



Operation and Installation Manual for M Series

M4-TL-US
M5-TL-US
M6-TL-US
M8-TL-US
M10-TL-US



This manual is subject to change.
Please check our website at <http://www.delta-americas.com/SolarInverters.aspx>
for the most up-to-date manual version.

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

1 General safety instructions

This manual contains important instructions for Delta models M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US that should be followed during installation and maintenance of the inverter.

Delta models M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US inverters are designed and tested to meet all applicable North American and International safety standards. However, like all electrical and electronic equipment, safety precautions must be observed and followed during installation and operation of the Delta M series inverters to reduce the risk of personal injury and to ensure a safe installation.

Installation, commissioning, service, and maintenance of Delta models M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US inverters must only be performed by qualified personnel that are licensed and/or satisfy state and local jurisdiction regulations.

Before starting installation or commissioning of the Delta models M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US, read through the entire manual and note all DANGER! WARNING! CAUTION!, and NOTICE! statements.

All US electrical installations must comply and be in accordance with all the state, local, utility regulations, and National Electrical Code ANSI/NFPA 70.

For installations in Canada, please ensure these are done in accordance with applicable Canadian standards.

Ce guide contient d'importantes instructions concernant les onduleurs solaires Delta M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US qui doivent être observées au cours de l'installation et de l'entretien de l'onduleur.

Les onduleurs solaires Delta M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US sont conçus et testés pour répondre à toutes les normes de sécurité nord-américaines et internationales applicables. Cependant, comme pour tous les équipements électriques et électroniques, des mesures de sécurité doivent être respectées et observées durant l'installation et l'exploitation des onduleurs M series de Delta afin de réduire le risque de préjudice corporel et de garantir la sécurité de l'installation.

L'installation, la mise en service, l'entretien et la maintenance des onduleurs solaires Delta M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US doivent être entreprises uniquement par un personnel qualifié autorisé et/ou répondant aux critères des règlements locaux ou nationaux applicables.

Lisez l'intégralité du manuel et prenez note de toutes les déclarations relatives à la sécurité sous les rubriques intitulées **DANGER ! AVERTISSEMENT ! PRUDENCE !** et **AVIS !** avant de commencer l'installation ou la mise en service des onduleurs solaires M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US.

Toutes les installations électriques nord-américaines doivent être conformes et respecter tous les règlements des services publics, nationaux, locaux ainsi que le National Electrical Code ANSI/NFPA 70.

Pour toute installation au Canada, veuillez vous assurer que les installations sont conformes aux normes canadiennes applicables.

1.1 Safety symbols and terminology definitions



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

DANGER indique une situation dangereuse qui, si elle n'est pas évitée, est susceptible de provoquer un décès ou des blessures graves.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

AVERTISSEMENT indique une situation dangereuse qui, si elle n'est pas évitée, est susceptible de provoquer un décès ou des blessures graves.



CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

PRUDENCE indique une situation dangereuse qui, si elle n'est pas évitée, est susceptible de provoquer des blessures légères ou de degré moyen.



NOTICE indicates a situation that can result in property damage if not avoided.

AVIS indique une situation susceptible de provoquer des dommages à la propriété, si elle n'est pas évitée.



INFORMATION provided that when known and used will ensure optimal operation of the system.

La connaissance et l'utilisation des **INFORMATIONS** fournies garantissent un fonctionnement optimal du système.



HIGH VOLTAGE WARNING! Indicates hazardous high voltages are present, which, if not avoided, will result in death or serious injury. Thus, only authorized and trained personnel should install and/or maintain this product.

AVERTISSEMENT HAUTE TENSION! indique la présence de hautes tensions présentant un danger susceptibles de provoquer un décès ou des blessures graves si elles ne sont pas évitées. Par conséquent, l'installation et/ou l'entretien de ce produit doivent être entreprises uniquement par un personnel autorisé et formé.



Hot surface

Surface chaude



Equipment grounding conductor (PE)

(PE) Équipement conducteur de terre



Wait for a prescribed amount of time before engaging in the indicated action.

Patiencez le délai requis avant d'entreprendre l'action indiquée.

1.2 Safety Instructions

The inverter installation must be performed by an authorized electrician in accordance with the local and National Electrical Code ANSI/NFPA 70 and OSHA requirements.

- The inverter section contains no user-serviceable parts. For all service and maintenance, the inverter should be returned to a Delta Authorized Service Center.
- Read all of these instructions, cautions, and warnings for the Delta M series inverter and associated PV array documentation.
- Before connecting the Delta M series inverter to the AC distribution grid, approval must be received by the appropriate local utility as required by national and state interconnection regulations, and must be connected only by qualified personnel.
- In operation, the inverter wiring and connections can have hazardous high voltages and currents present, thus only authorized and qualified personnel shall install and/or maintain the inverter.
- In some operation instances, the inverter chassis and heatsink surfaces may become hot.
- PV solar arrays produce hazardous voltages and currents when exposed to light which can create an electrical shock hazard. Use dark opaque sheets to cover the PV solar array before wiring or connecting cable terminations.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70 et condition nécessaire OSHA.

- L'onduleur ne comporte aucune pièce pouvant être réparée par l'utilisateur. Afin de réduire les risques de choc électrique, contactez le personnel d'entretien qualifié de l'usine à propos des opérations d'entretien.
- Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series , ainsi que la documentation sur le panneau photovoltaïque associé.
- Avant de connecter l'onduleur solaire Delta M series au réseau de distribution du courant alternatif (CA), une autorisation doit être obtenue de la part des services publics locaux de tutelle, conformément aux règlements concernant l'interconnexion nationale et locale. La connexion ne doit être effectuée que par un personnel qualifié.
- Des courants et des tensions de hautes intensités dangereuses peuvent être présents dans le câblage et les connexions de l'onduleur en marche, par conséquent, l'installation et/ou la maintenance de l'onduleur doivent être entreprises uniquement par un personnel autorisé et qualifié.
- Sous certains régimes de fonctionnement, le châssis de l'onduleur et les surfaces des dissipateurs de chaleur peuvent devenir chaud.
- Les panneaux solaires photovoltaïques produisent tensions et courants dangereux lorsqu'ils sont exposés à la lumière et constituent un danger de choc électrique. Couvrez le panneau solaire photovoltaïque à l'aide de morceaux de tissu opaques et foncés avant tout câblage ou connexion des terminaisons de câble.

2 Introduction

With this device you have acquired a solar inverter for connection of photovoltaic systems to the grid. This solar inverter is characterized by an advanced housing design and state-of-the-art high-frequency technology, which enable the highest levels of efficiency.

The solar inverter includes series monitoring units, such as anti-islanding protection, display, RS485 (EIA485) interfaces.

The inverter is usable indoor and outdoor. It fulfills the directives of ANSI/NFPA 70, NEC 690.5, UL 1741, UL 1741 SA, IEEE 1547 and IEEE 1547.1 for parallel operation of power generation plants on low-voltage network of regional electrical utility companies.

The function of the anti-islanding protection (automatic isolation point for in-plant generation systems) stipulates compliance with the specifications of UL 1741, UL 1741 SA and IEEE 1547.

In the following technical description, the precise functions are explained to the installer, as well as the user, which are required for the installation, operational start-up and handling of the solar inverter.

The inverter not only meets the safety requirements of UL 1741, but also complies with the specifications of UL 1741 SA for Grid Support Utility Interactive Inverters that support a more stable utility grid. Delta SOLIVIA TL series were testing to the UL 1741 SA for CA Rule 21 and other Source Requirement Document (SRD) including 'PG&E Electric Rule No.21 Hh' Jul,2017, 'SCE Rule21 Hh', 'SDGE Rule21 Hh' and 'HECO SRD-UL-1741-SA-V1.1'.

In the following technical description, the precise functions are explained to the installer, as well as the user, which are required for the installation, operational start-up and handling of the solar inverter.

2.1 System

The content of renewable energy with respect to overall power consumption worldwide is increasing annually by approximately 25%. The reason for this rise can be primarily attributed to the constantly increasing demand for power, the increasing interest in environmentally friendly technologies, as well as the increasing costs of non-renewable energy.

By the use of renewable energy sources, the earth's atmosphere can be enormously relieved of increases in CO₂ and other harmful gases which result from power generation.

The solar inverter converts direct current from the solar cells into alternating current. This enables you to feed your self-produced solar energy into the public grid.

Thanks to efficient MPP tracking, maximum capacity utilization of the solar energy plant is ensured even in cases of misty and cloudy skies.

The string concept means that PV modules are always connected in series (in a string) and/or that strings with the same voltage are connected in parallel to the solar inverter with the aim of significantly reducing the photovoltaic system's cabling requirements.

The fact that the modules are connected in strings also means that the photovoltaic system can be perfectly matched to the solar inverter's input voltage range.

The inverter is transformerless type without galvanic isolation. Therefore, the inverter may only be operated with ungrounded PV arrays. Furthermore, the PV array must be installed in accordance with the NEC690.35 (Ungrounded Photovoltaic Power Systems) and the locally valid regulations for ungrounded PV arrays. Additionally, the PV array (PV modules and cabling) must have protective insulation and the PV modules used must be suitable for use with this inverter. PV modules with a high capacity to ground may only be used if their coupling capacity does not exceed 1,200 nF with 60Hz grid.

2.2 Data evaluation and communication

The integrated interface, processing and communication of the device enables easy operation of the solar inverter. Monitoring of the operational status and signaling of operational failures are capable of being called up over the interface. The data interfaces enable the downloading of data which can be evaluated with the aid of a PC system and allow continuous recording of operating data.

The best way of accessing this functionality is via a monitoring system connected to your inverter.

The read-out of the data over the integrated interface (RS485, BLE4.0, Zigbee, WIFI) is possible only in solar operation.

2.3 Technical structure of the solar inverter

The photovoltaic voltage is adjusted so that the maximum power output of the PV modules is also achieved with different solar irradiation levels and temperatures (MPP-Tracking). These inverters have quite wide MPP range of suit for variety of PV modules by a variety of manufacturers. Measures must be taken to ensure that the maximum no-load voltage of 600 V is never exceeded. Please note that the maximum no-load voltage will occur at the lowest temperatures anticipated. You will find more detailed information about temperature dependency in the data sheet for the PV modules.

The high-quality aluminum casing corresponds to protection degree NEMA 4 (NEMA 3R for wiring box) and is protected by an anti-corrosion finish. The heat sink on the M series inverters is designed in such a way that operation of the inverter is possible at ambient temperatures from -22°F to +113°F (-30°C to +45°C) at full power and optimal efficiency for either 240 Vac or 208 Vac AC grids.

Metal fins designed into the rear side of the inverter chassis are used to dissipate heat and protect the unit. An internal temperature control protects the interior of the device. In case of high ambient temperatures, the maximum transferable power is limited.

The solar inverter is controlled by microcontrollers which provide interface communication and the values and messages on the front-panel display.

AC grid monitoring is done by an independent dedicated micro controller set up to meet the requirements of UL 1741, UL1741 SA / IEEE 1547. This enables a connection of the solar inverter to the in-house grid.

Operator protection requirements are met by electrically isolating the grid from the PV module. The electrical isolation between the grid and the PV module is equivalent to basic insulation. Maximum operator protection is ensured by reinforced isolation between the grid, PV modules and accessible interfaces (display, RS485 interface). Relevant standards concerning electromagnetic compatibility (EMC) and safety are fulfilled.

The solar inverter is functional in grid-parallel operation exclusively. An automatically anti-islanding function, which was accepted by a certification agency, guarantees secure disconnection in case of circuit isolation or interruptions in power supply and avoid isolated operation.

The DC arc-fault circuit interrupt (AFCI) is integrated into M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US. It complies the requirement as Type 1 device in UL1699B standard, series arc faults can be detected.

2.4 Ambient temperature

The solar inverter can be operated in an ambient temperatures from 22 °F to 149 °F (-30°C to +60°C). The following diagram illustrates how the output power of the solar inverter is reduced automatically in accordance with ambient temperature.

The device should be installed in a well-ventilated, cool and dry location.

Due to tolerance of temperature sensor and efficiency difference under different PV voltage, this derating curve may be a little different from actual behaviors of unit.

