



# Operation and Installation manual

SOLVIA 10 EU T4 TL  
SOLVIA 15 EU G4 TL  
SOLVIA 20 EU G4 TL  
SOLVIA 30 EU T4 TL

PRELIMINARY





This manual is subject to change.  
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All information and specifications are subject to change without notice.

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# 1. General Safety Instructions

## English

### DANGER



#### **Risk of death by electrocution**

Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for five minutes after all power sources have been disconnected.

- ▶ Never open the solar inverter.
- ▶ Always disconnect the solar inverter from power before installation, open the DC isolating switch and make sure neither can be accidentally reconnected.
- ▶ Wait at least five minutes until the capacitors have discharged.

### DANGER



#### **Risk of death or serious injury from electrocution**

Potentially fatal voltage may be applied to the DC connections of the solar inverter.

- ▶ Never disconnect the PV modules when the solar inverter is powered.
- ▶ First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ▶ Then open the DC isolating switch.
- ▶ Make sure the DC connections cannot be accidentally touched.

- The solar inverter can be safely and normally operated if installed and used in accordance with this manual (see IEC 62109-5.3.3). Delta Energy Systems is not responsible for damage incurred by failure to observe the installation and operating instructions in this manual. For this reason, be sure to observe and follow all instructions!
- Installation and commissioning may only be performed by qualified electricians using the installation and commissioning instructions found in this manual.
- The solar inverter must be disconnected from power and the PV modules before any work on it can be performed.
- The solar inverter has a high leakage current value. The ground wire **must** be connected before commissioning.
- Do not remove any warning signs that the manufacturer has installed on the solar inverter.
- Improper handling of the solar inverter may result in physical injury and damage to property. For this reason, observe and follow all general safety instructions and warnings.
- The solar inverter contains no components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.
- Do not disconnect any cables when the solar inverter is powered due to risk of a fault arc.

## General Safety Instructions

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- To prevent lightning strikes, follow the relevant regulations applicable in your country.
- The surface of the solar inverter can become very hot.
- The solar inverter is very heavy. The solar inverter must be lifted and carried by at least two people.
- Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.
- All connections must be sufficiently insulated in order to comply with the IP65 protection rating. Unused connections must be closed by placing cover caps on the solar inverter.

## Deutsch

## Allgemeine Sicherheitsanweisungen

### **GEFAHR**



#### **Lebensgefahr durch gefährliche Spannung**

Während des Betriebs liegt im Solar Wechselrichter eine gefährliche Spannung an. Diese gefährliche Spannung liegt noch 5 Minuten lang nach dem Trennen aller Stromquellen an.

- ▶ Öffnen Sie niemals den Solar Wechselrichter.
- ▶ Trennen Sie vor Installationsarbeiten den Solar Wechselrichter immer vom Netz, öffnen Sie den DC-Trennschalter und sichern Sie beides gegen Wiedereinschalten.
- ▶ Warten Sie mindestens 5 Minuten, bis die Kondensatoren entladen sind.

### **GEFAHR**



#### **Lebensgefahr oder Gefahr schwerer Verletzungen durch gefährliche Spannung**

An den DC-Anschlüssen des Solar Wechselrichters können gefährliche Spannungen anliegen.

- ▶ Trennen Sie die PV-Module niemals ab, wenn sich der Solar Wechselrichter unter Last befindet.
- ▶ Schalten Sie zunächst das Netz ab, sodass der Solar Wechselrichter keine weitere Energie einspeisen kann.
- ▶ Öffnen Sie dann den DC-Trennschalter.
- ▶ Sichern Sie die DC-Anschlüsse gegen Berührung ab.

- Der Solar Wechselrichter kann nur sicher und normal betrieben werden, wenn Installation und Betrieb nach Maßgabe dieses Handbuchs erfolgen (siehe IEC 62109-5.3.3). Delta Energy Systems ist für Schäden, die durch Nicht-Einhaltung der Installations- und Betriebsanweisungen in diesem Handbuch entstehen, nicht verantwortlich. Beachten und befolgen Sie deshalb sämtliche Anweisungen in diesem Handbuch!

- Installations- und Inbetriebnahmearbeiten dürfen nur von qualifizierten Elektrotechnikern und anhand der in diesem Handbuch beschriebenen Installations- und Inbetriebnahmeanweisungen durchgeführt werden.
- Bevor am Solar Wechselrichter Arbeiten ausgeführt werden, muss der Solar Wechselrichter vom Netz und von den PV-Modulen getrennt werden.
- Der Solar Wechselrichter weist einen hohen Ableitstrom auf. Der Erdungsleiter **muss vor** der Inbetriebnahme angeschlossen werden.
- Entfernen Sie keine Warnschilder, die vom Hersteller am Solar Wechselrichter angebracht wurden.
- Unsachgemäße Umgang mit dem Solar Wechselrichter kann zu Körperverletzungen und Sachschäden führen. Beachten und befolgen Sie deshalb alle in diesem Handbuch angegebenen allgemeinen Sicherheitshinweise und handlungsbezogenen Warnhinweise.
- Der Solar Wechselrichter enthält keine Komponenten, die vom Bediener oder Installateur zu warten oder zu reparieren sind. Sämtliche Reparaturen müssen von Delta Energy Systems durchgeführt werden. Durch Öffnen der Abdeckung erlischt die Garantie.
- Ziehen Sie keine Kabel ab, wenn der Solar Wechselrichter unter Belastung steht, da die Gefahr eines Störlichtbogens besteht.
- Um Blitzeinschlägen vorzubeugen, befolgen Sie die in Ihrem Land geltenden Regelungen zum Schutz vor Blitzeinschlägen.
- Die Oberfläche des Solar Wechselrichters kann sehr heiß werden.
- Der Solar Wechselrichter ist schwer. Der Solar Wechselrichter muss immer von zwei Personen angehoben und getragen werden.
- An die RS485 und die USB-Schnittstelle dürfen nur Geräte nach SELV (EN 69050) angeschlossen werden.
- Zur Gewährung des Schutzgrads IP65 müssen alle Anschlüsse ausreichend abgedichtet werden. Nicht genutzte Anschlüsse müssen mit den am Solar Wechselrichter angebrachten Abdeckkappen verschlossen werden.

## Italiano

### Indicazioni di sicurezza generali

#### **PERICOLO**



#### **Pericolo di morte dovuto a tensione pericolosa**

Durante il funzionamento, nell'inverter solare si rileva una tensione pericolosa. Anche dopo la separazione da tutte le fonti di corrente, questa tensione pericolosa è presente per ancora 5 minuti.

- ▶ Non aprire mai l'inverter solare.
- ▶ Prima delle operazioni di installazione scollegare sempre l'inverter solare dalla rete, aprire il sezionatore CC e mettere in sicurezza entrambi i componenti affinché non possano essere reinseriti accidentalmente.
- ▶ Attendere almeno 5 minuti perché i condensatori possano scaricarsi.

### **PERICOLO**



#### **Pericolo di morte o pericolo di lesioni gravi dovuto a tensione pericolosa**

Nei collegamenti CC dell'inverter solare possono formarsi tensioni pericolose.

- ▶ Non separare mai i moduli FV quando l'inverter solare è sotto carico.
- ▶ Scollegare prima la rete in modo che l'inverter solare non possa più immettere energia.
- ▶ Aprire poi il sezionatore CC.
- ▶ Proteggere i collegamenti CC per evitare il contatto accidentale con essi.

- Per garantirne il funzionamento normale e sicuro, installare e usare l'inverter attenendosi alle condizioni e misure indicate nel presente manuale (vedi IEC 62109-5.3.3). Delta Energy Systems declina ogni responsabilità per eventuali danni derivati dall'inosservanza delle istruzioni per l'installazione e l'uso contenute nel presente manuale. Attenersi perciò scrupolosamente a tutte le istruzioni riportate nel presente manuale!
- I lavori di installazione e di messa in funzione devono essere eseguiti soltanto da elettrotecnici qualificati e attenendosi alle relative istruzioni riportate nel presente manuale.
- Prima di effettuare dei lavori sull'inverter solare lo si deve scollegare dalla rete e dai moduli FV.
- L'inverter solare ha un'elevata corrente di dispersione. Il conduttore di terra deve essere allacciato prima della messa in funzione.
- Non rimuovere nessun cartello di pericolo apposto dal costruttore dell'inverter solare.
- Se si maneggia l'inverter solare in modo scorretto, si rischiano lesioni alle persone e danni materiali! Perciò attenersi scrupolosamente a tutte le avvertenze di sicurezza generali e alle avvertenze di pericolo relative al maneggio dell'apparecchio riportate in questo manuale.
- Per nessuno dei componenti dell'inverter solare è prevista la manutenzione o la riparazione da parte dell'operatore o dell'installatore. Tutte le riparazioni devono essere eseguite da Delta Energy Systems. L'apertura del coperchio provoca l'annullamento della garanzia.
- Non staccare mai nessun cavo quando l'inverter solare è sotto carico, altrimenti potrebbe generarsi un arco voltaico anomalo.
- Per evitare danni da fulmini attenersi ai regolamenti vigenti in proposito nel proprio Paese.
- La superficie dell'inverter solare può surriscaldarsi enormemente.
- L'inverter solare è pesante. Per questo motivo deve essere sollevato e trasportato sempre da due persone.
- Alle interfacce RS485 e USB è consentito allacciare soltanto apparecchiature SELV (EN 69050).
- Per ottenere il grado di protezione IP65, tutti i collegamenti devono essere a tenuta stagna. I collegamenti non utilizzati devono essere tappati con le calotte di copertura applicate sull'inverter solare.

