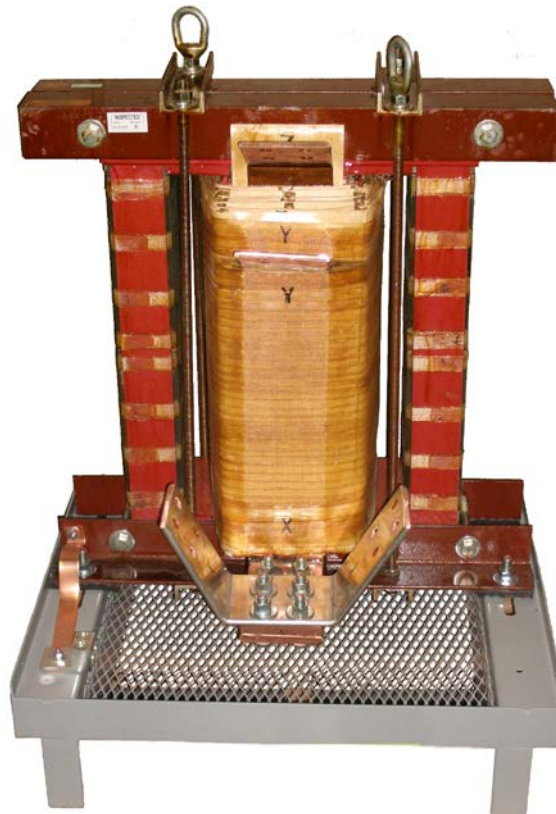


**GENLINK™**  
**DISSIMILAR PITCH NEUTRAL LIMITER (DPNL)**



**Owner's Manual**

**Warranty**

Seller warrants to the Ultimate Purchaser (the purchaser who buys for use, and not for resale) that all products furnished under this order and which are manufactured by Seller will conform to final specifications, drawings, samples and other written descriptions approved in writing by Seller, and will be free from defects in materials and workmanship. These warranties shall remain in effect for a period of twelve (12) months from the date of installation or eighteen (18) months from the date of shipment, whichever occurs first. In addition, the warranties are extended a further nine (9) years on a pro-rated basis. Parts replaced or repaired in the warrant period shall carry the unexpired portion of the original warranty.

The liability of Seller hereunder is limited to replacing or repairing at Seller's factory or on the job site at Seller's option, any part or parts which have been returned to the Seller and which are defective or do not conform to such specifications, drawings or other written descriptions; provided that such part or parts are returned by the Ultimate Purchaser within ninety (90) days after such defect is discovered. The Seller shall have the sole right to determine if the parts are to be repaired at the job site or whether they are to be returned to the factory for repair or replacement. If during the pro-rated portion of the warranty a replacement unit is warranted, the purchaser shall bear the cost of a replacement unit on a pro-rated basis. The replacement cost shall be 10% of the original purchase price in the second year, increasing yearly to a maximum of 90% of the original purchase price in the 10<sup>th</sup> year. All items returned to Seller for repair or replacement must be sent freight prepaid to its factory. Purchaser must obtain Seller's Return Materials Authorization (RMA) prior to returning items. The above conditions must be met if warranty is to be valid. Seller will not be liable for any damage done by unauthorized repair work, unauthorized replacement parts, from any misapplication of the item, or for damage due to accident, abuse, or Act of God.

In no event shall the Seller be liable for loss, damage, or expense directly or indirectly arising from the use of the units, or from any other cause, except as expressly stated in this warranty. Seller makes no warranties, express or implied, including any warranty as to merchantability or fitness for a particular purpose or use. Seller is not liable for and Purchaser waives any right of action it has or may have against Seller for any consequential or special damages arising out of any breach of warranty, and for any damages Purchaser may claim for damage to any property or injury or death to any person arising out of its purchase of the use, operation or maintenance of the product. Seller will not be liable for any labor subcontracted or performed by Purchaser for preparation of warranted item for return to Seller's factory or for preparation work for field repair or replacement. Invoicing of Seller for labor either performed or subcontracted by Purchaser will not be considered as a liability by the Seller.

This warranty shall be exclusive of any and all other warranties express or implied and may be modified only by a writing signed by an officer of the Seller. This warranty shall extend to the Ultimate Purchaser but to no one else. Accessories supplied by Seller, but manufactured by others, carry any warranty the manufacturers have made to Seller and which can be passed on to Ultimate Purchaser.