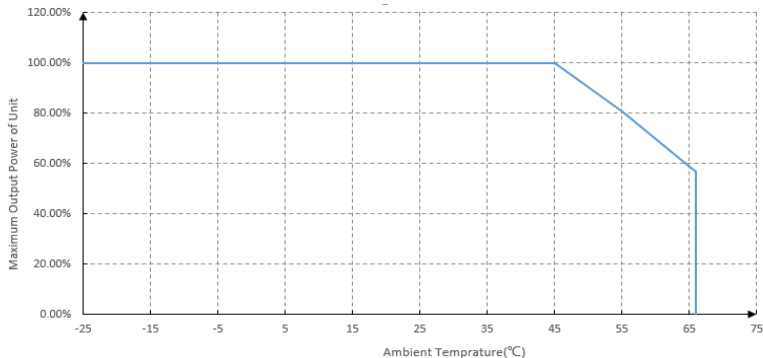


Figure 1: Typical derating curve of M series solar inverter

2.5 Solar inverter PV input DC voltage range

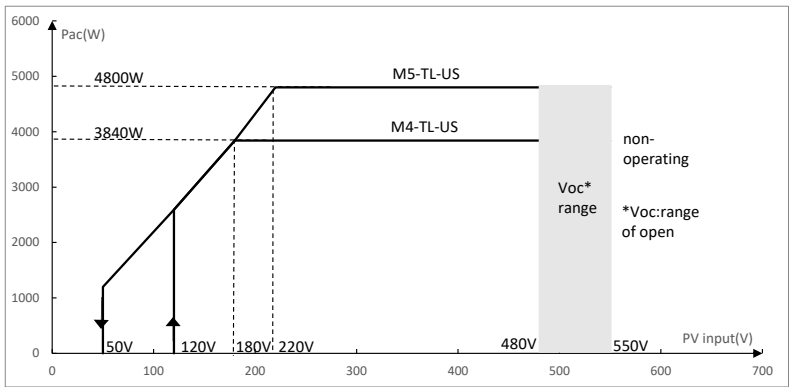


Figure 2: M4-TL-US / M5-TL-US DC voltage range

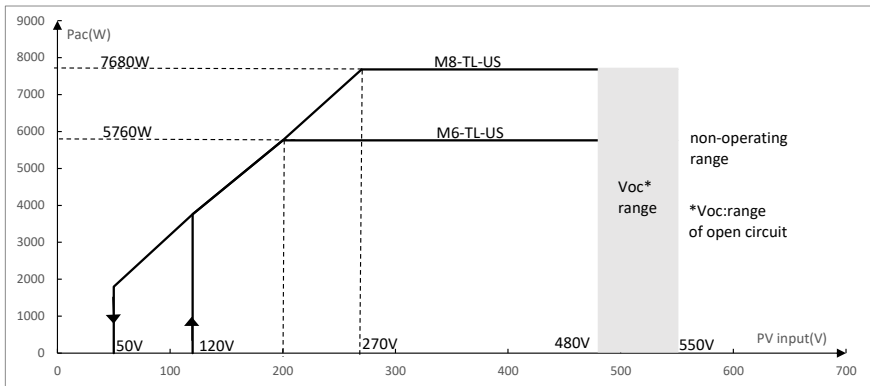


Figure 3: M6-TL-US / M8-TL-US DC voltage range

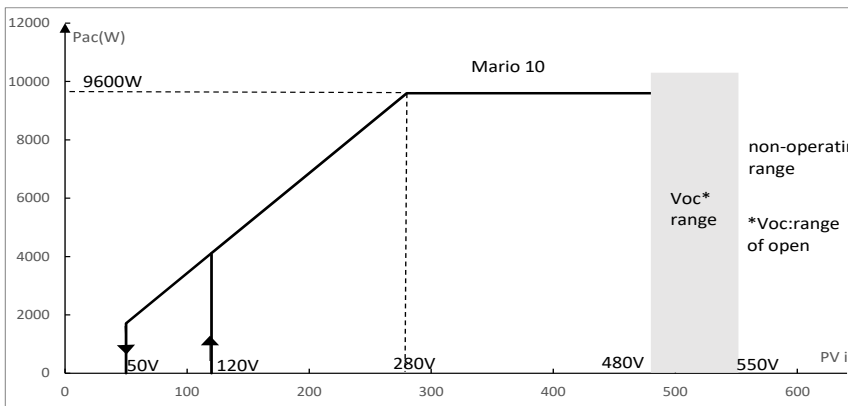


Figure 4: M10-TL-US DC voltage range

2.6 Efficiency

The best efficiency of the solar inverter is obtained at input voltages > 320V for 208V grid, and input voltages > 380V for 240V grid. The curve is obtained at 240V grid.

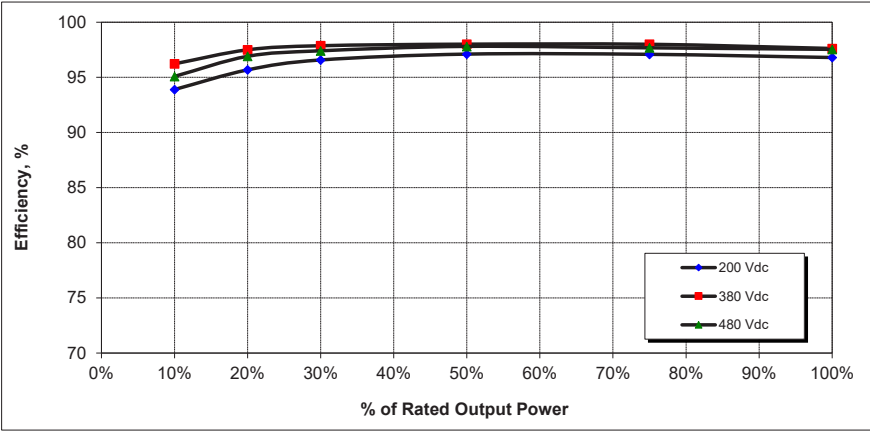


Figure 5: M6-TL-US efficiency plot

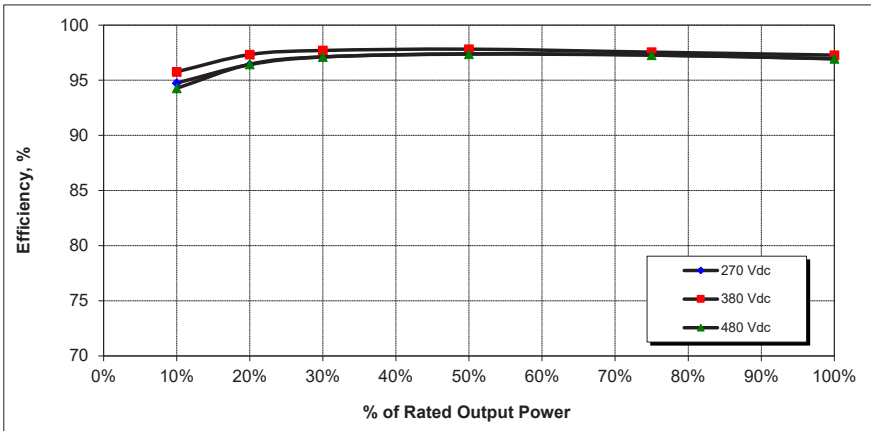


Figure 6: M8-TL-US efficiency plot

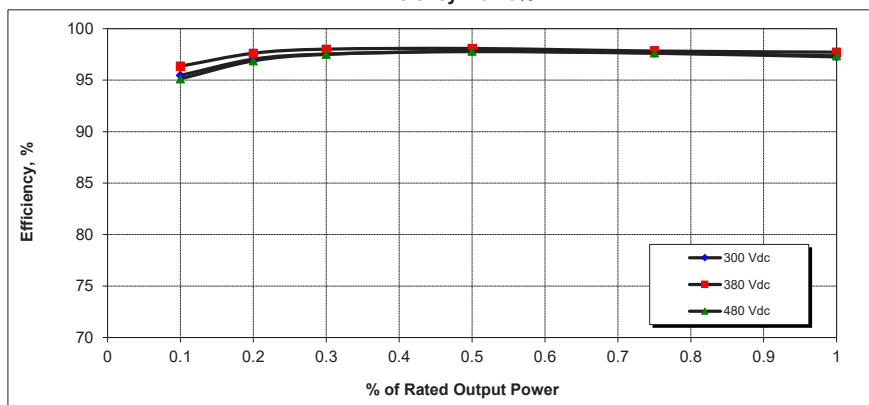
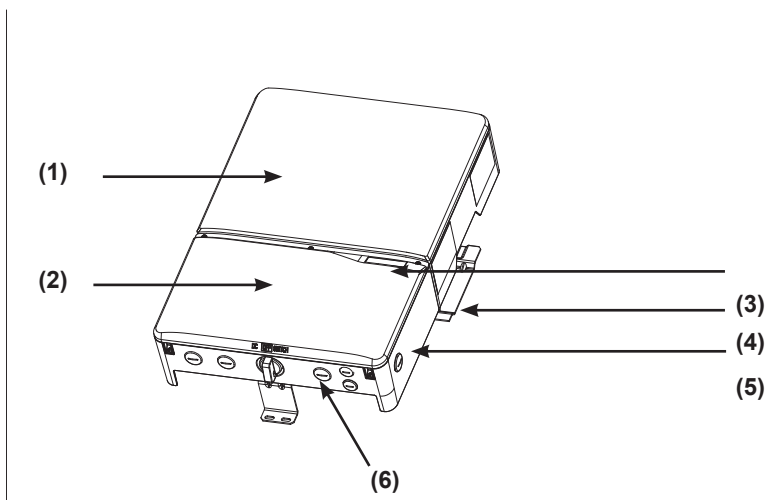


Figure 7: M10-TL-US efficiency plot

2.7 Equipment overview



- (1) Inverter Power Box
- (2) Wiring Box Cover
- (3) LED Lights
- (4) Mounting Plate
- (5) Wiring Box
- (6) Conduit Plugs

Figure 8: Exterior view of solar inverter main components

A further description of the equipment features:

(1) Solar Inverter Power Box - This is the inverter section of the assembly. This section is sealed at the factory and there are no user-serviceable parts inside. All wiring to install the inverter is done in the wiring box.

(2) Wiring Box Cover - This is the cover for the wiring compartment. The removal procedure is shown on page 30. Please note the DC disconnect must be in the OFF position before this cover can be removed.

(3) LED Lights - The three LED lights indicate errors or status as described in section 8.

(4) Mounting Plate - The inverter ships with a mounting plate that allows easy assembly of the inverter to a wall.

(5) Wiring Box - This is the compartment where all the wiring for the inverter inputs and outputs plus the RS485 communication are done.

(6) Conduit Plugs - There are 6 - 3/4" conduit openings and 2 - 1/2" conduit openings. Each conduit opening comes fitted with a conduit plug that should be removed before installing conduit fittings. Conduit fittings need to be water tight with either NEMA 4, 4X, 6, or 6X rated, and insulated type is preferred.

DC Disconnect shown with lock in off position. There are one openings on the disconnect where a padlock can be attached as shown above.

2.8 Inverter type and safety labels

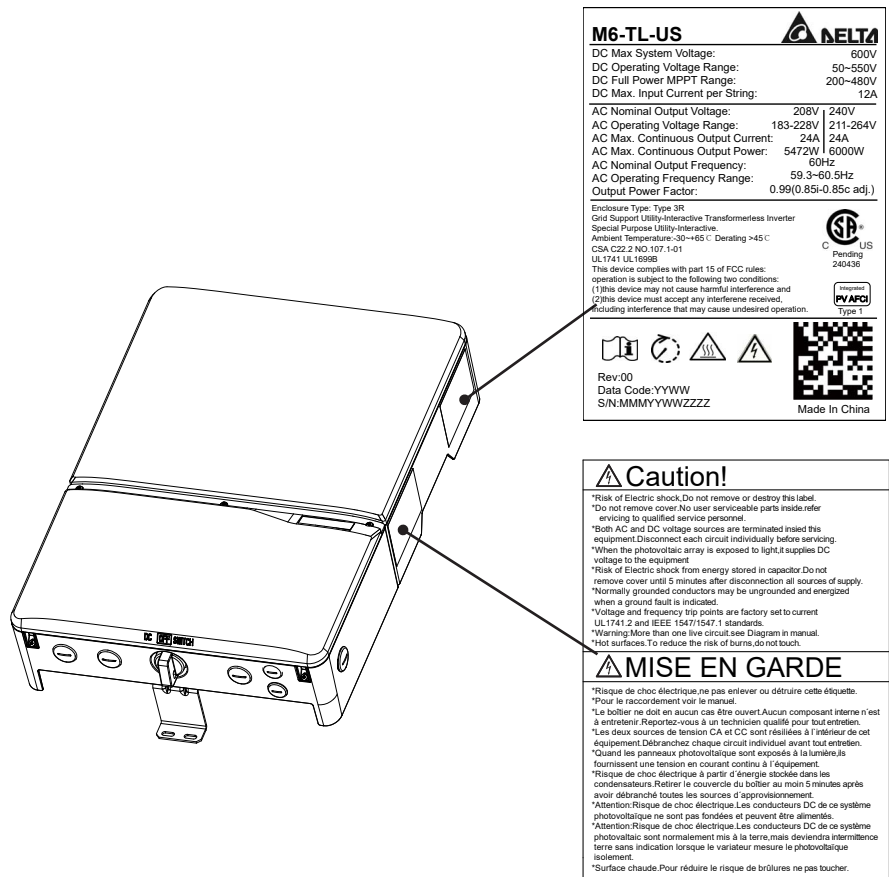


Figure 9: Location of type label

The type label is shown in figure 8. Different type labels can be found on the models M4-TL-US WB,M5-TL-US WB,M6-TL-US WB,M8-TL-US WB, and M10-TL-US WB. The inverter serial number can be found on the type label. Please note that capital letters in Serial Number are used as placeholders to indicate the variable information for the M4-TL-US WB,M5-TL-US WB,M6-TL-US WB,M8-TL-US WB, and M10-TL-US WB

The main caution labels in English and French are on the left side of the inverter.