## Français

### Consignes générales de sécurité

#### DANGER



##### **Danger de mort dû à une tension dangereuse**

Durant le fonctionnement, l'onduleur photovoltaïque est sous tension. Cette tension dangereuse est encore présente 5 minutes après avoir débranché toutes les sources de courant.

- ▶ N'ouvrez jamais l'onduleur photovoltaïque.
- ▶ Avant tous travaux d'installation, débranchez l'onduleur photovoltaïque du réseau, coupez l'interrupteur CC et sécurisez tout afin d'éviter toute remise en service accidentelle.
- ▶ Attendez au moins 5 minutes que les condensateurs se déchargent.

#### DANGER



##### **Danger de mort ou risque de blessures graves liés à une tension dangereuse**

Des tensions dangereuses peuvent être présentes au niveau des connexions CC de l'onduleur photovoltaïque.

- ▶ Ne débranchez jamais les modules PV lorsque l'onduleur photovoltaïque est sous charge.
- ▶ Coupez tout d'abord le réseau afin que l'onduleur photovoltaïque ne puisse plus injecter d'énergie.
- ▶ Coupez ensuite l'interrupteur CC.
- ▶ Protégez les connexions CC de tout contact.

- L'onduleur photovoltaïque ne peut fonctionner normalement et correctement que si son installation et son exploitation ont lieu conformément au présent manuel (voir CEI 62109-5.3.3). Delta Energy Systems ne saurait être tenu pour responsable des dommages causés par le non-respect des consignes d'installation et de fonctionnement mentionnées dans le présent manuel. Pour cette raison, observez et suivez toutes les consignes de ce manuel !
- Les travaux d'installation et de mise en service ne peuvent être réalisés que par des électriciens qualifiés et dans le respect des consignes d'installation et de mise en service décrites dans ce manuel.
- Avant d'effectuer des travaux sur l'onduleur photovoltaïque, celui-ci doit être débranché du réseau et des modules photovoltaïques.
- L'onduleur photovoltaïque présente un fort courant de fuite. **Le conducteur de terre doit être raccordé avant la mise en service.**
- Ne retirez aucun panneau d'avertissement ayant été installé sur l'onduleur photovoltaïque par le fabricant.
- Toute utilisation inappropriée de l'onduleur photovoltaïque peut entraîner des dommages cor-

## General Safety Instructions

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porcels et matériels. Respectez et suivez de ce fait à la lettre toutes les consignes générales de sécurité et les avertissements relatifs aux différentes opérations.

- L'onduleur photovoltaïque ne contient pas de composants qui doivent être entretenus ou réparés par l'utilisateur ou l'installateur. Toutes les réparations doivent être réalisées par Delta Energy Systems. L'ouverture du couvercle entraîne l'annulation de la garantie.
- Ne débranchez aucun câble quand l'onduleur photovoltaïque est sous charge en raison du risque d'arc électrique.
- Afin de prévenir les décharges de foudre, respectez les réglementations en vigueur dans votre pays.
- La surface de l'onduleur photovoltaïque peut être très chaude.
- L'onduleur photovoltaïque est lourd. **L'onduleur photovoltaïque doit être soulevé et porté par au moins deux personnes.**
- Seuls les appareils selon SELV (EN 69050) peuvent être raccordés aux interfaces RS485 et USB.
- Afin de garantir la protection IP65, toutes les connexions doivent être suffisamment étanchéifiées. Les connexions non utilisées doivent être obturées avec les capuchons installés sur l'onduleur photovoltaïque.

## Español

### Instrucciones de seguridad generales

#### PELIGRO



#### **Peligro de muerte por tensión peligrosa**

Durante el servicio puede generarse una tensión peligrosa en el inversor solar. Esta tensión peligrosa sigue presente incluso 5 minutos después de desconectar todas las fuentes de alimentación.

- ▶ No abrir nunca el inversor solar.
  - ▶ Antes de realizar los trabajos de instalación, separar siempre el inversor solar de la red, abrir el seccionador de CC y asegurar ambos contra una nueva posible conexión.
  - ▶ Esperar como mínimo 5 minutos hasta que se hayan descargado los condensadores.
-



 **PELIGRO**



**Peligro de muerte o de lesiones graves por tensión peligrosa**

Las conexiones de CC del inversor solar presentan riesgo por tensiones peligrosas.

- ▶ No separar nunca los módulos FV con el inversor solar bajo carga.
- ▶ Desconectar primero la red eléctrica de forma que el inversor solar no pueda seguir suministrando energía.
- ▶ Abrir entonces el seccionador de CC.
- ▶ Asegurar las conexiones CC contra el contacto.

- El servicio seguro y normal del inversor solar está garantizado únicamente si tanto la instalación como el servicio se llevan a cabo de conformidad con las indicaciones contenidas en el presente manual (véase la norma IEC 62109-5.3.3). Delta Energy Systems no se responsabiliza por los daños derivados del incumplimiento de las instrucciones de servicio e instalación contenidas en el presente manual. Se debe prestar atención y respetar la totalidad de las instrucciones del presente manual.
- Los trabajos de instalación y puesta en marcha deben realizarlos solamente técnicos electricistas competentes siguiendo las instrucciones de instalación y puesta en marcha descritas en este manual.
- Antes de realizar trabajos en el inversor solar, se debe separar el inversor solar de la red y de los módulos FV.
- El inversor solar presenta un valor de corriente de fuga elevado. El conductor de puesta a tierra **debe** conectarse antes de iniciar el servicio.
- No retirar ni eliminar las placas de advertencia colocadas por el fabricante en el inversor solar.
- Cualquier manipulación inadecuada del inversor solar puede provocar lesiones y daños materiales. Por eso se debe respetar la totalidad de los avisos de seguridad generales y de las advertencias relativas al funcionamiento que se indican en el presente manual.
- El inversor solar no contiene componentes sometidos a mantenimiento o a la reparación por parte del instalador o del usuario. Todas las reparaciones deberán ser ejecutadas por Delta Energy Systems. La apertura de la cubierta implica la anulación de la garantía.
- No retirar ningún cable cuando el inversor solar esté sometido a cargas debido al peligro de que se genere un arco voltaico parásito.
- Para evitar posibles descargas eléctricas deberá respetarse la normativa nacional vigente relativa a la protección contra descargas eléctricas.
- La superficie del inversor solar puede alcanzar temperaturas muy elevadas.
- El inversor solar es pesado. El inversor solar debe levantarse y moverse siempre entre dos personas.
- En las interfaces para RS485 y USB deben conectarse exclusivamente unidades con una muy baja tensión de seguridad (norma EN 69050).
- Para garantizar el tipo de protección IP65 se deben aislar eficientemente todas las conexiones. Las conexiones no usadas se deben cerrar con las tapaderas fijadas en el inversor solar.

## Nederlandse

### Algemene veiligheidsinstructies

#### GEVAAR



##### Levensgevaar door gevaarlijke spanning

Tijdens het bedrijf staat de omvormer voor zonne-energie onder gevaarlijke spanning. Deze gevaarlijke spanning blijft nog 5 minuten na het loskoppelen van alle stroombronnen aanwezig.

- ▶ Open de omvormer voor zonne-energie nooit.
- ▶ Koppel de omvormer voor zonne-energie vóór installatiewerkzaamheden altijd los van het net, open de DC-scheidingsschakelaar en beveilig beide tegen inschakelen.
- ▶ Wacht minstens 5 minuten tot de condensatoren ontladen zijn.

#### GEVAAR



##### Levensgevaar of gevaar voor ernstig letsel door gevaarlijke spanning

Op de DC-aansluitingen van de omvormer voor zonne-energie kan gevaarlijke spanning staan.

- ▶ Koppel de PV-modules nooit los als de omvormer voor zonne-energie zich onder belasting bevindt.
- ▶ Schakel eerst het net uit, zodat de omvormer voor zonne-energie geen energie meer kan leveren.
- ▶ Open dan de DC-scheidingsschakelaar.
- ▶ Beveilig de DC-aansluitingen tegen aanraking.

- De omvormer voor zonne-energie kan alleen veilig en normaal worden gebruikt wanneer de installatie en het gebruik volgens dit handboek plaatsvinden (zie IEC 62109-5.3.3). Delta Energy Systems is niet verantwoordelijk voor schade die ontstaat door het niet in acht nemen van de installatie- en gebruiksvoorschriften in dit handboek. Neem daarom alle instructies in dit handboek in acht en volg ze op!
- Installatie- en inbedrijfstellingswerkzaamheden mogen alleen door gekwalificeerde elektriciëns worden uitgevoerd aan de hand van de in dit handboek beschreven installatie- en inbedrijfstellingsinstructies.
- Voordat er werkzaamheden aan de omvormer voor zonne-energie worden uitgevoerd, moet de omvormer voor zonne-energie worden losgekoppeld van het net en de PV-modules.
- De omvormer voor zonne-energie vertoont een hoge lekstroom. De aardingsdraad **moet vóór** de inbedrijfstelling worden aangesloten.
- Verwijder geen waarschuwingsbordjes die door de fabrikant op de omvormer voor zonne-energie zijn aangebracht.
- Ondeskundige omgang met de omvormer voor zonne-energie kan lichamelijk letsel en materiële schade veroorzaken. Neem daarom alle algemene veiligheidsinstructies en alle

waarschuwingen met betrekking tot handelingen in dit handboek in acht en volg ze op.