Seller makes no warranty with respect to whether the products sold hereunder infringe any patent, U.S., Canadian or foreign, and Buyer represents that any specially ordered products do not infringe any patent. Buyer agrees to indemnify and hold Seller harmless from any liability by virtue of any patent claims where Buyer has ordered a product conforming to Buyer's specifications, or conforming to Buyer's specific design.

Buyer has not relied and shall not rely on any oral representation regarding the Product sold hereunder and any oral representation shall not bind Seller and shall not be part of any warranty.

There are no warranties which extend beyond the description on the face hereof. In no event shall MIRUS International Inc. be responsible for consequential damages or for any damages except as expressly stated herein.

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**Service and Factory Repair - Call 1 - 888 - TO - MIRUS (1 - 888 - 866 - 4787)**

Direct questions about the operation, repair, or servicing of this equipment to MIRUS International Inc. Customer Support Services. Include the part number, assembly number, and serial number of the unit in any correspondence. Should you require factory service for your equipment, contact MIRUS International Inc. Customer Support Services and obtain a Return Materials Authorization (RMA) prior to shipping your unit. Never ship equipment to MIRUS International Inc. without first obtaining an RMA.

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**Revision History**

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## 1.0 Introduction

### 1.1 General

GENLINK™ reactors are manufactured to provide optimum performance for a lifetime of uninterrupted service. Careful attention to the following instructions is recommended for safe and reliable operation.

Installation, operation and maintenance of transformers should be performed by authorized persons, familiar with electrical apparatus and the potential hazards involved.

	<p><b>WARNING</b></p> <p><i><b>Danger! There is the potential of electric shock whenever working in or around electrical equipment such as transformers. Power must be shut off before any work is conducted on a transformer.</b></i></p>
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As with any electrical device, transformers must be installed according to the requirements of the national and local electrical codes. Refer to ANSI/IEEE. C57-94 may also be referred to for recommended installation, application, operation and maintenance of GENLINK™ reactors.

### 1.2 Product Description/Application

When paralleling multiple generators with dissimilar winding pitches, heavy circulating currents can appear in the common neutral. These circulating currents can be very effectively reduced by the application of a GENLINK™ reactor.

The GENLINK™ is a uniquely wound reactor which introduces high impedance in the path of neutral circulating current (triple or any other frequency) but very minimal impedance in the fault current path. This significantly reduces the circulating current with negligible effect on the system fault level.

## 2.0 Installation

### 2.1 Handling

The GENLINK™ should be thoroughly protected against the entrance of dust, rain or snow when handled outdoors.

When lifting the GENLINK™, the lifting cables should be held apart by a spreader to avoid bending the lifting lugs or other parts of the structure. The GENLINK™ may be skidded or moved on rollers but care must be taken not to damage the base or tip it over. When rollers are used under larger units, skids must be used to distribute the stress over the base.

After the GENLINK™ is placed in permanent position, shipping braces should be removed and shipping bolts, if present, should be loosened. Where isolation pads have been included, the bolt should be loosened until the spring washer has been relaxed before putting into service. This will reduce noise resulting from the GENLINK™ natural vibration.

### 2.2 Receiving and Inspection

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of shipping container(s), packaging, and equipment for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again for damage to external painted panels and doors and to determine if any internal damage (broken components, disconnected wiring, loose connections, displaced parts, cracked insulators, dirt or foreign material, or evidence of moisture, etc.) has occurred. Verify that the equipment nameplate corresponds with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components can be ordered by calling 1-888-TO MIRUS (1-888-866-4787).

## 2.3 Storage

If the equipment is to be stored prior to installation, it should be stored in a warm, dry, well-ventilated location that is protected against rain, moisture, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials. Condensation and moisture absorption must be prevented during storage.

## 2.4 Location

Location of the GENLINK™ should be made with consideration given to accessibility, ventilation and atmospheric conditions. Sufficient clearances from walls and other obstructions should be provided to permit unrestricted opening of hinged and removable doors, covers and panels for the purpose of wiring terminations, inspection, maintenance and testing. Also, proper ventilation requires at least 6 in. (155mm) clearance at all ventilation openings. In enclosed rooms, minimum air circulation of 100 ft<sup>3</sup>/ min per kilowatt of transformer/reactor loss should be provided.

Installation locations should be free of contaminants including dust, fertilizer, excessive moisture, corrosive gases, flammable materials or chemical fumes. Filtered air may be considered to reduce maintenance where air born contaminants are a problem.