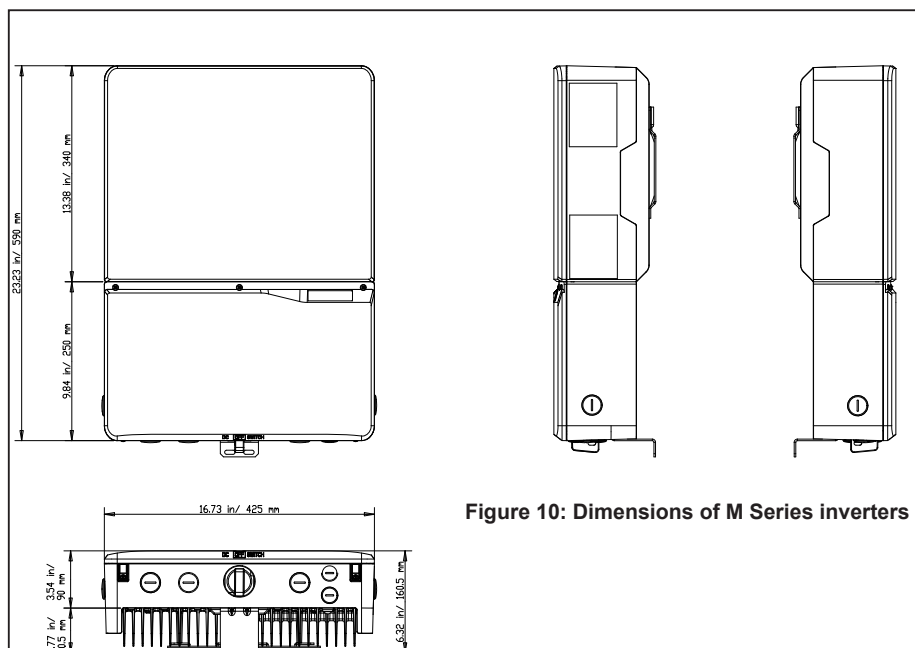


Figure 10: Dimensions of M Series inverters

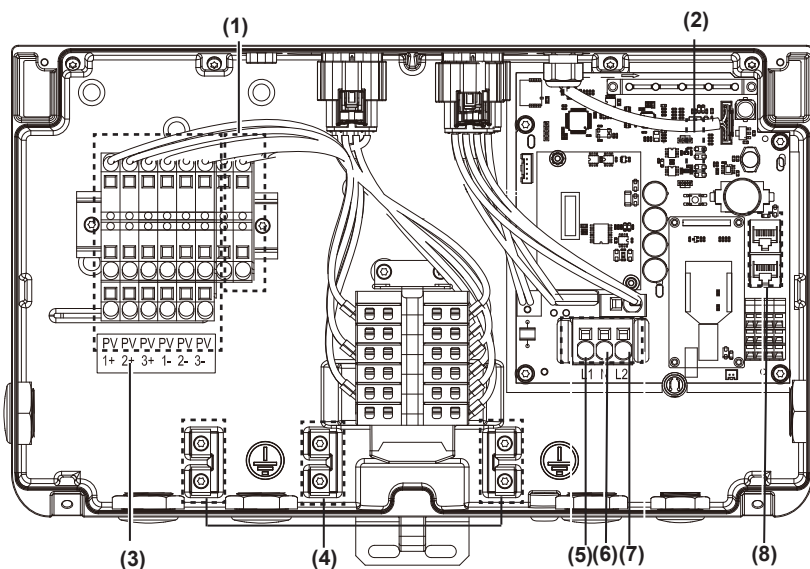


Figure 11: Wiring box of M series inverters

- | | |
|-----------------------|-------------------------------|
| (1) BAT Fuse Holders | (5) AC side L1 |
| (2) RS485 Termination | (6) AC side Neutral |
| (3) PV terminals | (7) AC side L2 |
| (4) Grounding | (8) RS485 communication ports |

Required torques for wiring box terminals

Terminals in Figure 12	Wire size permitted
3,(see location and description above)	14 - 8 AWG (2.5 - 9 mm ²)
1, 4, 5, 6, 7(see location and description above)	14 - 6 AWG (2.5 - 16 mm ²)

Table 1: Required torques for wiring box terminals

* Exception: Specified torque marked on the terminal block.

3 Installation



Read all of these instructions, cautions, and warnings for the Delta M series inverter and associated PV array documentation.

Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series, ainsi que la documentation sur le panneau photovoltaïque associé.



Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70.



The installation and wiring methods used in the installation of this inverter in the U.S. must comply with all US National Electric Code requirements (NEC) and local AHJ inspector requirements. In Canada, the installation and wiring methods used must comply with the Canadian Electric Code, parts I and II, and the local AHJ inspector requirements. System grounding when required by the Canadian Electrical Code, Part 1, is the responsibility of the installer.

Les méthodes d'installation et de câblage utilisées lors de l'installation de cet onduleur aux États-Unis doivent être conformes à toutes les exigences du National Electric Code (NEC) nord-américain et à celles des services d'inspection locaux de l'AHJ. Au Canada, les méthodes d'installation et de câblage utilisées doivent être conformes au Canadian Electric Code, parties I et II et aux exigences des services d'inspection locaux l'AHJ. L'installateur est responsable de la mise à terre du système lorsque requise par le Canadian Electrical Code, Partie 1.



These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, refer all servicing to factory qualified service personnel. No user service parts are contained inside the inverter.

Les instructions concernant la maintenance sont destinées à être utilisées uniquement par un personnel qualifié. Afin de réduire les risques de choc électrique, contactez le personnel d'entretien qualifié de l'usine à propos des opérations d'entretien. L'onduleur ne comporte aucune pièce pouvant être réparée par l'utilisateur.



The secondary short-circuit current rating is increased at the transfer connection point to the public electricity supply system by the nominal current of the connected solar inverter.

Le courant nominal secondaire du court-circuit est augmenté au point de connexion du transfert vers le réseau électrique public par le courant nominal de l'onduleur solaire connecté.



To reduce the risk of fire, connect only to a circuit provided with branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA70.

Afin de réduire les risques d'incendie, effectuez une connexion uniquement avec un circuit équipé d'une protection contre les surintensités des circuits de dérivation, conformément au National Electrical Code, ANSI/NFPA70.



This unit or system is provided with fixed trip limits and shall not be aggregated above 30KW on a single point of common connection.

Cet appareil ou système est fourni avec des limites de déclenche fixes et ne doit pas être agrégé au-dessus de 30KW sur un seul point de connexion commun.



In order to be able to carry out an energy measurement, a KWH revenue meter must be attached between the networks feed-in point and the solar inverter.

Afin de pouvoir mesurer la quantité d'énergie électrique consommée, un compteur électrique (kWh) devra être installé entre le point d'entrée du réseau d'alimentation et l'onduleur solaire.

3.1 Visual inspection

All Delta M series inverters are 100% tested, packaged in a heavy duty cardboard shipping carton, and visually inspected before leaving our manufacturing facility. If you receive the inverter in a damaged shipping carton, please reject the shipment and notify the shipping company.

Verify Delta M series shipping carton contains:

- a. Correct Delta M series inverter model: M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US, and M10-TL-US
- b. Mounting plate
- c. Operation and installation manual

Visually inspect the Delta M series inverter for any physical damage such as a bent heatsink fin and dented chassis.

If the inverter appears to be damaged or if the inverter needs to be returned, please contact your local Delta representative.



No user serviceable parts are contained in the inverter section.

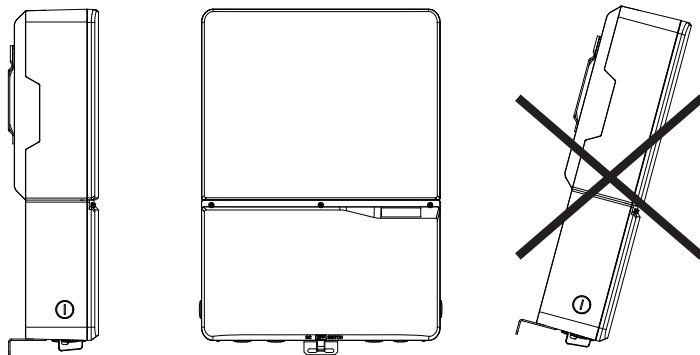
Do not attempt to open or repair the inverter. The inverter section is factory sealed to maintain its NEMA 4 rating and opening the top cover of the power head will void the inverter warranty.

Ne tentez pas d'ouvrir ou de réparer l'onduleur. La section de l'onduleur est scellée en usine afin qu'elle conserve son courant nominal NEMA 4, son ouverture annulerait la garantie.

3.2 Installation location

1. Install the inverter on a non-flammable support base.
2. The inverter must be mounted vertically on a flat surface.
3. A minimum distance of 6 inches (15.2 cm) of unobstructed clearance on all sides to promote free convection is required.
4. Ensure the mounting hardware and structure can support the weight of the inverter.
5. Ensure the mounting hardware meets the appropriate building code.
6. Avoid installation on resonating surfaces (light construction walls etc.).
7. Installation can be indoors or in protected outdoor areas.
8. Avoid direct sun exposure.
9. Ensure inverter ambient temperature is within -13°F to +122°F (-25°C to +45°C) for optimal efficiency of the PV system.
10. Chose a mounting height for easy viewing of the display.
11. Despite having a NEMA 4 (NEMA 3R for wiring box) enclosure with a soiling category III certification, the inverter must not be exposed to heavy soiling.
12. Unused connectors and interfaces must be covered through sealing connectors.

3.3 Mounting the inverter



Please make sure the inverter is installed vertically, especially if it is to be installed outdoors.

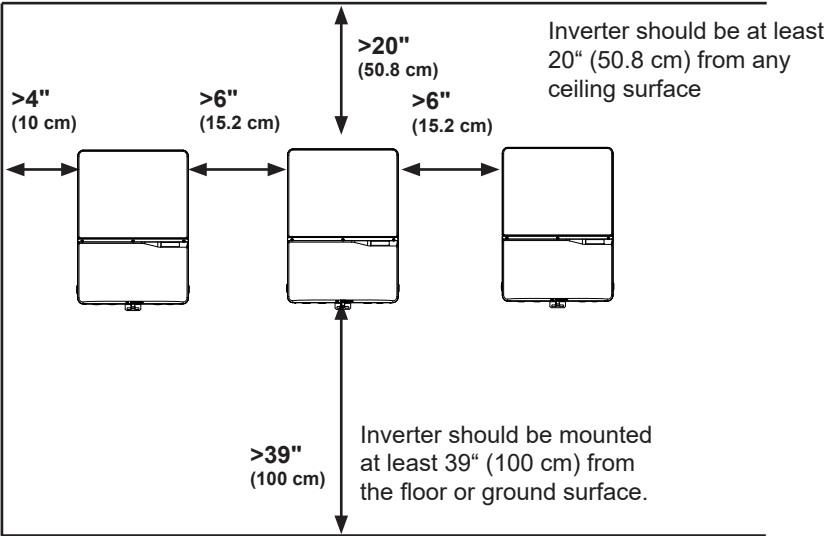


Figure 12: Inverter clearances

The National Electric Code may require significant larger working clearances (see NEC Section 110.26)

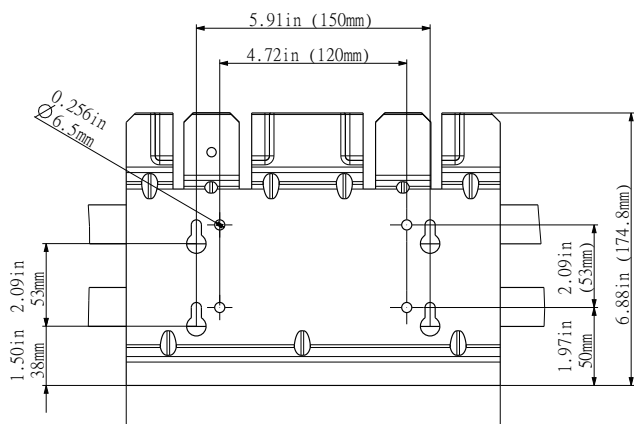


Figure 13: Dimension drawing of mounting plate

1. Mount the mounting plate to the wall with at least 4 screws and anchors ($\varnothing$ 6mm). With 4 screws use 4 holes A or 4 holes B (see Figure 14). You can use the mounting plate as a template for marking the positions of the boreholes.
2. Tighten the screws firmly to the wall.

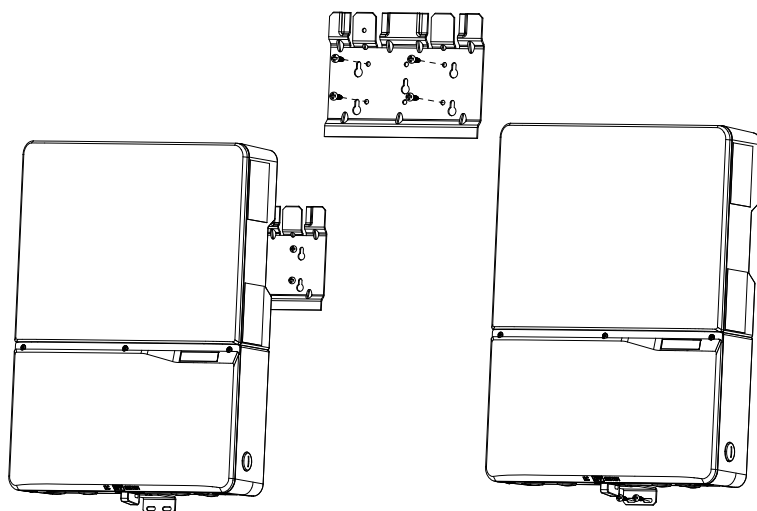


Figure 14: Installing the plate and inverter on a wood stud wall

1. Using the mounting plate as a template, mark four screw holes onto the wall. For 16 in. (40.6 cm) on center stud mounting, use the four holes that are indicated for this purpose in the figure. Make sure the holes are in the center of each stud before marking the drill location.
2. After marking the screw hole locations, drill the pilot holes for the appropriate screw type that will hold the weight of the inverter in the selected material. 1/4" lag bolts are recommended for mounting on wood framed walls.
3. Align the mounting plate over the pilot holes and install the mounting hardware to mounting surface. Please tighten to the recommended torque necessary to hold the mounting plate firmly to the wall surface type.
4. As the solar inverters are heavy, M4-TL-US /M5-TL-US weigh 37 lbs(17 kg) ,M6-TL-US weigh 42 lbs(19 kg) ,M8-TL-US /M10-TL-US weigh 43 lbs(19.5 kg), they should be lifted out of the cardboard container by at least two persons.
5. With at least two persons on either side of the inverter, lift it up and place it carefully onto the mounting plate. Install two screws as shown in the figure 15 to secure the device.
6. Check that the solar inverter is seated securely on the wall.