- De omvormer voor zonne-energie bevat geen componenten die door de gebruiker of installateur onderhouden of gerepareerd moeten worden. Alle reparaties moeten door Delta Energy Systems worden uitgevoerd. Indien de afdekking wordt geopend, vervalt de garantie.
- Koppel geen kabels los wanneer de omvormer voor zonne-energie onder belasting staat, aangezien er gevaar voor een vlamboog bestaat.
- Neem om blikseminslag te voorkomen de in uw land geldende regelingen ter voorkoming van blikseminslag in acht.
- Het oppervlak van de omvormer voor zonne-energie kan zeer heet worden.
- De omvormer voor zonne-energie is zwaar. De omvormer moet altijd door twee personen worden getild en gedragen.
- Op de RS485- en de USB-interface mogen alleen apparaten worden aangesloten die voldoen aan SELV (EN 69050).
- Om de IP65-bescherming te waarborgen, moeten alle aansluitingen voldoende worden afgedicht. Niet gebruikte aansluitingen moeten worden afgesloten met de op de omvormer voor zonne-energie aangebrachte afdekkappen.

## Dansk

### Generelle sikkerhedsanvisninger

#### FARE



##### **Livsfare pga. farlig spænding**

Under driften er der farlig spænding i solcelleinverteren. Denne farlige spænding findes stadig 5 minutter efter, at alle strømkilder er koblet fra.

- ▶ Åbn aldrig solcelleinverteren.
- ▶ Afbryd solcelleinverteren altid fra nettet inden installationsarbejder, åbn DC-skilleafbryderen, og sørg for at sikre begge mod genindkobling.
- ▶ Vent mindst 5 minutter, indtil kondensatorerne er afladet.

#### FARE



##### **Livsfare eller fare for alvorlige kvæstelser på grund af farlig spænding**

Der kan være farlig spænding på solcelleinverterens DC-tilslutninger.

- ▶ Afmonter aldrig fotovoltaikelementerne, mens der er strøm på solcelleinverteren.
- ▶ Frakobl først nettet, så solcelleinverteren ikke kan levere yderligere energi til nettet.
- ▶ Åbn derefter DC-skilleafbryderen.
- ▶ Sørg for at sikre DC-tilslutningerne mod berøring.

## General Safety Instructions

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- Solcelleinverteren kan kun betjenes sikkert og korrekt, hvis den er installeret og anvendes i overensstemmelse med denne håndbog (se IEC 62109-5.3.3). Delta Energy Systems hæfter ikke for skader, der opstår pga. manglende overholdelse af installations- og driftsanvisningerne i denne håndbog. Overhold og følg derfor samtlige anvisninger i denne håndbog!
- Installations- og idrifttagningsarbejderne må kun udføres af kvalificerende elektrikere og i overensstemmelse med de installations- og idrifttagningsanvisninger, der findes i denne håndbog.
- Inden der udføres arbejder på solcelleinverteren, skal solcelleinverteren afbrydes fra nettet og fotovoltaikmodulerne.
- Solcelleinverteren afgiver en høj lækstrøm. Jordlederen **skal tilsluttes inden** idrifttagningen.
- Fjern ikke advarselsskilte, som er placeret på solcelleinverteren af producenten.
- Ukorrekt håndtering af solcelleinverteren kan medføre kvæstelser og materielle skader! Overhold og følg derfor alle angivne generelle sikkerhedshenvisninger og handlingsrelevante advarselshenvisninger, der findes i denne håndbog.
- Solcelleinverteren indeholder ingen komponenter, der skal vedligeholdes eller repareres af brugeren eller montøren. Samtlige reparationer skal udføres af Delta Energy Systems. Garantien ophører, hvis dækslet åbnes.
- Træk ikke kablerne ud, mens solcelleinverteren er tilsluttet strømmen, da der er fare for lysbuefejl.
- Overhold de nationale bestemmelser for at beskytte mod lynnedslag.
- Solcelleinverterens overflade kan blive meget varm.
- Solcelleinverteren er tung. Solcelleinverteren skal altid løftes og bæres af mindst to personer.
- Kun apparater, der er i overensstemmelse med SELV-standarden (EN 69050), må tilsluttes til RS485 og USB-interface.
- For at sikre kapslingsklassen IP65 skal alle tilslutninger være tilstrækkeligt tætnet. Tilslutninger, der ikke er i brug, skal lukkes med de afdækningshætter, der er anbragt på solcelleinverteren.

## Slovenský

## Všeobecné bezpečnostné pokyny



### NEBEZPEČENSTVO



#### Nebezpečenstvo ohrozenia života vplyvom nebezpečného napätia

Počas prevádzky je solárny inverter pod nebezpečným napätím. Toto nebezpečné napätie zotrváva ešte 5 minút po odpojení všetkých zdrojov napätia.

- ▶ Solárny inverter nikdy neotvárajte.
- ▶ Pred inštaláciami vždy odpojte solárny inverter od siete, rozpojte odpojovač DC a obe zariadenia zabezpečte proti opätovnému zapnutiu.
- ▶ Počkejte minimálne 5 minút, kým sa kondenzátory nevybijú.

## NEBEZPEČENSTVO



### Nebezpečenstvo ohrozenia života alebo ťažkých poranení vplyvom nebezpečného napätia

Na DC prípojkách solárneho invertora môžu byť nebezpečné napätia.

- ▶ Nikdy neodpájajte PV-moduly, keď je solárny inverter pod zaťažением.
- ▶ Najprv odpojte sieť, aby solárny inverter nemohol dodávať žiadnu ďalšiu energiu.
- ▶ Potom rozpojte odpojovač DC.
- ▶ Zabezpečte DC prípojky pred dotykmi.

- Solárny inverter možno bezpečne a normálne prevádzkovať iba vtedy, ak inštalácia bola vykonaná resp. prevádzka je vykonávaná v súlade s touto príručkou (pozri IEC 62109-5.3.3). Delta Energy Systems nezodpovedá za škody, ktoré vzniknú v dôsledku nedodržovania inštalčných a prevádzkových pokynov uvedených v tejto príručke. Z tohto dôvodu dodržiavajte a dbajte na všetky pokyny uvedené v tejto príručke!
- Inštalčné práce a práce súvisiace s uvedením do prevádzky smú vykonávať iba kvalifikovaní elektrotechnici, a to pri dodržiavaní inštalčných pokynov a pokynov týkajúcich sa uvedenia do prevádzky, ktoré sú uvedené v tejto príručke.
- Pred vykonaním prác na solárnom invertore sa tento musí odpojiť od siete a od PV modulov.
- Solárny inverter vykazuje vysoký zvodový prúd. Uzemňovací vodič sa musí pripojiť **pred** uvedením do prevádzky.
- Neodstraňujte žiadne výstražné štítky, ktoré na solárny inverter umiestnil výrobca.
- Neodborná manipulácia so solárnym invertorom môže viesť k poraneniam a vecným škodám. Z tohto dôvodu rešpektujte a dodržiavajte všetky všeobecné bezpečnostné pokyny a výstražné pokyny týkajúce sa manipulácie, ktoré sú uvedené v tejto príručke.
- Solárny inverter neobsahuje žiadne komponenty, na ktorých by obsluha alebo inštalatéri museli vykonávať údržbu alebo opravy. Všetky opravy musia vykonávať pracovníci z Delta Energy Systems. Otvorením krytu zaniká záruka.
- Z dôvodu nebezpečenstva vzniku elektrického oblúka nevyťahujte počas zaťaženia solárneho invertora žiadne káble.
- Pre elimináciu zásahov bleskom dodržiavajte predpisy platné vo Vašej krajine, ktoré sa týkajú ochrany pred zásahmi bleskom.
- Povrch solárneho invertora sa môže výrazne zahriať.
- Solárny inverter je ťažký. Solárny inverter musia vždy nadvíhovať a prenášať minimálne dve osoby.
- Na rozhrania RS485 a USB sa smú pripojiť len zariadenia, ktoré sú v súlade so SELV (EN 69050).
- Pre zaručenie stupňa ochrany IP65 musia byť všetky prípojky dostatočne utesnené. Nepoužívané prípojky sa musia uzavrieť pomocou krycích uzáverov, ktoré sa nachádzajú na solárnom invertore.

## Český

### Všeobecné bezpečnostní pokyny

#### NEBEZPEČÍ



##### **Ohrožení života v důsledku nebezpečného napětí**

V solárním střídači je během provozu nebezpečné napětí. Toto nebezpečné napětí trvá ještě 5 minut po odpojení od všech elektrických zdrojů.

- ▶ Solární střídač v žádném případě a za žádných okolností neotvírejte.
- ▶ Před instalací je solární střídač nutno odpojit od sítě, odpojit jistič DC a obojí zajistit proti opětovnému zapnutí.
- ▶ Počkejte minimálně 5 minut, dokud se nevybijí kondenzátory.

#### NEBEZPEČÍ



##### **Nebezpečí ohrožení života nebo těžkých úrazů v důsledku nebezpečného napětí**

DC přípojky solárního střídače mohou být pod nebezpečným napětím.

- ▶ Jestliže je solární střídač pod zátěží resp. proudem, v žádném případě neodpojujte FV moduly.
- ▶ Nejprve odpojte síť, tak aby solární střídač nemohl dodávat žádnou další energii.
- ▶ Poté odpojte DC jistič.
- ▶ DC přípojky zajistíte tak, aby se jich nebylo možno dotknout.