Enclosures are designed in accordance with NEMA and UL standards and can allow for installation in various environments. GENLINK™ reactors are equipped standard with NEMA-3R enclosures which are suitable for both indoor and outdoor installations. However, for severe weather conditions (ie. blowing snow, heavy dust or driving rain) additional shielding against the elements may be required or enhanced NEMA-3R or better enclosures should be selected.

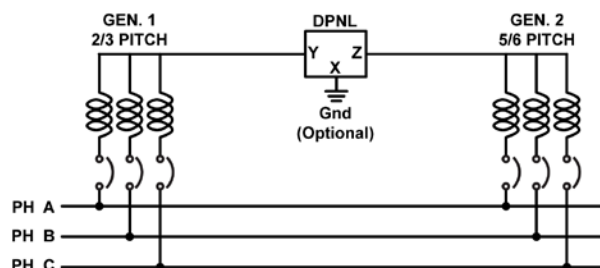
Where GENLINK™ reactors are connected to lines subject to lightning exposure or other voltage surges, careful coordination of BIL levels and protective surge arresters must be made. For derating factors which apply to installation at high altitudes, refer to ANSI C57.12.01-1989.

To prevent accidental contact to live parts through ventilation openings, ventilated reactors should be protected by fences, screens, partitions or walls where practical. Warning signs should be prominently displayed at all entrances.

## 2.5 Connection Diagrams

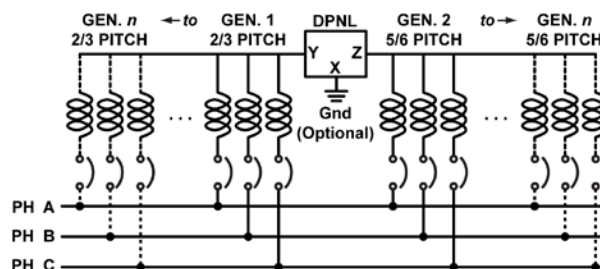
### 2.5.1 GENLINK 3-Wire Application

The GENLINK™ has three terminal connections – X, Y and Z. The common neutral should be connected between the generators through the Y and Z terminals. The X terminal is used only in 4-wire applications or if desired to ground the neutral in a 3-wire application.



GENLINK™ 3-wire,  
ungrounded neutral application

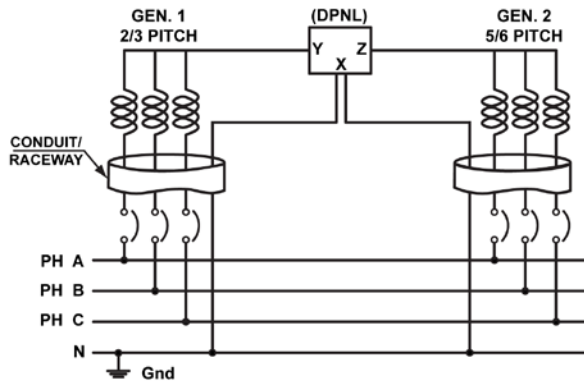
In applications where multiple generators of the same pitch are being paralleled with one or more generators of a different pitch, the GENLINK™ need only be installed in the neutral connection between the two sets of similar pitched generators as shown below.



GENLINK™ 3-wire,  
ungrounded neutral application,  
Multiple generators of different pitch

### 2.5.2 GENLINK 4-Wire Application

The diagram shows the neutral being grounded at the switchboard, but it can also be grounded at the X terminal of the GENLINK™, or at the common neutral anywhere else in the distribution system. The requirement is simply that the neutral is properly grounded, and grounded at only one location. To minimize stray fluxes, the neutral return conductor, from terminal X, should be run together (same conduit/raceway) with the generator phase conductors.



GENLINK™ 4-wire,  
grounded neutral application

### 2.6 Grounding

Consideration must be given to equipment grounding (case and core) and must be made in accordance with all applicable electrical codes. All core and coil assemblies are solidly grounded to the enclosure internally to ensure that all conductive metal parts have the same potential.

The enclosure in turn should also be securely and effectively grounded as a safety precaution.

This grounding should be in accordance with national electrical code standards.

The neutral should be grounded in only one location. If grounded at the switchboard or any other location, terminal X on the GENLINK™ should not be grounded (refer to Section 2.5).

### 3.0 Operation

For all relatively normal and clean installations, GENLINK™ reactors will operate satisfactorily under normal conditions of energization and load.

For your reference, fully loaded GENLINK™ reactors may appear warm to the touch, particularly on the cover of the unit.