It is recommended to use stainless steel screws, especially if installed outdoors. Be sure to verify sheer and pullout strength of anchors or other wall attachments.

3.4 Required torques for M series NA solar inverters

Part	Description	Required torque
Wiring Box Cover Screws	M4 screws (T20 head x5) for attaching the wiring box cover to the wiring box	max. 16 in-lbs (1.8 Nm)
Wiring Box Interior Screws	M5 screws (T25 head x4) that secure the wiring box to the inverter stage assembly	max. 35 in-lbs (4 Nm)

Table 2: Required Torques for M series NA solar inverters

4 Electrical connections

4.1 General safety



Read all of these instructions, cautions, and warnings for the Delta M series inverter and associated PV array documentation.

Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series, ainsi que la documentation sur le panneau photovoltaïque associé.



Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements. Use 10 AWG or greater 90°C (194 °F), copper solid or stranded wire for all DC and AC wiring to the M series inverter to optimize system efficiency.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70. Afin d'optimiser l'efficacité du système, utilisez au moins 10 fils en cuivre torsadé ou solide à 90°C (194 °F), pour l'ensemble du câblage en CC ou en CA vers l'onduleur M series.



PV solar arrays produce hazardous voltages and currents when exposed to light which can create an electrical shock hazard. Using dark opaque sheets cover the PV solar array before wiring or connecting cable terminations.

Les panneaux solaires photovoltaïques produisent tensions et courants dangereux lorsqu'ils sont exposés à la lumière et constituent un danger de choc électrique. Couvrez le panneau solaire photovoltaïque à l'aide de morceaux de tissu opaques et forcés avant tout câblage ou connexion des terminaisons de câble.



Before connecting the Delta M series inverter to the AC distribution grid, approval must be received by appropriate local utility as required by national and state interconnection regulations, and must be connected only by qualified personnel.

Avant de connecter l'onduleur solaire Delta M series au réseau de distribution du courant alternatif (CA), une autorisation doit être obtenue de la part des services publics locaux de tutelle, conformément aux règlements concernant l'interconnexion nationale et locale. La connexion ne doit être effectuée que par un personnel qualifié.



Do not attempt to open or repair the inverter as the inverter is factory sealed to maintain its NEMA 4 (NEMA 3R for wiring box) rating and will void the inverter warranty.

Ne tentez pas d'ouvrir ou de réparer l'onduleur. La section de l'onduleur est scellée en usine afin qu'elle conserve son courant nominal NEMA 4, son ouverture annulerait la garantie.



The PV AC output circuits are isolated from the enclosure. The PV system Ground Electrode Conductor (GET) when required by National Electric Code (NEC), ANSI/NFPA 70 Sections 690.41, 690.42, and 690.43 is the responsibility of the installer.

Les circuits d'entrée et de sortie de cette unité sont isolés du boîtier. La mise à la terre du système doit être effectuée conformément au National Electrical Code (NEC), ANSI/NFPA 70 Sections 690.41, 690.42, et 690.43, et l'installateur est responsable de cette mise en conformité.

4.2 Utility AC voltage

The Delta M series inverters are grid-tied to the public utility. Delta NA inverters are software configurable via the user display panel for various 208 Vac or 240 Vac 60 Hz public utility grid as shown in figures 16-22.



The Delta M series NA Inverters should never be connected to a 120 Vac utility service. NEC 690.64(b)(1) requires that the inverter be connected to a dedicated circuit with no other outlets or devices connected to the same circuit.

Les onduleurs nord-américains Delta M series ne doivent jamais être connectés à un service d'électricité publique de 120 Vca. NEC 690.64(b)(1) exige que l'onduleur soit connecté à un circuit dédié ne comportant aucune autre sortie ou aucun autre dispositif connecté(e) au même circuit.

AC connection voltage and frequency limits:

Voltage range for 208 V nominal, line to line	185 V - 226 V
Voltage range for 240 V nominal, line to line	213 V - 262 V
Frequency Range	59.3 Hz - 60.5 Hz

Table 3: AC connection voltage and frequency limits

Public grid configurations allowed:

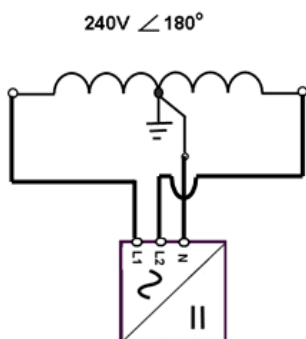


Figure 15: 240V / 120V Split Phase AC Grid

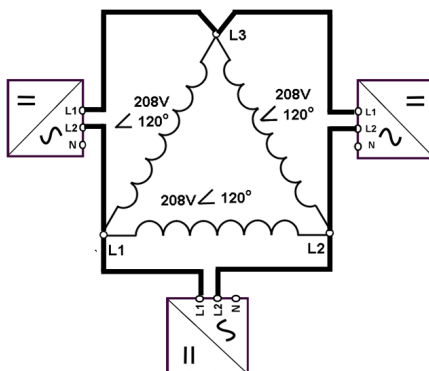


Figure 16: 208V Delta AC Grid

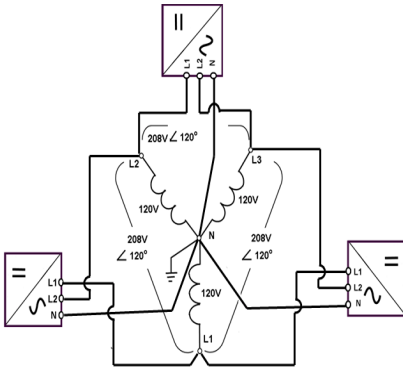


Figure 17: 208V / 120V WYE AC Grid

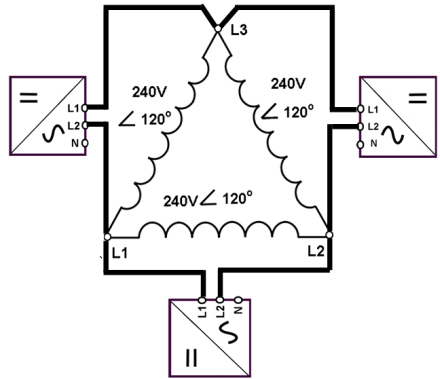


Figure 18: 240V Delta AC Grid

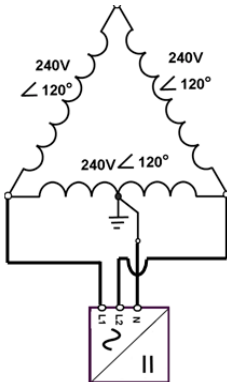


Figure 19: 240V / 120V Stinger AC Grid

Public Grid Configurations NOT Allowed:

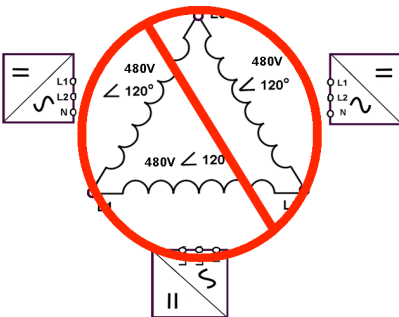


Figure 20: 480V Delta AC Grid

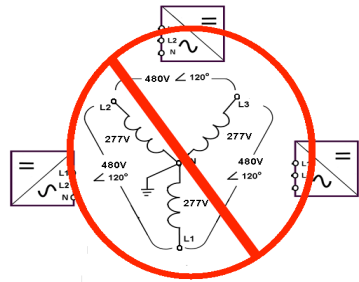


Figure 21: 480V / 277V WYE AC Grid

4.3 AC circuit breaker requirements

A dedicated circuit breaker in the building circuit panel is required for each Delta M series inverter that is installed. There should be a circuit breaker or fuse to protect each AC line, L1 and L2. The circuit breaker should be able to handle the rated maximum output voltage and current of the inverter. Please refer to the table below to determine the appropriate circuit breaker size to avoid potential fire hazards. The National Electrical Code (NEC), ANSI/NFPA 70 or applicable local electrical codes must be followed when determining maximum branch-circuit over-current protection requirements.

Inverter model	Recommended AC branch protection
M4 -TL -US	2-pole, 20 A 240 Vac
M5 -TL -US	2-pole, 25 A 240 Vac
M6 -TL -US	2-pole, 30 A 240 Vac
M8 -TL -US	2-pole, 40 A 240 Vac
M10 -TL -US	2-pole, 50 A 240 Vac

Please note that there is an exception to the requirement of a dedicated circuit breaker in the building circuit panel for each inverter if there exists a dedicated PV system AC subpanel that is used to combine multiple inverters. In this case, only one breaker at the main building service panel should be installed for a multiple inverter installation utilizing a dedicated PV system AC subpanel.

4.4 Grounding electrode conductor (GET)

Per NEC 690.47, a Grounding Electrode Conductor must be installed, and the GET conductor must be sized in accordance with NEC article 250.166. The GET conductor should be terminated at the GET screw terminal inside the wiring box compartment.

4.5 Lightning and surge protection

Delta M series NA inverters are designed and certified to meet stringent UL 1741 / IEEE 1547 and ANSI/ IEEE 62.41/62.42 AC lighting and surge requirements; however, every PV installation is unique, thus additional external UL/NEC AC and DC surge protection and solid grounding practice is recommended

4.6 Multiple inverters

Multiple Delta M series inverters are permitted at a common location if all applicable NEC, state, local building codes and local utility commissioning guidelines are met. In addition, each inverter should have its own dedicated AC branch protection circuit breaker and a dedicated PV string/array, not to exceed the inverter's ratings.

4.7 PV string considerations

There are a large number of PV module string combinations that will offer optimal performance from either the M4-TL-US, M5-TL-US, M6-TL-US, M8-TL-US and M10-TL-US inverters thanks to its wide full power MPP range (50 V – 48'0 V)

1



Follow the temperature multiplication factors given in NEC 690.7 table and the PV module manufacturer specified V/Temp coefficient to ensure PV string voltage is less than < 600 Vdc. Maximum inverter PV input voltage for all possible weather conditions in the location of installation.

Respectez les facteurs de multiplication de température énoncés dans le tableau NEC 690.7 ainsi que le coefficient Tension/Température spécifié par le fabricant du module PV afin de garantir que la tension de chaîne PV soit inférieure à 600 Vcc. Cette valeur correspondra à la tension d'entrée maximale PV de l'onduleur pour toutes conditions météorologiques éventuelles au niveau de l'emplacement d'installation.



System wiring voltage losses should be no greater than 1 to 2 percent for optimal system efficiency and performance.

Les pertes de tension du câblage du système ne doivent pas dépasser 1 à 2% pour une efficacité et une performance optimales du système.

4.8 Inverter connections

4.8.1 General information



Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70.



Inputs and output circuits of this unit are isolated from the enclosure. System grounding must be done in accordance with the National Electrical Code (NEC), ANSI/NFPA 70 and Compliance is the responsibility of the installer.

Les circuits d'entrée et de sortie de cette unité sont isolés du boîtier. La mise à la terre du système doit être effectuée conformément au National Electrical Code (NEC), ANSI/NFPA 70, et l'installateur est responsable de cette mise en conformité.



Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the "OFF" position, before inverter installation.

Assurez-vous qu'aucune tension directe n'est présente sur les circuits photovoltaïques d'entrée et de sortie du CA, vérifiez que le CC et le CA sont déconnectés, et que le disjoncteur de dérivation dédié est sur position "OFF", avant de procéder à l'installation de l'onduleur.



PV solar arrays produce hazardous voltages and currents when exposed to light which can create an electrical shock hazard. Using dark opaque sheets cover the PV solar array before wiring or connecting cable terminations

Les panneaux solaires photovoltaïques produisent tensions et courants dangereux lorsqu'ils sont exposés à la lumière et constituent un danger de choc électrique. Couvrez le panneau solaire photovoltaïque à l'aide de morceaux de tissu opaques et foncés avant tout câblage ou connexion des terminaisons de câble.



Before any electrical wiring can be connected to the inverter, the inverter must be permanently mounted.

Avant tout connexion de câblage électrique à l'onduleur, ce dernier doit être assemblé de manière définitive.