- Solární střídač lze bezpečně a normálně provozovat jen tehdy, když jeho instalaci a provoz provedete v souladu s touto příručkou (viz IEC 62109-5.3.3). Společnost Delta Energy Systems nezodpovídá za škody, ke kterým dojde v důsledku nedodržení instalačních a provozních pokynů uvedených v této příručce. Proto dbejte všech pokynů v této příručce a dodržujte je!
- Práce v rámci instalace a uvedení do provozu je dovoleno provádět jen kvalifikovaným elektrotechnikům, a to v souladu s pokyny pro instalaci a uvedení do provozu popsány v této příručce.
- Na solárním střídači je dovoleno pracovat jen po odpojení od sítě a FV modulů.
- Solární střídač vykazuje vysoký svodový proud. Uzemňovací vodič se **musí připojit před** uvedením do provozu.
- Neodstraňujte žádné výstražné štítky, které výrobce na solární střídač namontoval.
- Neodborné zacházení se solárním střídačem může způsobit tělesná poranění a věcné škody. Proto dbejte všech všeobecných bezpečnostních pokynů a praktických varování v této příručce a dodržujte je.
- Solární střídač neobsahuje žádné součásti, které by vyžadovaly údržbářské zásahy nebo opravy ze strany obsluhy či instalátéra. Veškeré opravy musí být prováděny společností

Delta Energy Systems. Otevřením krytu ztrácíte nárok na plnění ze záruky.

- Kabele neodpojujte, dokud je solární střídač pod zatížením, protože hrozí nebezpečí rušivého světelného oblouku.
- Zajistěte prevenci proti zásahu bleskem, a to dodržováním ustanovení platných ve vaší zemi.
- Povrch solárního střídače může být velmi horký.
- Solární střídač je těžký. Solární střídač je nutno zvedat a přenášet vždy ve dvou.
- K rozhraní RS485 a rozhraní USB je dovoleno připojovat jen přístroje dle SELV (EN 69050).
- Za účelem zajištění stupně ochrany IP65 je nutno všechny přípojky dostatečně utěsnit. Nepoužívané přípojky je nutno zavřít krytkami upevněnými na solárním střídači.

## 2. General Information

### 2.1 About this Manual

This manual provides the detail information for the specification, installation procedures and all related functional settings of the solar inverter model - SOLIVIA 10EUT4TL / SOLIVIA 15EUG4TL / SOLIVIA 20EUG4TL / SOLIVIA 30EUT4TL. Installation technicians must be well-trained and qualified for installing solar system and must follow all the safety instruction and installation procedures.

### 2.2 Safety Symbols & Instruction



**CAUTION!**  
Machine and equipment damage may occur if this hazardous situation is not avoided



**WARNING!**  
Death and serious injury may occur if this hazardous situation is not avoided



**DANGER!**  
Death and serious injury will occur if this hazardous situation is not avoided



**WARNING! BURN HAZARD**  
The enclosure temperature may exceed 70° C while inverter is in operation. A dangerous burn hazard is present in this situation. Please do not touch!

### 2.3 Validity

This user manual describes the installation procedures, maintenance, technical data and safety instruction of the following solar inverter models under the DELTA brand.

Model	Software:: DSP ver.	Red. ver.	Comm. ver.
<b>SOLIVIA 10EUT4TL</b>	1.83	1.36	1.56
<b>SOLIVIA 15EUG4TL</b>	1.83	1.36	1.56
<b>SOLIVIA 20EUG4TL</b>	1.83	1.36	1.56
<b>SOLIVIA 30EUT4TL</b>	1.83	1.36	1.56

The software version of your inverter is found on the inverter display. Please find more information in section 7.35 "Inverter Information."



## 2.4 Product Description

The SOLIVIA 10 TL / 15 TL / 20 TL / 30 TL are 3 phase grid-tied solar inverters with reactive power control. These devices convert direct current (DC) electricity from photovoltaic power collected from PV arrays into 3 phase alternating current (AC) to feed the excess capacity back to the local mains electrical grid. Using cutting-edge technology allows a wide voltage input range (250~1000 V) and high performance efficiency based on a user-friendly operation design. In addition, special DSP (Digital Signal Processor) design decreases the circuit complication and electronic components. Please note that this device does not support off-grid function. The following are the key features of SOLIVIA 10 / 15 / 20 / 30 TL 3 phase grid-tied solar inverters.

### Key Features

- Power Rating: 10 / 15 / 20 / 30 kVA
- Power Balancing (33/67) in asymmetrical dc loading situations
- 3-Phase (3-Phase + N + PE), Grid-tie, Transformerless solar inverter
- Maximum efficiency: > 98.0 %
- Europe efficiency: > 97.8 %
- Reactive power capability (Cap 0.80 - Ind 0.80)
- Low input current harmonic distortion (THD < 3%) @ full load
- 2 MPP Trackers
- Record up to 30 event logs.
- 5" LCD display
- EPO

The 10 TL / 15TL / 20 TL / 30 TL inverters comply with the latest country regulations and standards. Please see chapter 7 - Operating the PV Inverter for the complete list of compliance standards.

## 2.5 Application & Intended Use

The operation of the solar inverter is as shown as in the figure 2.1. In order to save energy and electricity, solar inverters convert the DC input power supplied from the PV array into three-phase AC output power to the grid.

The solar inverter may be used in the following countries as shown:

**NOTE**



The country list may change due to ongoing certification processes. If you have any questions, please contact the Delta Support Team.

**Countries supported\*:** Belgium, France, Italy, Netherlands, Spain, Greece, Germany, Czech Republic, Slovakia, Slovenia, Portugal, Bulgaria, Romania, United Kingdom, United Kingdom (240 V), Australia, French Islands, Denmark.

**Language supported:** English, Italian, French, German, Dutch, & Spanish

\*Please note at the time of printing, all countries shown may not necessarily be available for 30 TL model, but are expected to be completed within Q1 2013. Please check with the Delta support team for questions about countries approved.

The solar power inverter may only be used as intended.

Proper use of the solar power inverter meets the following criteria:

- Use in stationary PV systems connected to the local power grid for converting the direct current in the PV system to alternating current and feeding it into the grid
- Use within the specified power range (see Sec. 12.1 - Technical Specifications) and under the specified ambient conditions (indoor area or covered outdoor area with up to IP65)

Any of the following uses of the solar power inverter is considered improper:

- Isolated operation: The solar power inverter has anti-islanding and other monitoring features.
- Use in mobile PV systems.

**2.6 Additional Information**

For more detailed information about the SOLIVIA 10 TL, 15 TL, 20 TL, and 30 TL or other related product information, please visit the website at <http://www.solar-inverter.com> for more support.

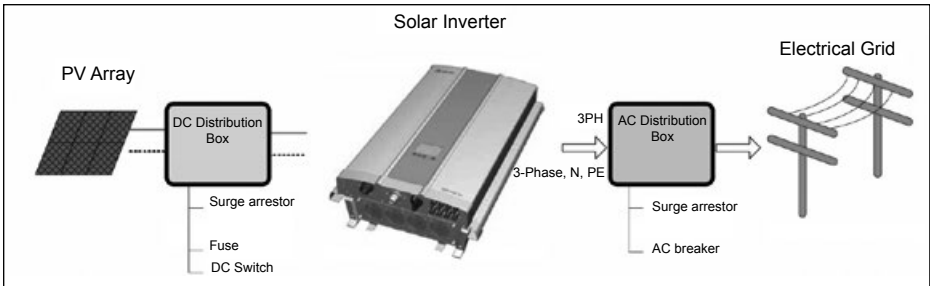


Figure 2.1.: Solar Inverter System Operation Illustration

## 2.7 Monitoring

The SOLIVIA TL inverters include a display for monitoring performance on location. Remote monitoring is also an option. The 10 TL, 15 TL, 20 TL, and 30 TL with Solar Log and Meteocontrol as well as Delta's own monitoring solution, SOLIVIA Monitor G2. Please contact your Delta supplier for more information on these remote monitoring options.

SOLIVIA Monitor G2 ensures reliable operation and maximum performance of PV systems. The system is compatible with all SOLIVIA String Inverter models from Delta. The all-in-one solution is made up of the SOLIVIA GW M1 G2, a gateway that acts as an interface, and an online portal that is available to users at <http://monitoring.solar-inverter.com>. Both real-time data reports and historical data statistics can be generated and exported as a CSV or Excel file. Automated alert messages notify the operator and ensure that the solar investment pays off. The installer also has the opportunity to manage its customers' systems in order to gain a quick overview of the system status at all times. What's more, the user receives information on the weather and also the latest news via the integrated news feed.

For more information about technical features and functions, please refer to the company website at the following link: <http://www.solar-inverter.com/eu/en/SOLIVIA-monitoring-system.htm>.

### 3. Preparing for Installation

#### 3.1 Instruction before Installing

Due to the variety of user installation environments, reading the manual thoroughly before installation is strongly recommended. All the installation and start-up procedures must be undertaken by a professional and well-trained technician.

#### 3.2 Checking the Package

There might be some unpredictable situations during transportation. Please check if there is any damage to the cardboard carton. After opening the package, please check both the outer case and inner part of this inverter as below.

1. Check the right side on the inverter case to ensure the model number and the specification is the same with the model you have purchased.
2. Check if there are any loose components.
3. Check if all the accessories are in the package, the standard accessories are listed in the below table:

Item	Quantity	Description
10 TL, 15 TL, 20 TL, or 30 TL Solar Inverter	1	10 kVA, 15 kVA, 20 kVA, or 30 kVA solar inverter
User Manual	1	User installation and operation instructions
AC Plug	1	Connector for AC connection
Mounting Bracket	1	Bracket to install the inverter on the wall

Table 3.1.: Packing List

#### NOTE



When there is outer or inner damage on the inverter or there is any missing or damaged standard accessories, please contact your inverter supplier for support.