Standards permit the temperatures of the cover to be 65°C over ambient. This represents normal loading and should not be of concern.

GENLINK™ reactors are designed to operate continuously at their full nameplate current rating.


If overheating is noted, any attempt to add supplemental fan cooling must be in accordance with factory installation guidelines. Incorrectly installed fans can misdirect the airflow and cause

serious deterioration of the insulation life in a reactor coil.

GENLINK™ reactors can be shut down and stored for extended periods of time without any deterioration. Care must be exercised to clean and dry units prior to energization, as previously outlined.

## 4.0 Maintenance

Maintenance would include internal cleaning, tightening of links and bolted connections, servicing and inspection of auxiliary devices.

	<p><b>WARNING</b></p> <p><i>Internal maintenance must be performed with a reactor de-energized, isolated and with the terminals grounded.</i></p>
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### 4.1 Periodic Inspection

Under normal operating conditions and environments, GENLINK™ reactors do not require maintenance. However, periodic care and inspection is a good practice particularly dependent on the environmental conditions in which the unit is installed.

Peripheral inspection and external dust removal may be carried out while the reactor is in operation. However, access covers must not be opened under energized conditions.

Visual inspection for evidence of loose connections, dirt, moisture, rusting, corrosion, and deterioration of the insulation, varnish or paint.

Observations should be made for signs of overheating and overvoltage creeping. Corrective measures should be taken as necessary.

For early detection of any developing hotspots, an infrared scan can be performed while the DPNL™ is operating under its heaviest load condition.

Auxiliary devices should be tested for proper operation.

The ground connection should also be checked to ensure a low impedance connection.

## 4.2 Cleaning


Excessive accumulations of dirt on the reactor windings or insulators should be removed to permit free circulation of air and to guard against the possibility of insulation breakdown. Particular attention should be given to cleaning the top and bottom ends of the winding assemblies and to cleaning out ventilating ducts. Windings should be lightly cleaned by the use of a vacuum cleaner. If necessary a blower or compressed air may be used but pressure should not exceed 25 psi. Lead supports, tap changers and terminal boards, bushings, and other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is not recommended due to deteriorating effects on most insulating materials.

Air ducts should be free of any accumulation of dust and debris and any bolted connections of terminals must be in good condition.

Vacuuming or blowing of compressed air from the top down is an accepted practice for removing dust from the ducts of a reactor coil. Low pressure, dry air should be used to avoid further contamination of the windings by foreign material.

## 4.3 Drying of Core and Coil Assembly

In the event that reactors have been exposed to moisture such as condensation or rain, it is advisable to dry out any unit prior to energization.

	<p><b>CAUTION</b></p> <p><i>Constant attention during the drying process is recommended.</i></p>
---	--

When it is necessary to dry GENLINK™ reactors before installation or after an extended shutdown under relatively high humidity conditions; internal and/or external heating methods can be used. (See ANSI/IEEE C57.94-1982 for a description of these methods).

Drying may be accomplished by using any hot or warmed air, radiant heat or internal heat that is directed through the windings and not around the sides. Heated air should be allowed to rise up through the windings for a minimum of twenty four (24) hours after the evidence of condensation is no longer visible. A sufficient quantity of air should be used to assure approximately equal inlet and outlet temperatures.

Air temperature should not exceed 110°C.

Reactors that have been exposed to flood conditions, direct rain or sprinklers, may require special methods to ensure that the equipment is dried appropriately. Contact the factory for proper instructions.

## 5.0 Technical Data

### 5.1 General Specifications

**Voltage**

690V or less, 3-ph, 3 or 4-wire, 60 or 50Hz

**Operating Temperature Rise**

130°C

**Insulation Class**

220°C

**System Connection**

Series connected in the common neutral of generator groups with dissimilar winding pitches

**Equivalent Energy Efficiency (@ Full Load)**

>99%

**Through Impedance (%Z)**

Y-Z Term: ~ 45%

X-Y or X-Z Term: ~ 1% (saturated)

**Winding Material**

Copper

**Insulating Varnish Impregnation**

Polyester Resin

**Audible Sound Level**

As per NEMA ST-20 & CSA C9

Based on equivalent kVA

**Ventilation**

Convection air cooled

**Enclosure**

Type: NEMA-3R, ventilated

Paint: Polyester powder coated

Colour: ANSI 61 Grey

**Over-Temperature Alarm**

ALM2: Over-Temperature Alarm with horn and flashing light (requires separate power, supplied by customer)