Use solid or stranded copper conductors only.
8 AWG (9 mm²) for PV, 8 AWG (9 mm²) for PV, is maximum allowed wire size.

Utilisez uniquement des conducteurs en cuivre torsadés ou solides.
La taille maximum de câble autorisée est de 6 AWG (16 mm²).



Inverter warranty is VOID if the DC input voltage exceeds the inverter 600 Vdc maximum.

La garantie de l'onduleur devient NULLE si la tension d'entrée du CC dépasse le maximum de 600 Vcc de l'onduleur.

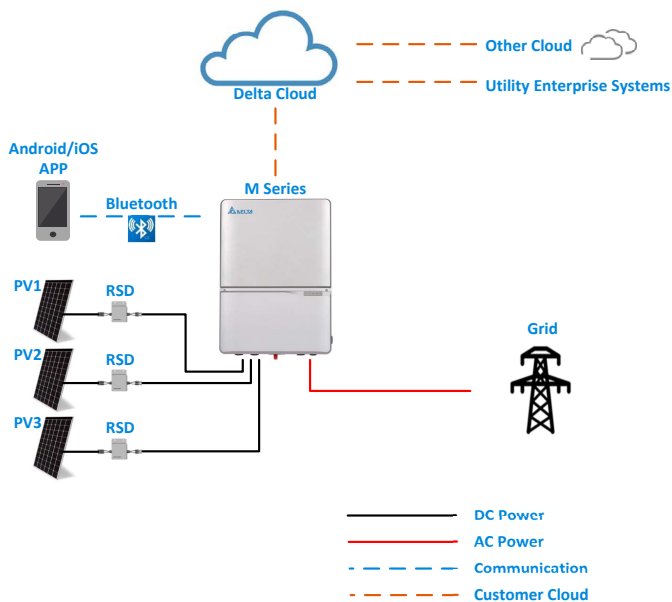


Figure 22: M series Inverter electrical diagram



POWER FED FROM MORE THAN ONE SOURCE, MORE THAN ONE LIVE CIRCUIT. Please note that all DC and AC terminals may carry current even without connected wires.

Alimentation puissance provenant de plus d'une source, plus d'un circuit vivre. Veuillez noter que toutes les terminaux CC et CA peuvent transporter le courant, même sans fils reliés.

4.8.2 Opening the wiring box cover



Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the "OFF" position, before inverter installation.

Assurez-vous qu'aucune tension directe n'est présente sur les circuits photovoltaïques d'entrée et de sortie du CA, vérifiez que le CC et le CA sont déconnectés, et que le disjoncteur de dérivation dédié est sur position "OFF", avant de procéder à l'installation de l'onduleur.

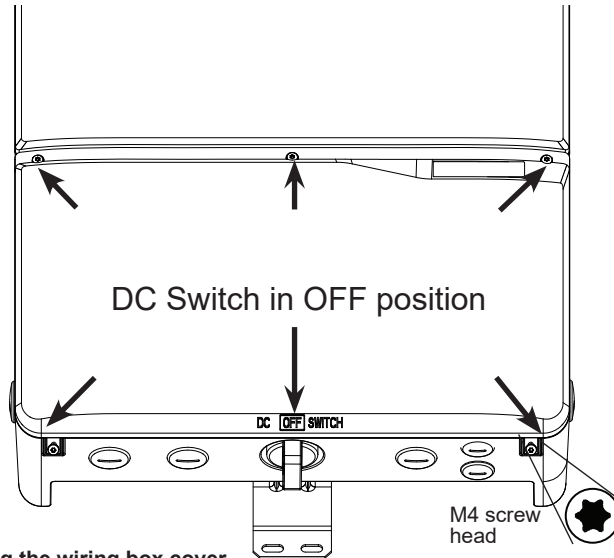


Figure 23: Removing the wiring box cover

1. Place DC Disconnect switch in "OFF" position. Please note the cover cannot be removed when the DC Disconnect switch is in the "ON" position.
2. Remove the 5 cover screws indicated above with a T20 Torx screw driver
3. Lift the cover upward and place off to the side.

4.8.3 Wiring box conduit plugs

Conduit plugs are provided for 3/4 inch and 1/2 inch conduit fittings. If conduit fitting used is between 3/4 inch and 1/2 inch , an appropriate conduit reducer should be used.

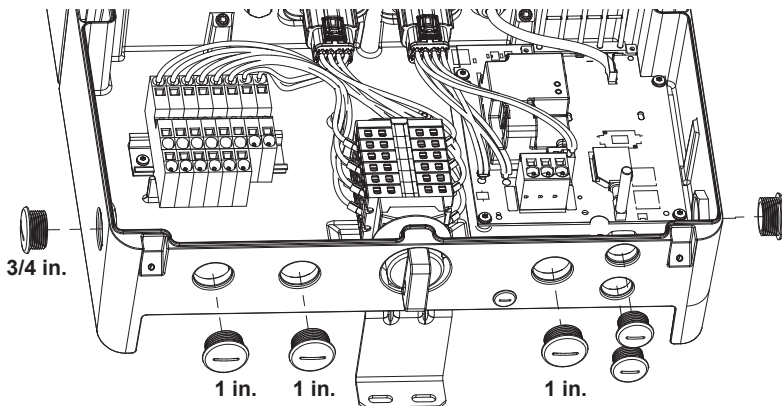
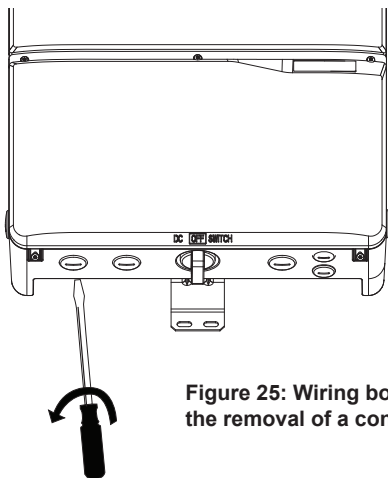


Figure 24: Locations of wiring box conduit plugs



Do not enlarge the wiring compartment conduit openings as the wiring box enclosure will be damaged which will void the inverter warranty.

N'élargissez pas les ouvertures du conduit du compartiment de câblage, boîtier de câblage risque d'être endommagé et la garantie de l'onduleur invalidée.



The conduit plugs are removed by placing a flat blade screwdriver in the slot on the conduit plug face and turning while gripping the nut on the inside of the enclosure to ensure it does not slip. Unscrew the nut from the conduit plug and slip the conduit plug out of the conduit opening.

Figure 25: Wiring box conduit plug removal (illustration showing the removal of a conduit plug)

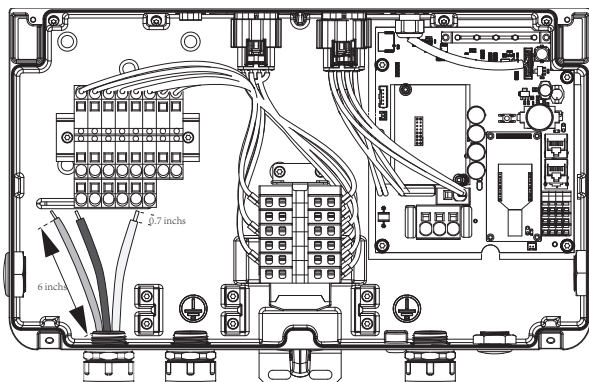


Figure 26: Conduit installation and wiring routing

Conduit fittings need to be water tight with either NEMA 4, 4X, 6, or 6X rated, and insulated type preferred.

Once conduit and fittings are installed, route wiring thru conduit and fitting and allowing a 6 inch strain relief loop within the wiring box compartment.

4.8.4 PV array string input connections



To ensure maximum protection against hazardous contact voltages while assembling photovoltaic installations, both the positive and the negative leads must be strictly isolated electrically from the protective ground potential (PE).

Afin d'assurer une protection maximale contre les tensions dont le contact est dangereux lors du montage des installations photovoltaïques, les câbles positifs et négatifs doivent être strictement isolés électriquement de la mise à la terre (PE).



Verify DC conductor voltage polarity with voltage meter because damage to the inverter could result if incorrect DC input polarity is connected.

Vérifiez la polarité des tensions du conducteur de courant direct à l'aide d'un voltmètre, une connexion incorrecte de polarité d'entrée du CC est susceptible d'endommager l'onduleur.

Risk of damage. Be sure that the polarity is correct when you make the connection. Connecting it wrongly will cause damage to the inverter.

Risque d'endommagement. Assurez-vous que la polarité est correcte lorsque vous effectuez la connexion. Une mauvaise connexion est susceptible d'endommager l'onduleur.



Risk of electric shock and fire. Use only with PV modules with a maximum system voltage of rating of 600V or Higher.

Risque de choc électrique et d'incendie. Utilisez uniquement des modules photovoltaïques avec une tension maximale du système de 600V ou supérieur.

Electric shock hazard. The DC conductors of this photovoltaic system are ungrounded and may be energized.

Hasard de choc électrique. Les conducteurs CC de ce système photovoltaïque ne sont pas mis à la terre et peuvent être alimentés.

Electric shock hazard. The DC conductors of this photovoltaic system are ungrounded but will become intermittently grounded without indication when the inverter measures the PV array isolation.

Hasard de choc électrique. Les conducteurs CC de ce système photovoltaïque ne sont pas mis à la terre, mais deviendront par intermittence à la terre sans indication lorsque l'onduleur mesure l'isolement du générateur photovoltaïque.



INFORMATION! INFORMATIONS!

The PV Array positive or negative leads must not be connected to ground before the inverter!

Les fils du positif ou du négatif du groupe solaire PV ne devront jamais être reliés à la terre avant l'onduleur !



INFORMATION! INFORMATIONS!

All screw terminals accept solid or stranded copper 14 – 6 AWG wire only. A 3.5 mm flat blade screw driver is recommended for tightening screw terminals to a 10.5 in-lbs. (1.2 Nm) torque.

Toutes les bornes à vis n'acceptent que les fils de cuivre rigides ou souples de 14 – 6 AWG. Il sera recommandé d'utiliser un tournevis plat de 3,5 mm pour serrer les bornes à vis à un couple de 1,2 Nm (10,5 in-lbs).

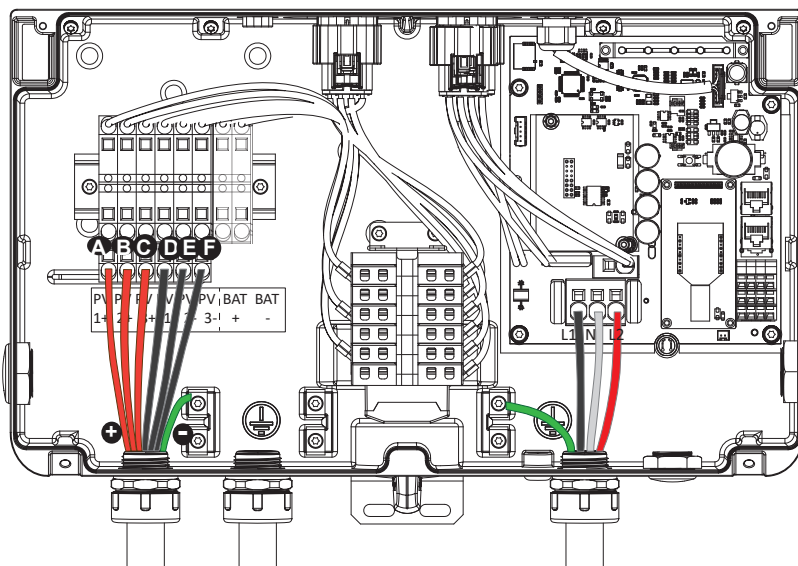


Figure 27: Wiring box of M Series inverters

- A** PV1_Positive Terminals
- B** PV2_Positive Terminals
- C** PV3_Positive Terminals

- D** PV1_Negative Terminals
- E** PV2_Negative Terminals
- F** PV3_Negative Terminals

1. Verify that the exposed wires are at least 6 inches in length to provide adequate strain relief and wire end strip length required.
2. Connect the positive lead from each PV array string to PV_Positive Terminals (A / C) in the wiring box compartment.
3. Connect the negative lead from each PV array string to PV_Negative Terminals (B / D) in the wiring box compartment.
4. Verify inverter to wiring box compartment connections DC wiring board assembly:
 - “RED” wire goes to “PV_Positive” Terminal **A**
 - “BLACK” wire goes to “PV_Negative” Terminal

Note: In M series inverters, if the PV array contains more than 3 PV module strings then an external PV combiner is recommended.

4.8.5 Inverter AC output wire connections



- Read all of the instructions, cautions, and warnings for the Delta M series Inverter, associated PV array documentation.

Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series, ainsi que la documentation sur le panneau photovoltaïque associé.

- Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70.

- Ensure no live voltages are present on PV input and AC output circuits, and verify that the DC disconnect, AC disconnect, and dedicated AC branch circuit breaker are in the “OFF” position, before inverter installation.

Assurez-vous qu'aucune tension directe n'est présente sur les circuits photovoltaïques d'entrée et de sortie du CA, vérifiez que le CC et le CA sont déconnectés, et que le disjoncteur de dérivation dédié est sur position “OFF”, avant de procéder à l'installation de l'onduleur.

- Verify that dedicated 2-pole 240 Vac / 208 Vac circuit breaker in the building electrical service panel is turned-off.