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### 3.3 Unpacking

1. Open the top of the cardboard box as shown in the figure below.
2. Remove the top packing material after opening the box.
3. Lift the Inverter out of the package and save the packaging in case of return.

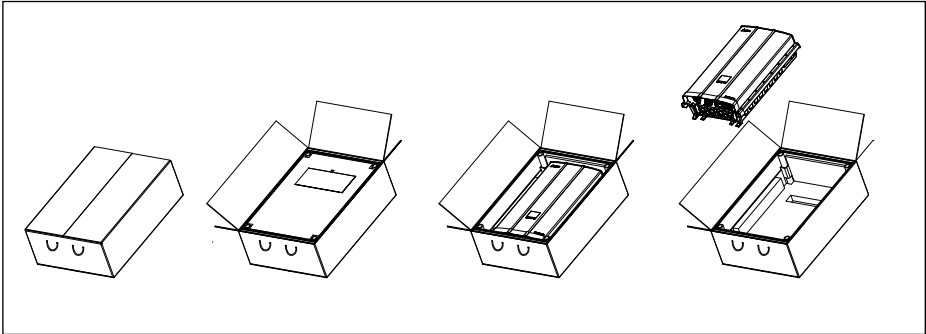


Figure 3.1.: Unpacking Process

### 3.4 Identify the Inverter

User can identify the model number by the information on the product label. The model number, specification as well as the series no. is specified on the product label. In regard to the label location, please refer to the below figure.

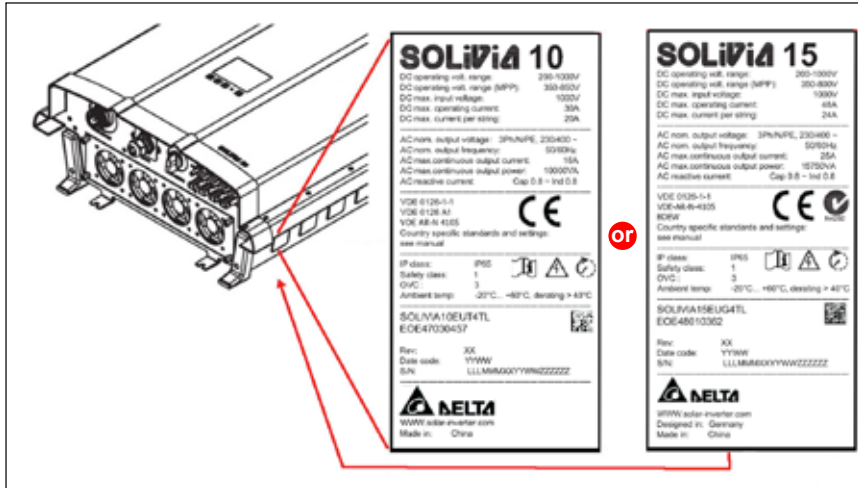


Figure 3.2.: The Type Label 10 TL and 15 TL

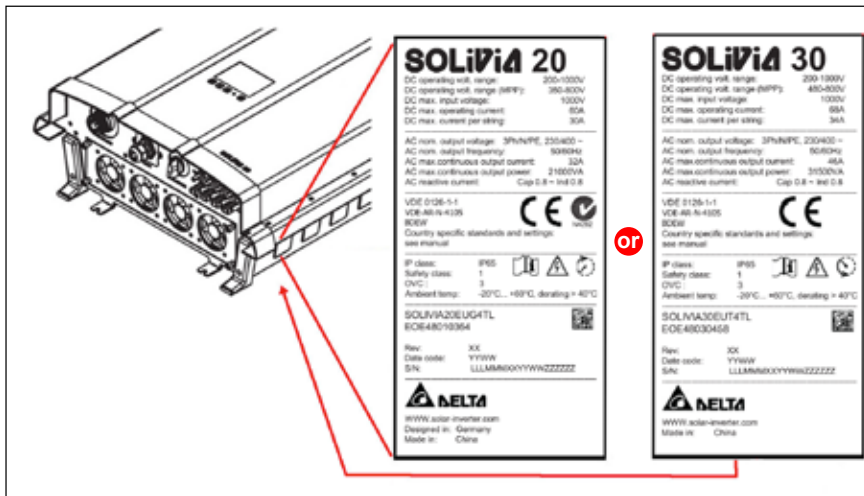
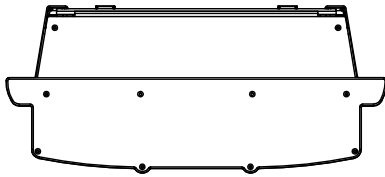


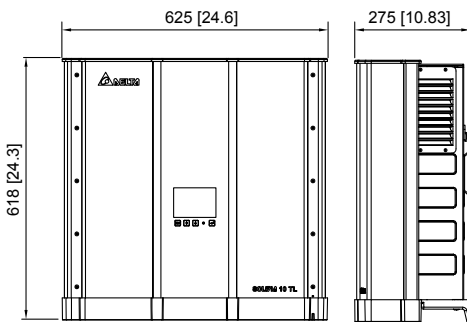
Figure 3.3.: The Type Label 20 TL and 30 TL

## 4. Product Overview

### 4.1 Dimensions SOLIVIA 10 TL

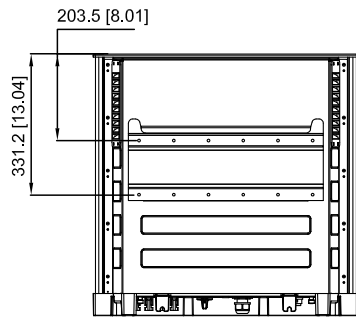


Top view

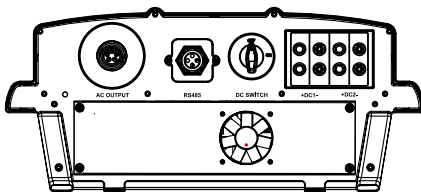


Front view

Side view



Rear view



Bottom view

Figure 4.1.: Dimensions of SOLIVIA 10 TL

## 4.2 Dimensions SOLIVIA 15 TL, 20 TL, 30 TL

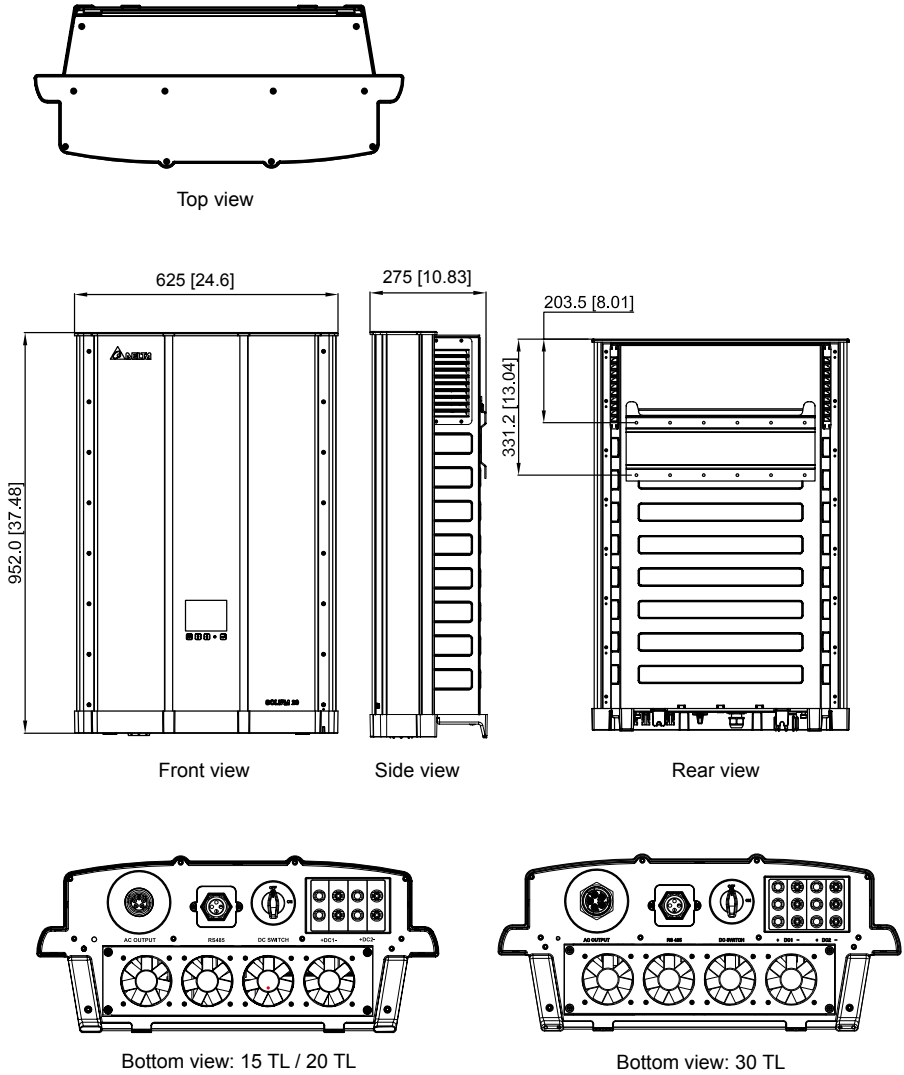
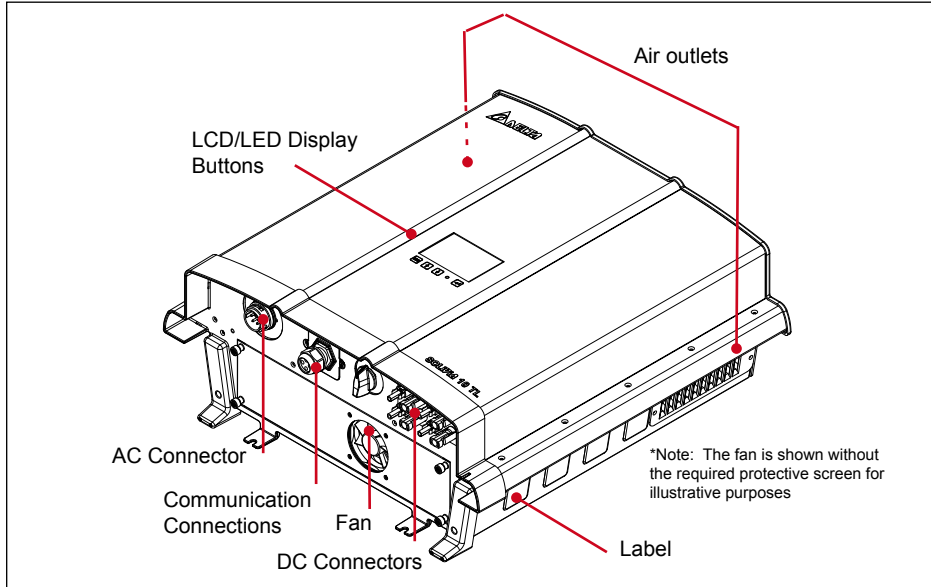