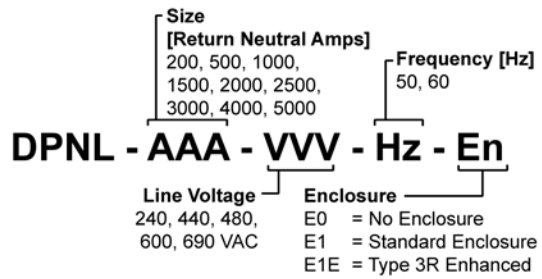


## 5.2 Options

**Solid Bottom Plate (Case 'MT' only)**  
[yes], [no]

## 5.3 Model Number

### ***Product Code:***

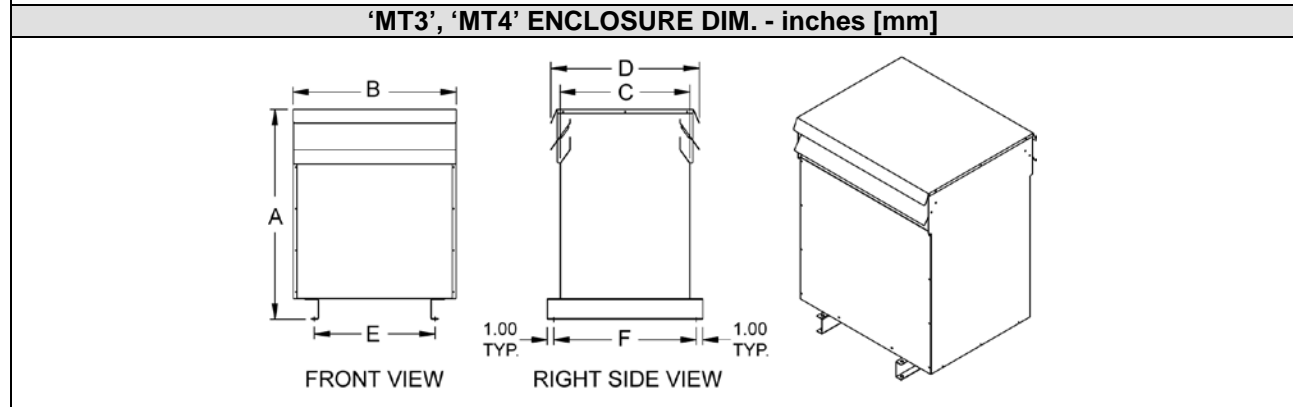
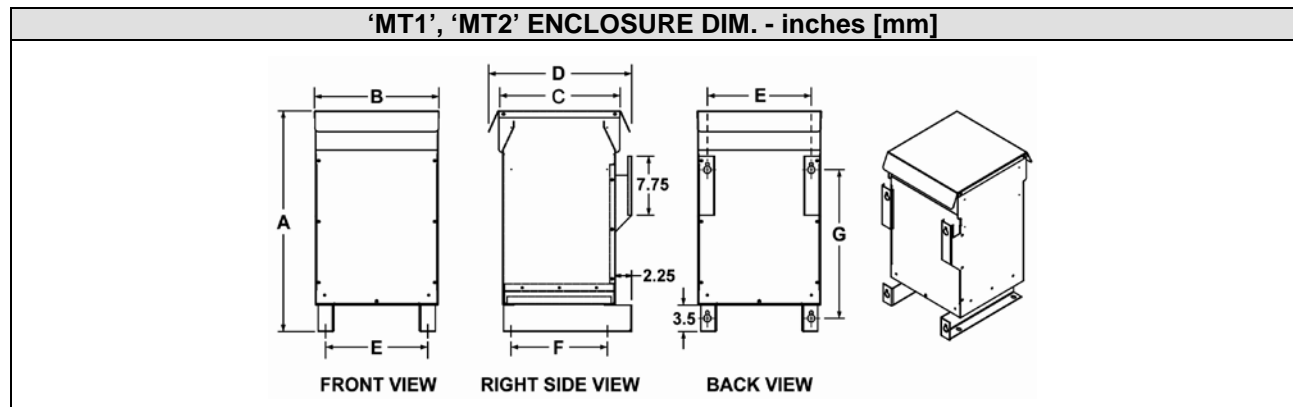