Vérifiez que le disjoncteur à 2 circuits de 240 Vca / 208 Vca du tableau d'alimentation électrique du bâtiment est mis hors tension.



INFORMATION! INFORMATIONS!

All screw terminals accept solid or stranded copper DC: 14 – 8 AWG wire, AC: 14 – 6 AWG wire.

Toutes les bornes à vis n'acceptent que les fils de cuivre rigides ou souples de DC: 14 – 8 AWG ,AC: 14 – 6 AWG. I



INFORMATION! INFORMATIONS!

The AC output (neutral) is not bonded to ground in the inverter.

La sortie de courant alternatif (neutre) n'est pas lié à la masse de l'onduleur.

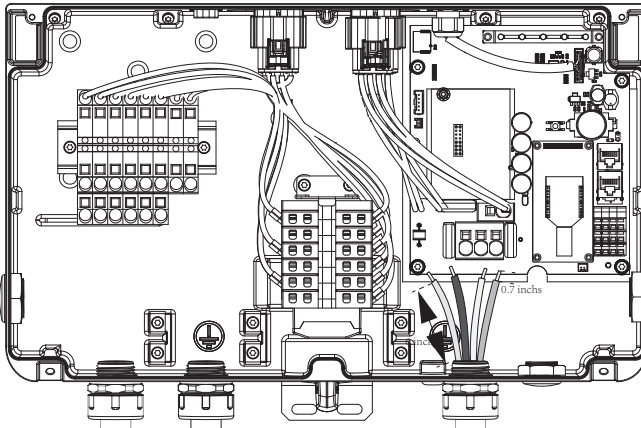


Figure 28: Conduit installation and AC wiring routing

Conduit fittings need to be water tight with either NEMA 4, 4X, 6, or 6X rated, and insulated type preferred.

Once conduit and fittings are installed, route wiring thru conduit and fitting and allowing a 6 inch strain relief loop within the wiring box compartment.

Potential AC voltage loss in AC wires is possible to determine for a given wire cross section and wire length. Pages 59 and 60 contain diagrams for each M series solar inverter model to help determine the best wire size for your particular installation. Delta recommends you select a wire size and length to ensure a maximum voltage loss between 1 - 2 %. Please note that the diagrams only offer approximate voltage loss and more precise voltage loss should be calculated by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

Percentage of voltage loss with 208 V AC and 240 V AC service. The load used in the calculation is the maximum continuous AC current of the inverter. **The maximum AC current of 3.8 TL model and 3.0 TL model is similar.**

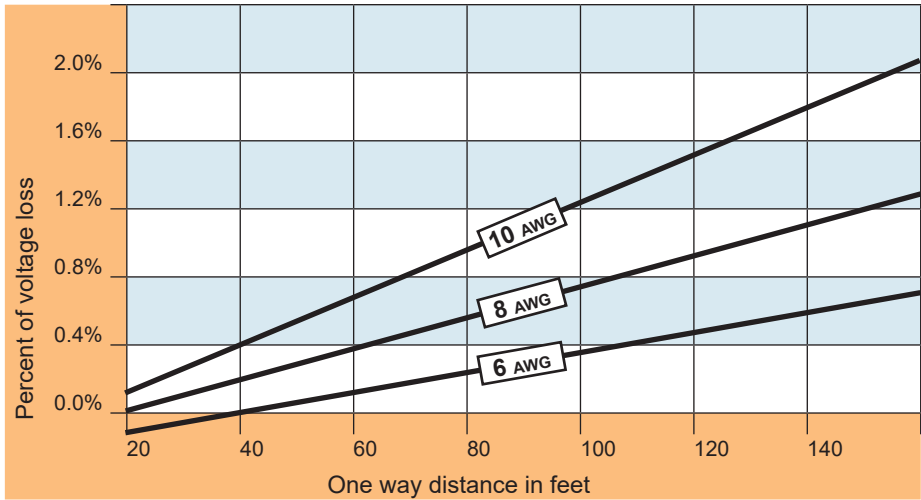


Figure 29: M series voltage loss in different wire sizes and lengths

Percentage of voltage loss with 208 V AC and 240 V AC service. The load used in the calculation is the maximum continuous AC current of the inverter.

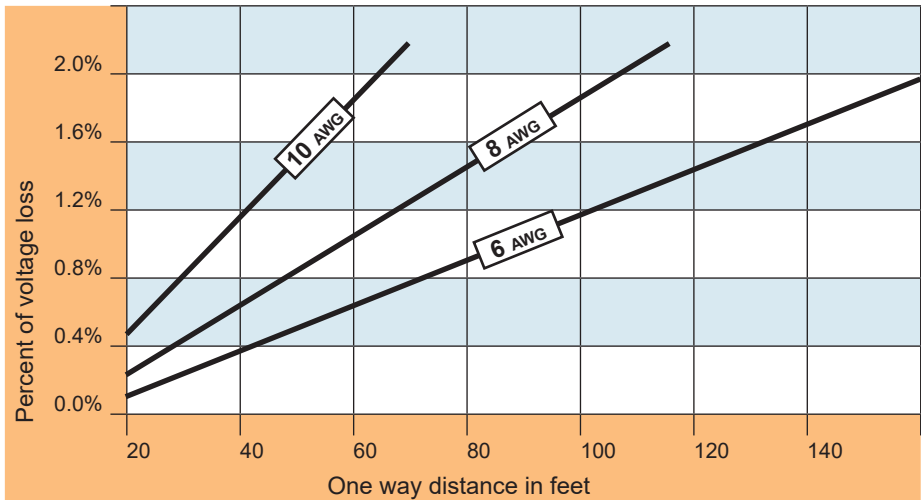
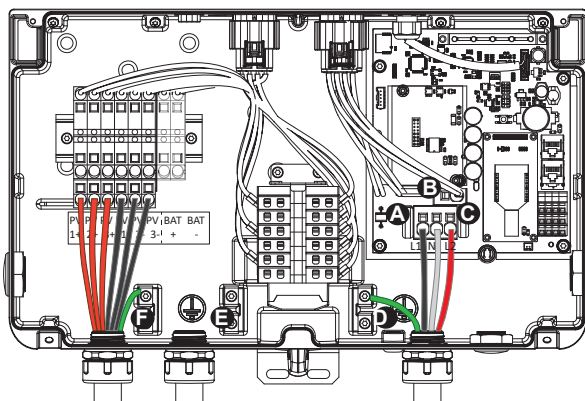


Figure 30: M series voltage loss in different wire sizes and lengths



A L1 Terminal

D Ground

B N Terminal

E Ground

C L2 Terminal

F Ground

Figure 31: Wiring box AC assembly – terminal labeling



Stranded copper wire should be checked so that all strands go into the terminal opening.

Il conviendra d'inspecter le fil de cuivre multi-filaire afin de s'assurer que tous ses brins sont insérés dans l'alésage de la borne.



AC disconnect may be required by your local AHJ. Please check local regulations to determine if the AC disconnect is required for your installation.

Une déconnexion du CA peut être requise par votre AHJ local. Veuillez consulter les règlements locaux afin de déterminer si la déconnexion du CA est requise pour votre installation.

1. Mount the AC disconnect (if required by local AHJ) close enough to the inverter.
2. Install conduit fitting and conduit into the wiring box compartment from AC disconnect or utility service panel.
3. Thread the inverter's AC output wires through cup piece of conduit and loosely fit the conduit into the inverter's open conduit fitting and the DC disconnect or junction box conduit fitting.
4. Route AC wiring through conduit and verify that the exposed wires are at least 6 inches in length to provide adequate strain relief and wire end strip length required. Secure the conduit into both fittings then tighten conduit fittings to manufacturer's recommended torque.

5. Terminate inverter's AC output wires inside the AC disconnect or junction box.
- Connect the AC equipment GND wire to the PE screw terminal (A).
 - Connect the "WHITE" Neutral wire to the "N" screw terminal (B).
 - Connect "BLACK" L1 wire to the "L1" terminal (C)
 - Connect "RED" L2 wire to the "L2" terminal (D)
 - Use a 3.5 mm flat blade screwdriver tighten the screw terminal to 10.5 in-lbs (1.2 Nm) of torque for all above connections.



Stranded copper wire should be checked so that all strands go into the terminal opening.

Il conviendra d'inspecter le fil de cuivre multi-filaire afin de s'assurer que tous ses brins sont insérés dans l'alésage de la borne.



If the grid type with Neutral connection is selected, please double check whether the Neutral wire is connected reliably. The unsuccessful Neutral wire connection will make the unit fail to feed in power to the grid because of the wrong phase voltage detection.

Si un réseau électrique avec connexion de neutre est choisie, veuillez vérifier attentivement si le conducteur neutre est connecté de manière fiable. Une connexion échouée du conducteur neutre causera le manque d'énergie de l'appareil à cause de la détection de tension en mauvais phase.

4.8.6 Inverter RS485 communication connections



Read all of these instructions, cautions, and warnings for the Delta M series inverter and associated PV array documentation.

Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series , ainsi que la documentation sur le panneau photovoltaïque associé.

Interface connection RS485 (EIA485)

The Delta M series inverters offer an EIA RS485 communication interface which can address up to 31 daisy chained inverters. For optimal performance, all unused interface connections must always be terminated by placing the termination jumper in the “on” position.

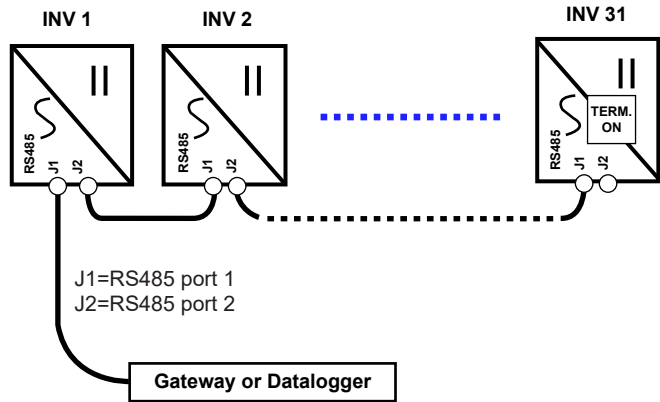


Figure 32: Inverter RS485 system diagram

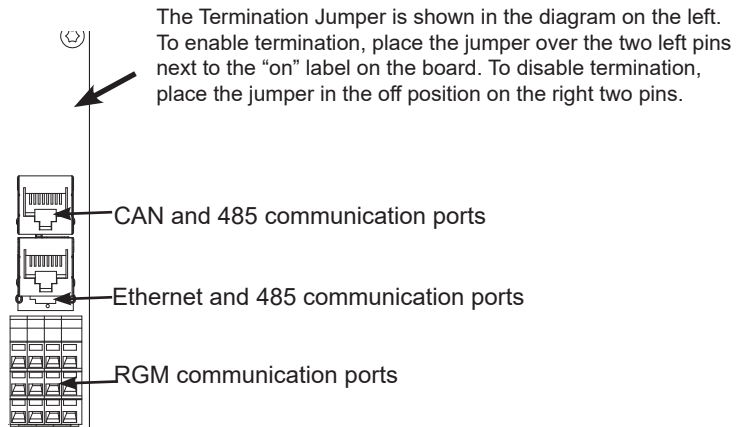


Figure 33: RS485 Termination Jumper

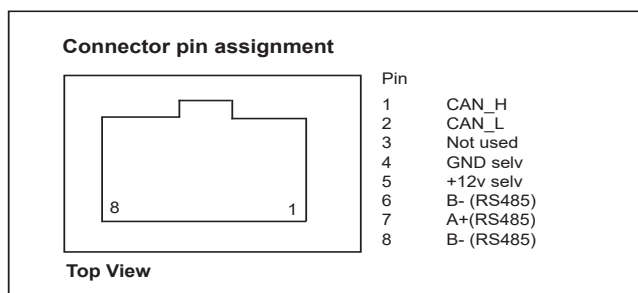


Figure 34: CAN and 485 communication ports

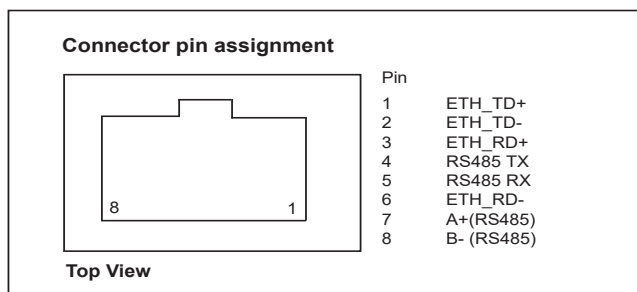
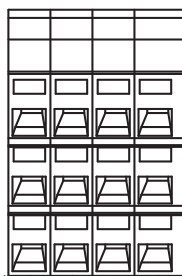


Figure 35: Ethernet and 485 communication ports



B- A+ EN GND

Figure 36: RGM communication ports

5 Commissioning the PV system



Read all of these instructions, cautions, and warnings for the Delta M series inverter and associated PV array documentation.

Lisez toutes les instructions, rubriques Prudence et Avertissement de l'onduleur Delta M series, ainsi que la documentation sur le panneau photovoltaïque associé.



Installation and commissioning must be performed by a licensed electrician in accordance with local, state, and National Electrical Code ANSI/NFPA 70 requirements.