Figure 4.2.: Dimensions of SOLIVIA 15 TL / 20 TL / 30 TL



### 4.3 Function Introduction

Inverter exterior features are shown on figure 4.3 and 4.4, and a more detailed description is found in the sections from 4.3.1 to 4.3.3



## Product Overview

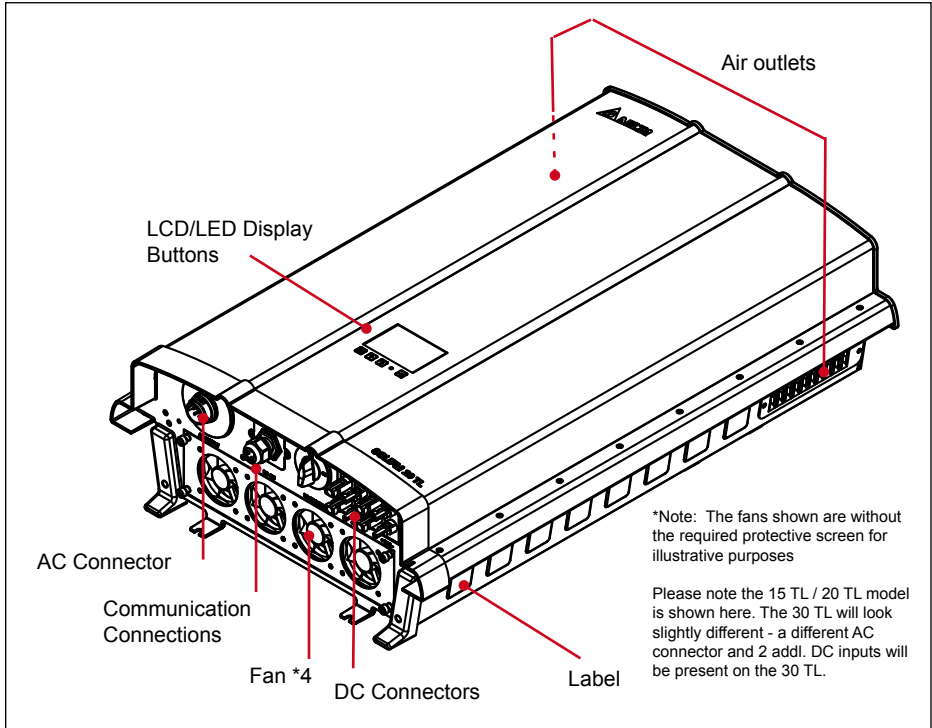


Figure 4.4.: 15 TL / 20 TL / 30 TL Inverter Exterior View

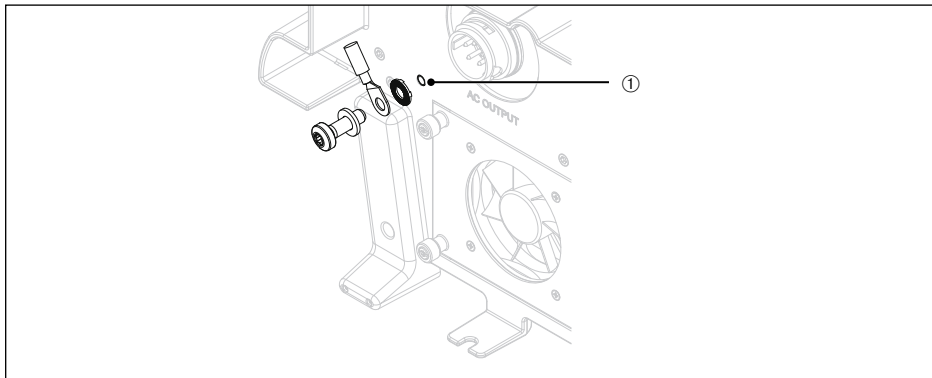


Figure 4.5.: Grounding Kit

The chassis has a predrilled hole ① to accept a grounding screw as shown. The maximum torque of the M6 grounding screw is 4.4 Nm. There is a 15 mm diameter unpainted surface around the center of the ground screw hole that allows for a solid ground connection when installing the grounding kit.

### 4.3.1 LCD Display and Buttons

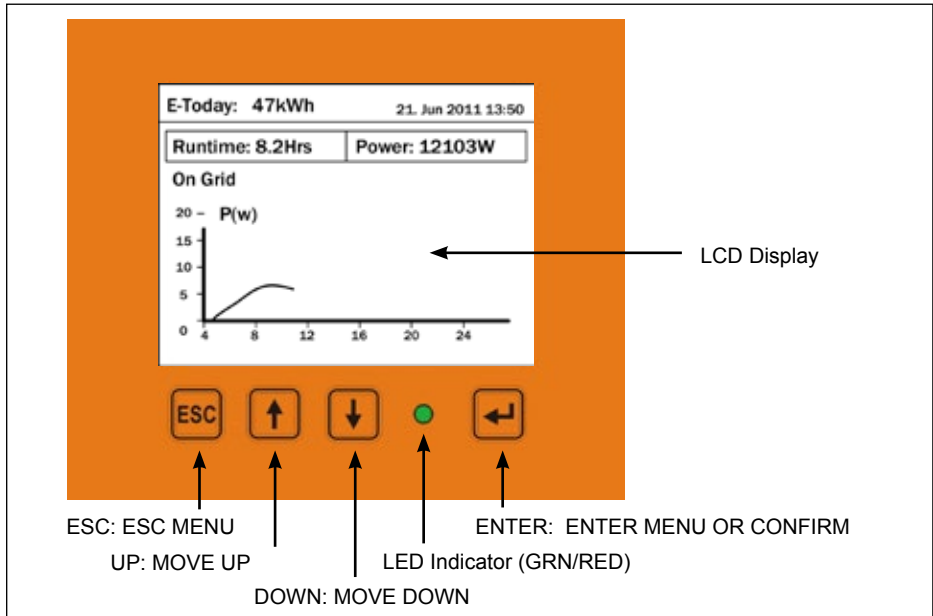


Figure 4.6.: LCD Display and Control Panel

### 4.3.2 Inverter Input/Output Interface

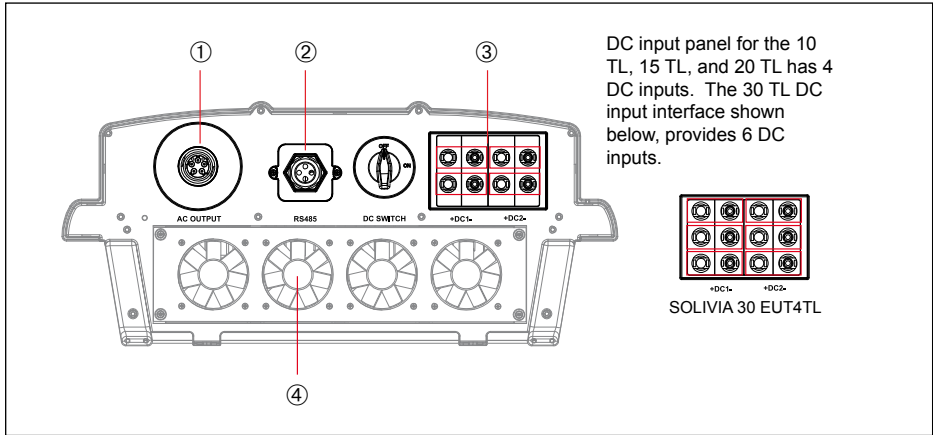



Figure 4.7.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V <sub>AC</sub> for 10 / 15 / 20 TL ; 500 V <sub>AC</sub> for 30 TL
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings (10 TL / 15 TL / 20 TL), 6 Strings (30 TL)
④	Fans	4 Fans (10 TL model with only one fan)

**NOTE**

 The fans shown are without the required protective screen for illustrative purposes. The 15 TL, 20 TL and 30 TL models have 4 fans in the fan tray, whereas the 10 TL will only have one fan.