### 5.4 Ratings/Enclosures/Connections

DPNL Rating (Amps) <sup>[3]</sup>		Total Capacity of all Paralleled Sources kW [kVA] <sup>[2] [3]</sup>				Case Style	Weight lb [kg] <sup>[1]</sup>	Losses @ Full Load (Watts) <sup>[1]</sup>	Connections Mechanical Lugs Provided	
Return Neutral	Circulating	208-240V	460-480V	575-600V	660-690V				Y and Z Terminals	X Terminal
200	100	68 [85]	250 [312]	320 [400]	360 [450]	MT1	150 [68]	150	250MCM-#6	250MCM-#6
500	250	160 [200]	640 [800]	800 [1000]	900 [1120]	MT2	330 [150]	315	600MCM-#2	2x600MCM-#2
1000	500	335 [420]	1280 [1600]	1600 [2000]	1800 [2250]	MT2	408 [185]	515	2x350MCM-#6	4x350MCM-#6
1500	750	500 [625]	2000 [2500]	2400 [3000]	2720 [3400]	MT3	500 [227]	765	Copper Pad	Copper Pad
2000	1000	675 [840]	2500 [3126]	3200 [4000]	3600 [4500]	MT3	560 [254]	800	Copper Pad	Copper Pad
2500	1250	840 [1050]	3200 [4000]	4000 [5000]	4500 [5625]	MT4	725 [329]	965	Copper Pad	Copper Pad
3000	1500	1000 [1250]	3800 [4750]	4800 [6000]	5475 [6843]	MT4	1169 [530]	1120	Copper Pad	Copper Pad

DPNL Rating (Amps) <sup>[3]</sup>		Total Capacity of all Paralleled Sources kW [kVA] <sup>[2] [3]</sup>				Case Style	Weight lb [kg] <sup>[1]</sup>	Losses @ Full Load (Watts) <sup>[1]</sup>	Connections Mechanical Lugs Provided	
Return Neutral	Circulating	208-240V	380-440V	575-600V	660-690V				Y and Z Terminals	X Terminal
200	100	68 [85]	120 [150]	320 [400]	360 [450]	MT1	160 [73]	210	250MCM-#6	250MCM-#6
500	250	160 [200]	300 [375]	800 [1000]	900 [1120]	MT2	262 [119]	360	600MCM-#2	2x600MCM-#2
1000	500	335 [420]	620 [775]	1600 [2000]	1800 [2250]	MT2	527 [239]	630	2x350MCM-#6	4x350MCM-#6
1500	750	500 [625]	920 [1150]	2400 [3000]	2720 [3400]	MT3	680 [309]	850	Copper Pad	Copper Pad
2000	1000	675 [840]	1200 [1500]	3200 [4000]	3600 [4500]	MT3	749 [340]	1050	Copper Pad	Copper Pad
2500	1250	840 [1050]	1540 [1930]	4000 [5000]	4500 [5625]	MT4	863 [392]	1250	Copper Pad	Copper Pad
3000	1500	1000 [1250]	1840 [2300]	4800 [6000]	5475 [6843]	MT4	1241 [563]	1350	Copper Pad	Copper Pad

### 5.5 Enclosure Dimensions



		ENCLOSURE DIMENSIONS - inches [mm]						
Standard	Enhanced	A	B	C	D	E	F	G
MT1	MT1-E	29.00 [737]	16.75 [425]	15.00 [381]	19.00 [483]	13.75 [349]	13.00 [330]	19.50 [495]
MT2	MT2-E	38.00 [965]	21.50 [546]	19.50 [495]	23.50 [597]	17.00 [432]	17.50 [445]	25.00 [635]
MT3	MT3-E	45.00 [1143]	26.00 [661]	21.00 [534]	25.00 [635]	21.50 [546]	19.00 [483]	
MT4	MT4-E	51.50 [1308]	32.00 [813]	25.50 [648]	29.50 [749]	23.50 [597]	23.50 [597]	

**APPENDIX A**

**AMPACITY RATINGS FOR CONNECTIONS**

**Ampacity of Insulated Conductor in Raceway**

Wire Size AWG No.	60°C (140°F)		75°C (167°F)	
	Conductor Ampacity		Conductor Ampacity	
	Copper	Aluminum	Copper	Aluminum
14	15	-	15	-
12	20	15	20	15
10	30	25	30	25
8	40	30	50	40
6	55	40	65	50
4	70	55	85	65
3	80	65	100	75
2	95	75	115	90
1	110	85	130	100
1 / 0	125	100	150	120
2 / 0	145	115	175	135
3 / 0	165	130	200	155
4 / 0	195	150	230	180
(250)	215	170	255	205
(300)	240	190	285	230
(350)	260	210	310	250
(400)	280	225	335	270
(500)	320	260	380	310











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