L'installation et la mise en service doivent être effectuées par un électricien autorisé conformément aux exigences locales et nationales ainsi qu'au National Electrical Code ANSI/NFPA 70.



Verify that the dedicated 2-pole 240 Vac / 208 Vac circuit breaker in the building electrical service panel is turned-off.

Vérifiez que le disjoncteur à 2 circuits de 240 Vca / 208 Vca du tableau d'alimentation électrique du bâtiment est mis hors tension.



Disconnect in the "OFF" position, verify the PV input polarity once more simply by carefully using a 600 V, DC rated digital volt meter and probing the positive (+) and negative (-) PV array connections.

Débranchez l'appareil lorsqu'il est éteint (« OFF ») puis vérifiez à nouveau la polarité de l'entrée PV en utilisant simplement avec précaution un voltmètre numérique de valeur nominale de 600 Vcc et en prélevant les mesures au niveau des connexions positive (+) et négative (-) du groupe solaire PV.

5.1 LED Indication

5.1.1 Introduction

There are five LEDs in the front side of the inverter, from left to right, it is used for indicating status of operation, battery, communication, information and fault.



5.1.2 LED Status

Label	Designation	Color
	Operation(OPER)	Red / Green
	Battery(BAT)	Red / Green
	Wireless Communication(COMM)	Red / Green
	Information(INFO)	Red / Green
	Fault(FAULT)	Red / Green

5.1.3 LED Message

The LEDs indicate the operational status of the inverter

Message Category	LED Signals				Message Explanation	Example
	LED	Color	Status	Behavior		
OPER Led						
Normal operation	OPER	Green	<ON>	Constant on	The inverter feeds in grid.	
Sync.	OPER	Green	<BAR>	Four LEDs form a progress bar.	The inverter is synchronizing with grid.	LED signals: OPER LED is ON, BAT LED is ON. COMM LED Blinks Message: Synchronization progress is 50%-75%.
	BAT	Green	<BAR>			
	COMM	Green	<BAR>			
	INFO	Green	<BAR>			
Night mode	OPER	Green	<BLINK>	1s on, 4s off	Grid is connected, but the inverter is unable to feed in grid because PV voltage is too low.	
BAT Led						
Battery fault	BAT	Red	<ON>	Constant on	Battery is in fault mode.	
Battery comm. fail	BAT	Yellow	<ON>	Constant on	Battery communication timeout	
Battery standby	BAT	Yellow	<BLINK>	1s on, 1s off	Battery is in standby mode	
Battery low power	BAT	Green	<BLINK>	1s on, 4s off	Absolute battery power is lower than 50W	
Battery normal	BAT	Green	<ON>	Constant on	Battery is in normal operation.	
COMM Led						
BLE fail	COMM	Red	<ON>	Constant on	BLE is in fault mode	
APP Connected	COMM	Green	<ON>	Constant on	APP is connected	
BLE is running	COMM	Green	<BLINK>	1s on, 1s off	BLE is running	Only BLINK for 2 cycles in one minute

INFO Led						
Firmware upgrading	INFO	Yellow	<BLINK>	1s on, 1s off	Firmware upgrading is ongoing	
Receiving image	INFO	Green	<BLINK>	1s on, 1s off	Inverter is receiving image file	
Equipment alarm	INFO	Yellow	<ON>	Constant on	External event occurs and inverter is unable to run	
FAULT Led						
Arc fault	FAULT	Red	<ON>	Constant on	Arc fault occurs	
Ground fault	FAULT	Red	<BLINK>	1s on, 1s off	Ground fault occurs	
Other						
Initialization	OPER	Green	<ON>	On until done	Inverter initialization when grid is changing from disconnected into connected.	
	BAT	Green	<ON>	On until done		
	COMM	Green	<ON>	On until done		
	INFO	Green	<ON>	On until done		

5.2 Button

5.2.1 Reset button

There is button located inside the junction box, for this button, there are following functions.

1. Arc reset

Application: Clear arc fault.

Trigger condition: Press the button for 3-5 seconds.

2. Arc self-test

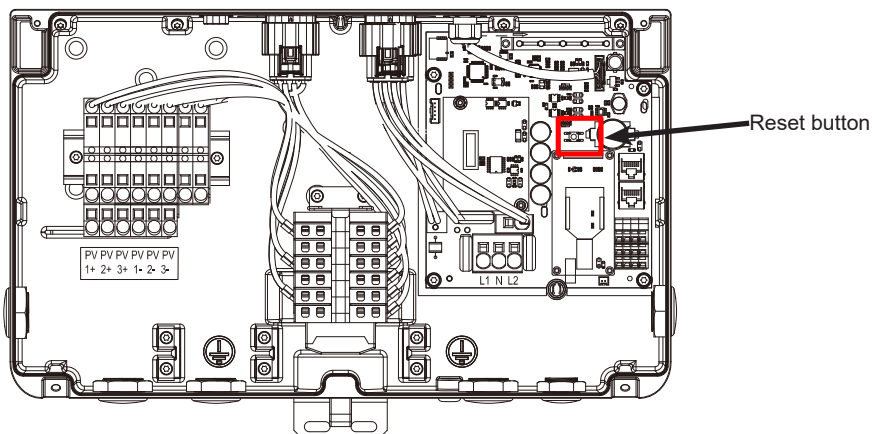
Application: If there is no arc fault, run arc self-test

Trigger condition: Press the button for 3-5 seconds.

2. Gateway reset

Application: gateway reset to factory status

Trigger condition: Press the button for more than 10 seconds.



5.3 Inverter turn-on procedure

Compatibility

1. Turn on the DC disconnect (turn to “ON” position, if rapid shutdown device is connected turn on AC disconnect firstly).
2. Check for inverter initialization (all five LED indicators are illuminated).
3. Turn on the dedicated 2-pole 240Vac / 208Vac circuit breaker in the building electrical service panel (put in closed position).
4. If there is AC disconnect, turn on the AC disconnect.
5. Refer to section 6 for setup process that needs to be completed before the inverter can begin feeding power to the grid.

5.4 Inverter turn-off procedure

1. If there is AC disconnect, turn off the AC disconnect.
2. Turn off the dedicated 2-pole 240Vac / 208Vac circuit breaker in the building electrical service panel (put in open position).
3. Turn off the DC disconnect (turn to “OFF” position).

5.5 M Series APP(Android) Manual

5.5.1 Introduction

Delta E Series APP is a mobile application to communicate with inverter system for real-time status monitoring, system mode management, RMA request upload and daily maintenance via Bluetooth Low Energy.

5.5.2 Installation

Compatibility

1. Requires android 4.4 or later.
2. BLE supported.
3. Internet over Wi-Fi or Cellular.

Procedure

Search “M Tool” in Google Play, download and install the application.

5.5.3 Connection

Procedure

- Step 1. Open app, allow all the permissions required.
- Step 2. Close guide page, guide page only shows at the first time.
- Step 3. Click on the “search” button to refresh and display device list.



Step 4. Press on a device to get connection with it.

Step 5. Enter the “Date code” of the inverter as the password.

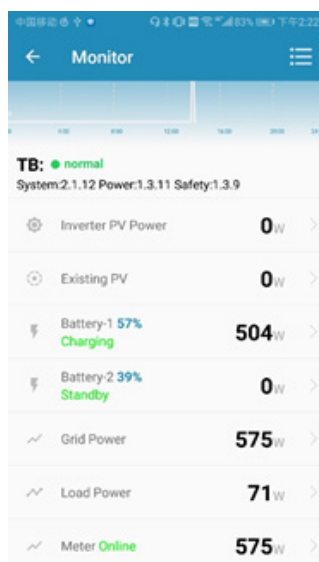
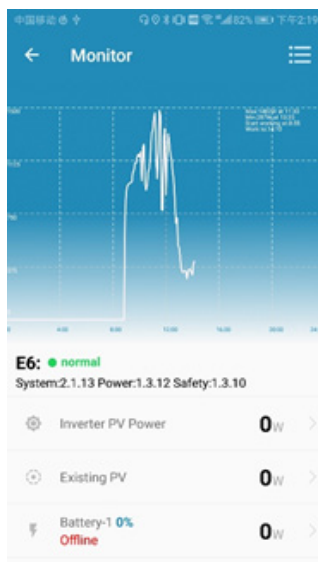
5.5.4 Functions

Functions of Delta E Series APP including monitor, system mode, communication card, upgrade, RMA, Arc detection, history and app settings.

5.5.4.1 Monitor - Display Real-time Status, Power Curve, Device Name, Firmware Version and Sync Date

Procedure

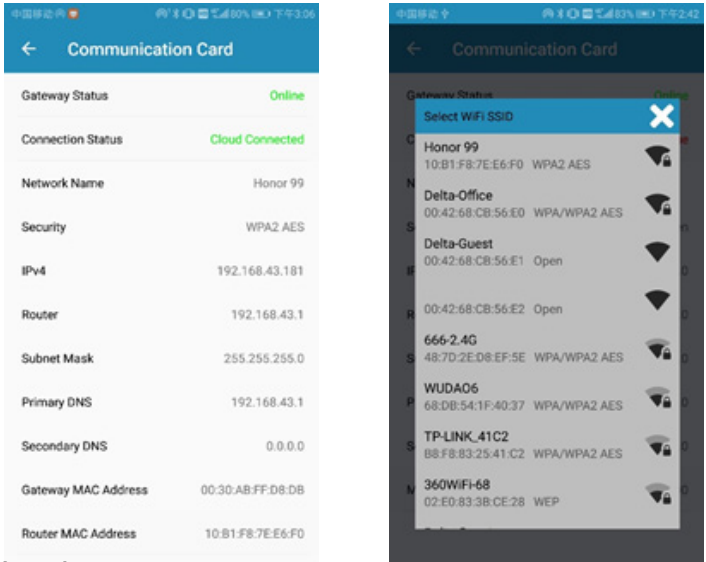
After connecting device, monitor page will show real-time status of today, including power curve, inverter data and battery data. It will show device name, firmware version, status of health and synchronize date and time automatically.



5.5.4.2 Communication Card

Procedure

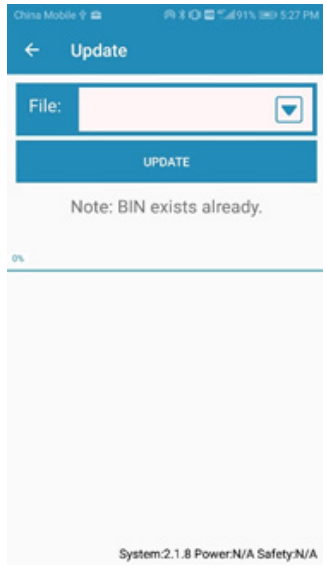
Press “Communication Card” in the menu to enter communication card page. Communication card page will show current information data of the gateway. Press the connection status line to select Wi-Fi to connect.



5.5.4.3 Upgrade

Procedure

Press “Upgrade” in the menu to enter upgrade page. Click on the drop-down list to show all the available BIN files and select the one needed to upgrade inverter firmware. It shows “OK” if succeed, and “Fail” if failed. Upgrade can resume from the break-point.



5.5.4.4 RMA

Procedure

Press “RMA” in the menu to enter RMA page. Press on the RMA button, the RMA request with inverter data and error log will then be upload to delta cloud.

5.6.4.5 Arc Detection

Procedure

Press “Arc” in the menu to enter Arc page. Press on the scan button on the upper-left corner, the arc graph will be shown.



5.5.4.6 History – Display PV and AC History

Procedure

Press “History” in the menu to check history data.

China Mobile

57% 1:02 PM

History

AC

⊕

Max Active Power

3735W

⚡

Max Voltage

231V

~

Max Current

17A

⊕

Max Reactive Power

N/AVar

PV1

⊕

Max Power

3687W

⚡

Max Voltage

336.0V

~

Max Current

13.2A

PV2

⊕

Max Power

2146W

5.5.4.7 App Settings

Procedure

Step 1 Press on “menu” on the upper-left corner to display menu.

Step 2 Press “App Settings” to enter app settings page. The settings contain basic settings and other settings.

China Mobile

80% 15:49

App Settings

Basic

Guide Page

Snack Bar

Snack bar pops up from bottom to show tips

Device Filter

Keep Connection

Ping device regularly to keep connection

Others

APP Version

1.2.5

Guide Page

Guide page shows only once at the first time, enable the switch to show it one more time.

Snack Bar

Snack bar

pops up from the bottom of screen to show some tips. Click the switch to enable or disable it.

Device Filter

Device filter

allows the scanner to ignore the irrelevant devices. Click the switch to enable or disable it.

Keep Connection

Connection interruption will occur if the connection is not active in a period of time. Keep connection allows app to send pin message to device regularly to avoid interruption. Click the switch to enable or disable it.

6 Production information



All production information is provided for orientation purposes only. The measuring devices and meters provided by the electricity supply company are the authoritative source of information for invoicing.

Toutes les informations de production ne sont fournis qu'à titre d'orientation. Les appareils de mesure et les compteurs fournis par la société de distribution d'électricité constituent la source officielle de la facturation.

7 Repair



Danger of death from hazardous voltage.

Hazardous voltage is applied to the solar power inverter during operation. Hazardous voltage is still present 5 minutes after all power sources have been disconnected.

► Never open the solar power inverter. The solar power inverter contains no components that are to be maintained or repaired by the operator or installer. Opening the cover will void the warranty.