### 4.3.3 Air outlet

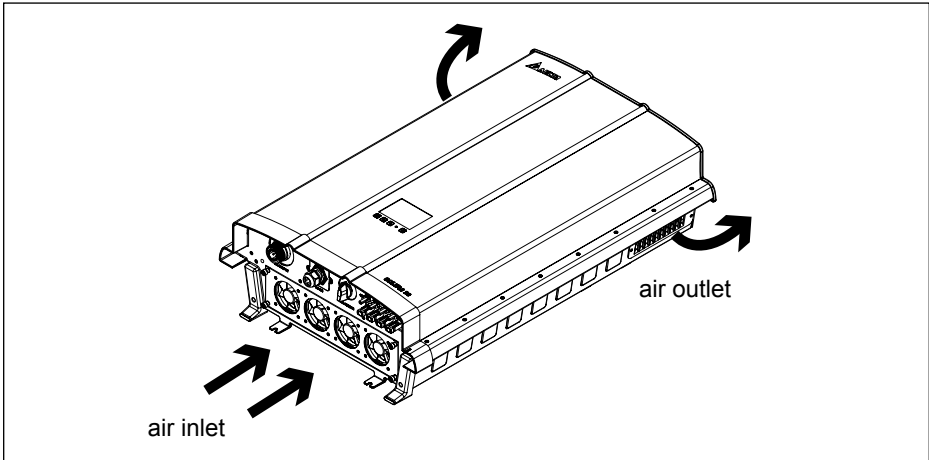


Figure 4.8.: Air Outlet Illustration

There are 4 fans in the bottom section of the inverter and all fans work synchronously. If any one fan locks up or is defective, it will cause a fan failure and power derating. If you suspect that there is a problem with a fan please call the Delta support hotline.

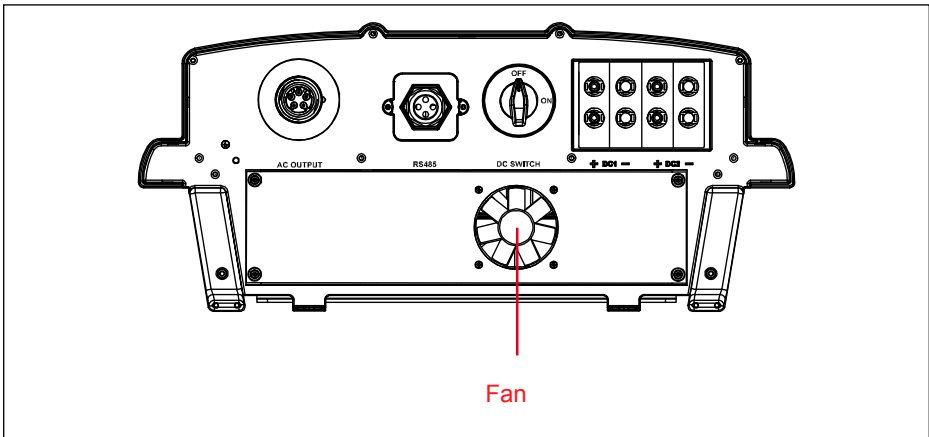


Figure 4.9.: Fan Control 10 TL

Product Overview

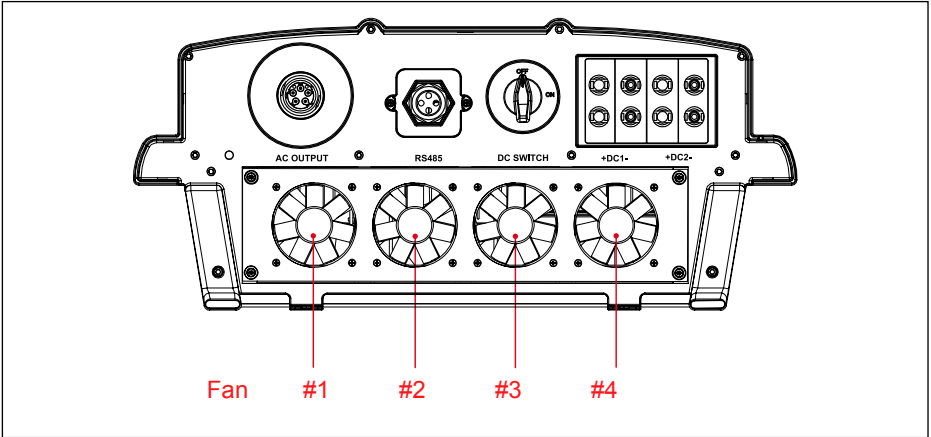


Figure 4.10.: Fan Control 15 TL and 20 TL

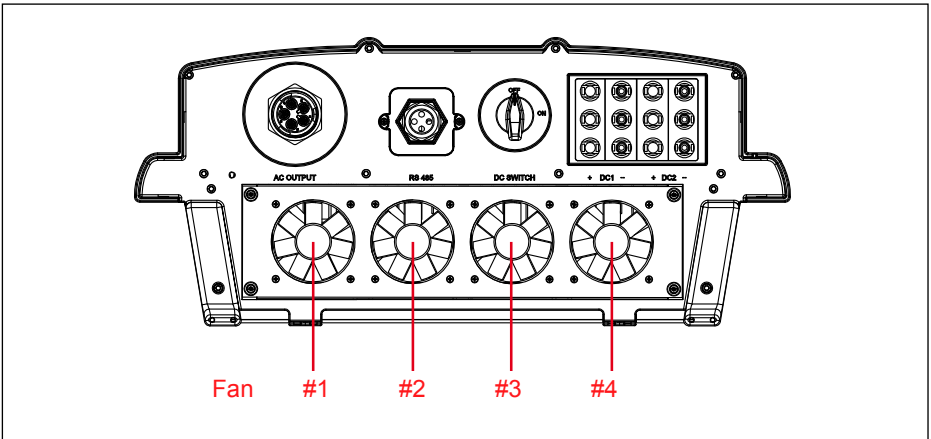


Figure 4.11.: Fan Control 30 TL

## 5. Installation

### 5.1 Installing Location

The SOLIVIA TL inverters can be installed indoors and in protected outdoor areas due to its enclosure protection classes IP65 and IP55. See the figure 5.1 for further explanation of the protection classes.

#### WARNING



**Death and serious injury may occur if the following instructions are not carefully followed**

- ▶ Do not install the unit near/on flammable objects.
- ▶ Do not install the unit at a location that people can gain entry/touch easily.
- ▶ Mount the unit tightly onto a solid/ smooth wall.
- ▶ In order to ensure the safety of installers, there should be at least two people to handle the installation.
- ▶ When moving the SOLIVIA TL, installer should not stand under material handling machines.
- ▶ Dusty conditions can impair the unit's performance

#### WARNING



- ▶ According to the Australian/New Zealand standard AS/NZS 5033:2005, PV arrays for installation on domestic dwellings should not have a maximum voltage greater than 600 V. For non-domestic installations where the PV array maximum voltage exceeds 600 V, the entire PV array and associated wiring and protection, should have restricted access, only accessible to authorized personnel.

#### CAUTION



**Machine and equipment damage may occur.**

- ▶ Do not install the unit at a location that has direct exposure to sunlight.

## Installation

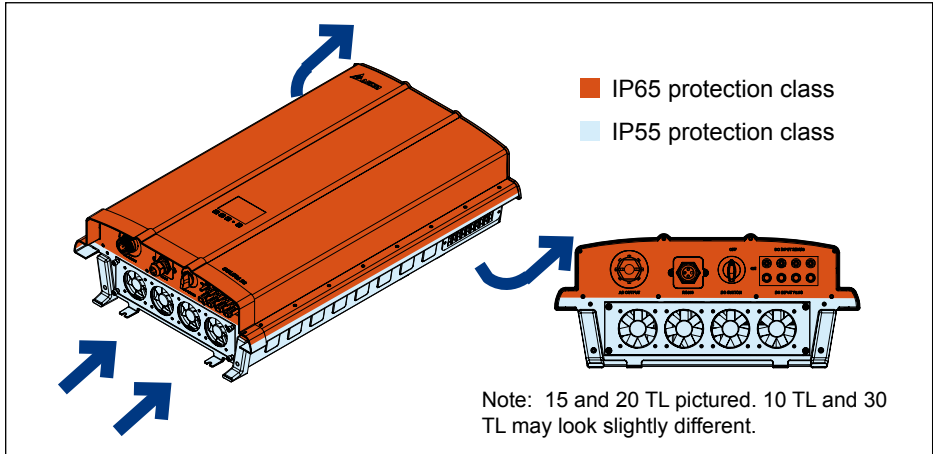


Figure 5.1.: SOLIVIA 10 TL, 15 TL, 20 TL, 30 TL protection classes

### NOTE



The fans shown are without the required protective screen for illustrative purposes. The 15 TL, 20 TL and 30 TL models have 4 fans in the fan tray, whereas the 10 TL will only have one fan.

The upper section of the inverter, shown in the darker tone above, is sealed from the lower section and rated at IP65 enclosure protection. The lower section of the inverter, containing the cooling mechanisms, is rated at IP55 enclosure protection.

## 5.2 Mounting

This unit utilizes a wall mounting system. Please ensure the installation is perpendicular and with the AC plug at the bottom. Do not install the device on a slanted wall. The dimensions of the mounting bracket are shown in the following figures. There are 12 pcs. of M6 screws required for attaching the mounting plate to the wall. Attach the mounting plate securely to the wall, before attaching the inverter on the mounting plate.

### NOTE



Please ensure you are using the correct fastener for the material you are attaching the inverter mounting plate to.



