310 Class 2: Output power is certified to be limited to less than a total of 100 watts.

UL 1604 Hazardous Location: (now ISA 12.12.01)The power supply is certified by UL not to exceed combustable temperatures in operation.

Paralleling: The ability to wire multiple units either to obtain higher output voltage, wattage or redundancy. Some units utilize a paralleling circuit which interconnects both supplies' control loops. Wiring in series for higher voltage is also termed "paralleling".

Hold-up Time: The timespan that output will remain when the primary power is cut. Measured at rated load and normally only a few milliseconds.

Decoupling Module: Also called a Redundancy Module. The device installs between multiple power supplies and allows each to evenly share a portion of the load. If one fails the other picks up the full load thereby averting a shutdown of critical equipment. The module is, in essence, a diode array which prevents feedback should one power supply fail. A number of *DIN*ergy products are equipped with a built-in diode array, which is activated by an on-board switch.

Power Boost: The ability of a power supply to support higher than nameplate wattage before allowing the output voltage to drop below an acceptable level or going into hiccup mode. Normally varies from 105% to 150% of rated

output.

Constant Current: A power supply that will provide greater than nameplate current at the expense of nameplate voltage.

Constant Voltage: A power supply that will supply nameplate voltage until a designed overcurrent cut-off point, at which point it will shut down.

MTBF: Mean Time Between Failure. Average life expectancy. Normally expressed in hundreds of thousands of hours.

Derating Curve: Normally refers to the calculation that measures available output power as a function of ambient temperature.

DC "OK" Output: Available terminal outputs that allow a remoted LED or indicator to signal a low voltage or power-out condition.

TYPICAL POWER SUPPLY QUESTIONS:

Why are there multiple output terminals?	If the power supply has two positive (++) and two negative (--) terminals they are meant to be all connected. The reason the terminals are duplexed is to provide ample current carrying capabilities for both the terminals and wires.
What are the suggested fusing values for input/ output?	Input: 125% of FLA should be in line with current code. Note that due to input capacitors, the power supply is capable of producing high inrush currents. Output: 100% FLA for electronic applications; 125% for motor applications (to account for inrush).
I am getting no output. Why?	**First**, make sure that the power feeding the power supply is good. (Autoranging) power supply's operating range is from 85-265V; (auto-select) power supplies may not operate reliably with an input voltage falling between the high and low ranges. **Second**, make sure the connection to the primary terminals are within the clamps and secure. **Third**, make sure that the output wires are connected to a (+) and a (-) terminal. In many cases the power supply must be connected to both positive and both negative terminals in order to properly carry the full load. If the power supply still does not operate after assuring the above, assume it has failed. The power supplies have an internal fuse. However, they typically only trip due to catastrophic failure and are not designed to be user replaceable.
The DC OK lamp just blinks	The power supply is in "hiccup" mode. It is trying to energize but may be seeing too high an amp draw on the secondary side. Try disconnecting the load and see if the power supply output stabilizes. The power supply should be able to carry a load of up to 25% - 50% over nameplate rating before shutting down. The DC – OK lamp will also blink if the input voltage is below minimums.
Can I wire in series for higher voltage?	Yes, two can be wired in series to provide a higher output voltage. Make sure that the maximum Current is no more than the rated load of the smallest power supply used. **EXAMPLE:** If you put an MD240-12A-1CS (12V @ 20A) in series with an MD240-24A-1CS (24V @ 10A) to obtain 36V, the maximum current must be 10A.

How can I get more power?	Up to three units can be wired in parallel to increase the available output current. If one of the units fails the other will go into hiccup mode due to an overcurrent situation. Note that in both examples the system must be balanced. That is, the wires the same length and gauge, the terminals evenly torqued and both output voltages equal. Failure to do this will cause one power supply to carry the load at the expense of the other.
Do I need a redundancy module?	Also called a "diode module", redundancy devices are used when a system cannot shut down for loss of a single power supply. Two power supplies are connected in parallel with both secondaries feeding into the module. The load is then "shared" with each power supply carrying a portion of the total load. If one power supply fails, the module shifts full power to the remaining, provides a feedback buffer through the diode array and can provide for a DC-OK check signal to warn of a failure. A number of the ***DIN***ergy products of 100 watts and larger contain a built-in diode array allowing redundant paralleling without the need for a diode module. In super critical applications where electrical failure cannot be tolerated, a Sag Buffer and/or battery backup system may also be employed.
Can the redundancy module operate at other than 24Vdc?	No. The MDP-PDMA-C module is designed to operate at 24Vdc. The on-board parallel switch found on many units both eliminates the redundancy module and allows for other than 24Vdc redundant parallel operation.
Do I need to restart the power supply once it shut down?	No. The DINergy products will auto restart once an overvoltage or overload fault has been removed.
Are the power supplies Class 2?	Yes. Class 2 power limited, LPS and UL1310 all refer to an design which will not allow output above a 100 watt maximum. A number of the lower wattage power supplies are UL 1310 listed.
What is a Sag Buffer?	Technically, a Sag Buffer is a capacitor circuit that connects between a power supply output and the load. The charged capacitor provides voltage to ride through voltage sags of short duration (from 700 milliseconds to 10 seconds), depending on load, to allow a system an orderly shut-down. The DINergy Sag Buffer also has a battery connection that with battery installed will seamlessly transition the 24Vdc power for a longer period dependent on battery size and load. In normal mode the Sag Buffer provides a charging circuit for the battery. In this mode the Sag Buffer performs as a UPS. Micron also offers both a 12Vdc and 24Vdc UPS controller capable of controlling a 30A load.
Can the power supply operate with a DC input?	Virtually all of the ***DIN***ergy product can operate with a DC input. Those with *autoranging* capability can accept as low as 120Vdc while those with *autoselec*t capability normally accept a DC input in conjunction with the higher AC voltage range.

NOTES

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