Risque de mort par une tension dangereuse.

La tension dangereuse est appliquée à l'onduleur solaire pendant le fonctionnement. Une tension dangereuse est toujours présent 5 minutes après que toutes les sources d'alimentation ont été débranchées.

► Ne jamais ouvrir le onduleur solaire. L'onduleur solaire ne contient pas de composants qui doivent être entretenus ou réparés par l'opérateur ou l'installateur. Ouverture du couvercle annule la garantie.

The solar power inverter contains no components that are to be maintained by the operator or installer.

L'onduleur solaire ne contient pas de composants qui doivent être mis à jour par l'opérateur ou l'installateur.





Danger of death or severe injuries from dangerous voltage

► Disconnect the solar inverter from the grid before removing or inserting the AC connector.

Danger de mort ou de blessures graves par une tension dangereuse

► Déconnecter l'onduleur solaire du réseau électrique avant de retirer ou d'insérer le connecteur AC.



Danger of death or severe injuries from dangerous voltage

Dangerous voltages can be present at the DC connections of the solar power inverter.

► Never disconnect the PV modules when the solar power inverter is under load. First switch off the grid connection so that the solar power inverter cannot feed energy into the grid. Then open the DC disconnecter.

► Secure the DC connections against being touched.

Danger de mort ou de blessures graves par une tension dangereuse

Des tensions dangereuses peuvent être présentes sur les connexions CC de l'onduleur solaire.

► Ne jamais déconnecter les modules PV lorsque l'onduleur solaire est en cours de charge. D'abord désactiver la connexion au réseau électrique de sorte que l'onduleur solaire ne peut pas fournir de l'énergie dans le réseau. Ensuite, déconnectez le sectionneur CC.

► Sécuriser les connexions CC contre être touché.



Danger of injury due to heavy weight

The solar power inverter is heavy (see "11.2 Technical data"). Incorrect handling can lead to injuries.

► The solar power inverter must be lifted and carried by two people.

Risque de blessure en raison du poids lourd

L'onduleur solaire est lourd (voir «11.2 Caractéristiques techniques»).

Une mauvaise manipulation peut entraîner des blessures.

► Il faut que l'onduleur solaire soit soulevé et déplacé par deux personnes.

8.1 Decommissioning

1. Switch off the AC cable to be free of voltage.
2. Open the DC disconnect.
3. Remove all cables from the solar power inverter.
4. Unscrew the solar power inverter from the wall bracket.
5. Lift the solar power inverter from the wall bracket.

8.2 Packaging

Use the original packaging or packaging of the same quality.

8.3 Transport

Always transport the solar power inverter in the original packaging or packaging of the same quality.

8.4 Storage

Always store the solar power inverter in the original packaging or packaging of the same quality. Observe the specifications relating to storage conditions described in chapter "11.2 Technical data".

8.5 Dispose

Dispose of the solar power inverter in a technically appropriate manner according to the legal requirements of your country.

9 Certificate and technical data

9.1 Certificate

Please check our web site at: <http://www.delta-americas.com/SolarInverters.aspx> for the most recent certificates.

9.2 Technical data

Model	M4-TL-US	M5-TL-US	M6-TL-US	M8-TL-US	M10-TL-US
INPUT (DC)					
Maximum system voltage	600 V				
Nominal voltage	380 V				
Maximum operating voltage Voc	540 V				
Operating MPPT range	50 V to 480 V				
Maximum input current (per MPPT)	12 A	12 A	12 A	12 A	12 A
Maximum short circuit current @ STC	15 A / 15 A	15 A / 15 A	15 A / 15 A / 15 A	15 A / 15 A / 15 A	25 A / 25 A
Maximum DC/AC ratio	1.3				
DC disconnect	Integrated				
MPP tracker	2	2	3	3	2
Input strings available	2 - 2	2 - 2	2 - 2 - 2	2 - 2 - 2	2 - 2
OUTPUT (AC)					
Nominal power @ 240V	3840 W	4800 W	5760 W	7680 W	9600 W
Maximum output power	4000 W	5000 W	6000 W	8000 W	10000 W
Voltage range	183 Vac to 229 Vac @ 208 Vac 211 Vac to 264 Vac @ 240 Vac				
Maximum continuous current	16 A	20 A	24 A	32 A	40 A
Nominal frequency	60 Hz				
Frequency range	59.3 Hz to 60.5 Hz				
Adjustable frequency range	50 Hz to 66 Hz				
Night consumption	< 1.5 W				
THD @ nominal power	< 3 %				
Power factor @ nominal power	> 0.99				
Adjustable power factor range	0.85i to 0.85c				
Acoustic noise	< 45 dB(A) @ 3 ft (1m)				
GENERAL SPECIFICATION					
Maximum efficiency	98%				
CEC efficiency	97.0 % @ 208 V 97.5 % @ 240 V	97.5 % @ 208 V 97.5 % @ 240 V	97.0 % @ 208 V 97.5 % @ 240 V	97.5 % @ 208 V 97.5 % @ 240 V	97.5 % @ 208 V 97.5 % @ 240 V
Operating temperature range	-22 °F to 149 °F (-30 °C to 65 °C)				
	de-rating above 113 °F (45 °C)				
Storage temperature range	-40 °F to 185 °F (-40 °C to 85 °C)				
Humidity	0% to 95%				
Maximum operating altitude	9,843 ft (3,000 m)				

- 1) Adjustable value, limited by the output capability of battery pack
- 2) Adjustable value, Limited by the maximum allowed voltage of battery pack

Model	M4-TL-US	M5-TL-US	M6-TL-US	M8-TL-US	M10-TL-US
GENERAL SPECIFICATION					
Dimensions (W x H x D)	16.7 x 23.2 x 5.9 in (425 x 590 x 150 mm)				
Weight	43.7 lbs (19.8 kg)	44 lbs (20 kg)	45.9 lbs (20.8 kg)	45.9 lbs (20.8 kg)	47.6 lbs (21.6 kg)
Cooling	Natural convection			Natural convection with internal fan	
AC connection	Spring contact type				
Admissible conductor size AC	AWG 10 to AWG 6				AWG 8 to AWG 6
DC connection	Spring contact type				
Admissible conductor size DC	AWG 12 to AWG 8				AWG 10 to AWG 8
Communication interface	Bluetooth 4.0 / WiFi / 3G / 4G / Cellular (optional)				
Enclosure material	Die-casting aluminum				
STANDARDS / DIRECTIVES					
Enclosure protection rating	Type 4				
Safety	UL 1741, CSA-C22.2 No. 107.1-01				
Software approval	UL 1998				
Ground fault protection	UL 1741 CRD				
Anti-islanding protection	IEEE 1547, IEEE 1547.1				
EMC	FCC part 15 Class B				
AFCI	UL 1699B (Type 1), NEC 2017 Article 690.11				
Integrated meter	ANSI C12.20 (meets 0.5% accuracy)				
Grid support regulation	UL 1741 SA, California Rule 21, HECO Compliant				
WARRANTY					
Standard warranty	10 years				



- 1) Un-balance PV input allowed, maximum input power for each MPP tracker is limited with 70% rating power. And total input is limited with 100% rating power.
- 2) The maximum AC power value indicates the power an inverter might be able to deliver, but such a maximum AC power may not necessarily be achieved.
- 3) Max. output fault current and duration is 140A_{pk}, 2ms duration@208V, 116.8A_{pk}, 6.15ms duration@240V.

Utility interconnection voltage and frequency trip limits and trip times for all models:

Simulated utility source		Maximum time (sec) at 60Hz before cessation of current to the simulated utility
Voltage (V)	Frequency (Hz)	
< 50% V	Rated (60 Hz)	0.16
50% V ≤ V < 88% V	Rated (60 Hz)	2
110% V < V < 120% V	Rated (60 Hz)	1
120% V ≤ V	Rated (60 Hz)	0.16
Rated	f > 60.5	0.16
Rated	f < 59.3	0.16

Trip limit and trip time accuracy for all models:

Voltage:	±1 V (L-L)
Frequency:	±0.01Hz
Time:	1%, but not less than 100ms

9.3 FCC compliance information

These devices, DELTA ELECTRONICS (SHANGHAI) CO.,LTD. string inverters, Model E series , comply with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna

Increase the separation between the equipment and the receiver

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes or modifications not expressly approved by Delta Products Corporation could void the user's authority to operate this equipment.

Please Contact Delta Products Corporation for more information:

Delta Electronics (Americas), Ltd.

46101 Fremont Blvd, Fremont, CA 94538

Sales Email: Inverter.Sales@deltaww.com

Support Email: Inverter.Support@deltaww.com

Sales Hotline: +1-877-440-5851 or +1-626-369-8021

Support Hotline: +1-877-442-4832

Support (Intl.): +1-626-369-8019

Monday to Friday from 7am to 5pm PST (apart from Holidays)

www.Delta-Americas.com

9.4 Canada compliance information

This Class B digital apparatus complies with Canadian ICES-003.

10 **Warranty**

The Delta E series grid-tied inverter includes a standard 10-year warranty in effect from the time your inverter is commissioned. For all the Delta E series NA warranty terms and return procedures, please refer to our web site at <http://www.delta-americas.com/SolarInverters.aspx> for further information.

For assistance with warranty repairs or returns you may contact our North America support hotline at: 1-877-442-4832 or via email at support.usa@solar-inverter.com.

11 **Appendix**

Gateway available for E series inverter

E series Gateway	Delta part number
E series GW WEB MONITOR GATEWAY M1 G2	EOE90010381

12 **Glossary**

AC

Abbreviation for "Alternating Current".

AFCI

Abbreviation for "Arc-Fault Circuit Interrupters".

AHJ

Abbreviation for "Authority Having Jurisdiction".

Anti-islanding protection

This is a unit for grid monitoring with assigned switching elements (anti-islanding protection) and is an automatic isolation point for small power generation systems (to 30 kWp).

Basic Insulation

Insulation to provide basic protection against electric shock.

CEC

Abbreviation for the California Energy Commission

CEC Efficiency

CEC Efficiency is the California Energy Commission Efficiency rating, a performance rating for modules and inverters based on the real environment that a system will be in.

CSA

Abbreviation for the Canadian Standards Association.

DC

Abbreviation for "Direct Current".

EMC

The Electro-Magnetic Compatibility (EMC) concerns the technical and legal basics of the mutual influencing of electrical devices through electromagnetic fields caused by them in electrical engineering.

FCC

FCC is the abbreviation for Federal Communications Commission.

Galvanic isolation

No conductive connection between two component parts.

GET

Grounding Electro Terminal

GND

Ground

IEEE

The Institute of Electrical and Electronics Engineers or IEEE (read I-Triple-E) is an international non-profit, professional organization for the advancement of technology related to electricity.

IMI

Isolation Monitor Interrupter

Initialization

Under initialization (cf. English to initialize) is understood the part of the loading process of a program, in which the storage space required for the execution (e.g. variable, code, buffers ...) for the program is reserved and is filled with initial values.

Isc

Short Circuit Current

Local utility company

A local utility company is a company which generates electrical energy and distributes it over the public grid.

MPP

The Maximum Power Point is the point on the current-voltage (I-V) curve of a module, where the product of current and voltage has its maximum value.

NEC

The National Electrical Code (NEC), or NFPA 70, is a United States standard for the safe installation of electrical wiring and equipment.

Nominal power

Nominal power is the maximum permissible continuous power output indicated by the manufacturer for a device or a system. Usually the device is also optimized so that the efficiency is at its maximum in case of operation with nominal power.

Nominal current

Nominal current is the absorbed current in case of electrical devices if the device is supplied with the nominal voltage and yields its nominal power.

PE

In electric systems and cables a protective earth conductor is frequently employed. This is also called grounding wire, protective grounding device, soil, grounding or PE (English „protective earth“).

Photovoltaics (abbr.: PV)

The conversion of PV energy into electrical energy.

The name is composed of the component parts: Photos - the Greek word for light - and Volta - after Alessandro Volta, a pioneer in electrical research.

Power dissipation

Power dissipation is designated as the difference between absorbed power and power of a device or process yielded. Power dissipation is released mainly as heat.

PV cell

PV cells are large-surface photodiodes which convert light energy (generally sunlight) into electrical energy. This comes about by utilization of the photoelectric effect (photovoltaics).

PV generator

System comprising of a number of PV modules.

PV module

Part of a PV generator; converts PV energy into electrical energy.

RJ45

Abbreviation for standardized eight-pole electrical connector connection. RJ stands for Registered Jack (standardized socket).

RS485 (EIA485)

Differential voltage interface on which the genuine signal is transmitted on one core and the negated (or negative) signal on the other core.

Separate grid system

Energy supply equipment which is completely independent of an interconnected grid.

Solar inverter

is an electrical device which converts DC direct voltage into AC voltage and/or direct current into alternating current.

String

Designates a group of electrical PV modules switched in series.

String solar inverter (solar inverter concept)

The PV generator is divided up into individual strings which feed into the grid over their own string solar inverters in each case. In this way, the installation is considerably facilitated and the gain decrease, which can arise from the installation or from different shading conditions of the PV modules, is considerably reduced.

UL

Stands for Underwriters Laboratory, a non-profit organization that sets standards for different product categories and tests products to make sure they meet the standards.

Voc

Open Circuit Voltage

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