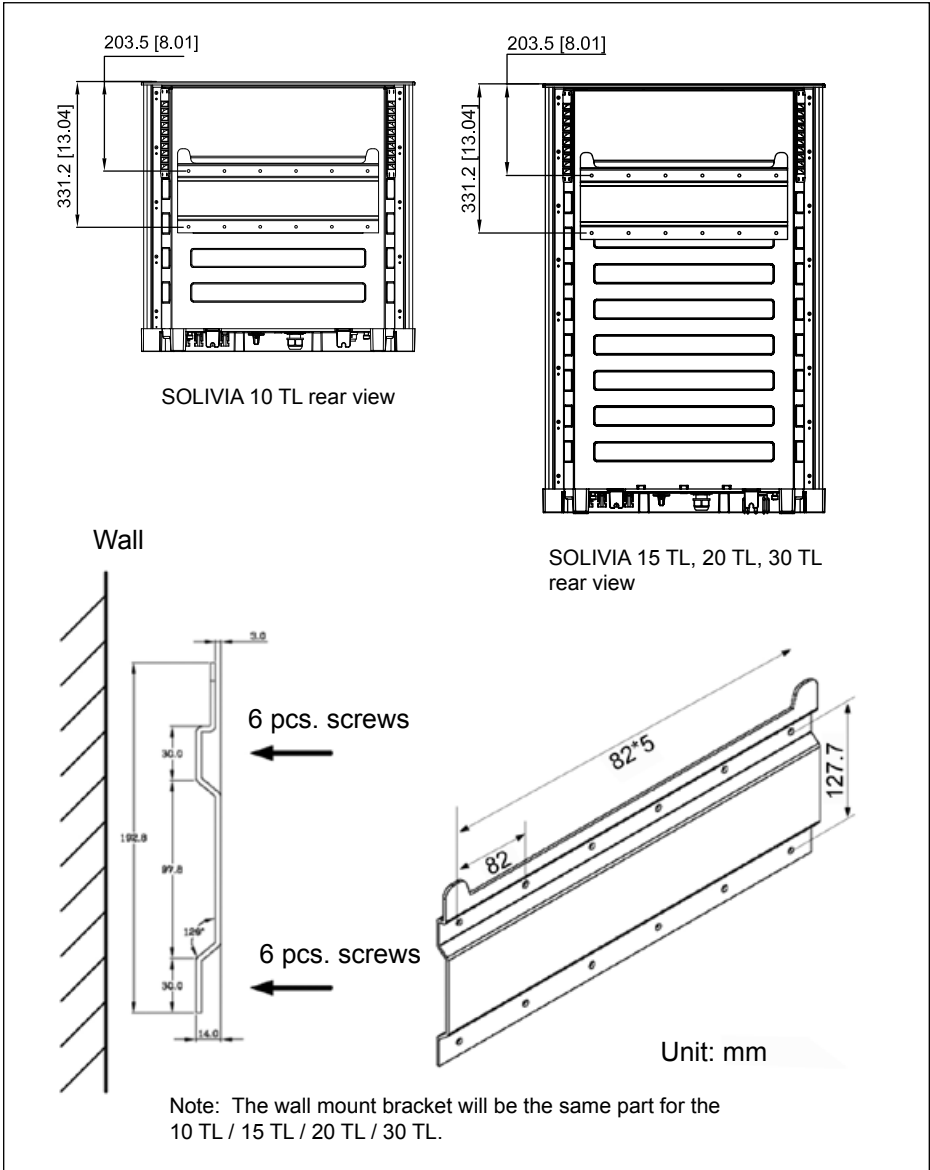


Figure 5.2.: Attaching the mounting bracket to the wall

## Installation

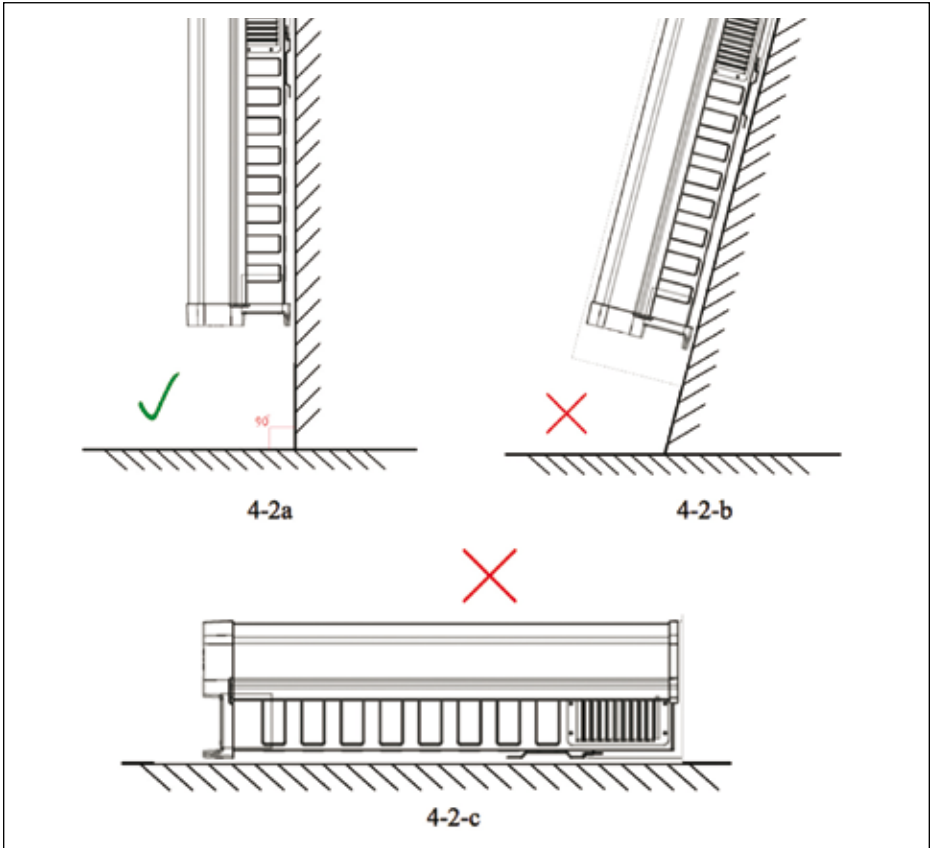


Figure 5.3.: Correct and Incorrect Installation Illustration

### CAUTION



#### Machine and equipment damage may occur.

- ▶ Please leave an appropriate gap in between when installing single / several DELTA solar inverter systems.
- ▶ Please install solar inverters at eye level to allow easy observation for operation and parameter setting.
- ▶ Please install solar inverter in a clean and open space.
- ▶ The ambient temperature should be between  $-20^{\circ}\text{C}$  ...  $+60^{\circ}\text{C}$ .

There should be sufficient space for product operation as shown in the figure 5-4. If necessary, the installer should increase the gap space for optimum product performance.

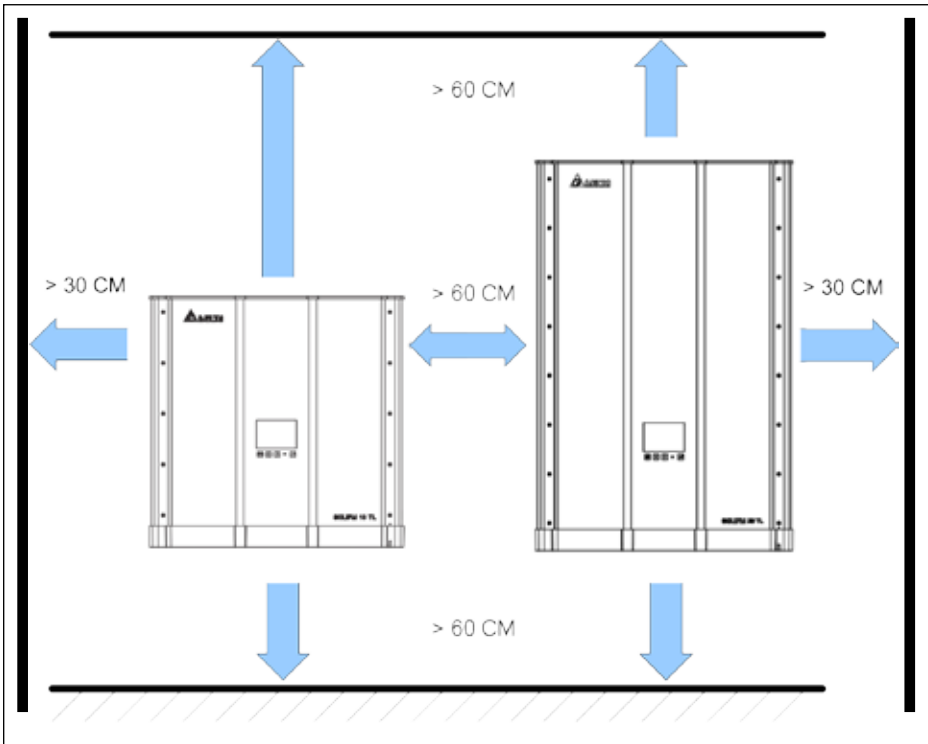


Figure 5.4.: Proper Installation Gap

### 5.3 Ambient temperature

The solar inverter can be operated in an ambient temperature between  $-20\text{ }^{\circ}\text{C}$  ...  $+60\text{ }^{\circ}\text{C}$ . The following diagram illustrates how the power supplied by the solar inverter is reduced automatically in accordance with the ambient temperature. The device should be installed in a well-ventilated, cool and dry location.

## Installation

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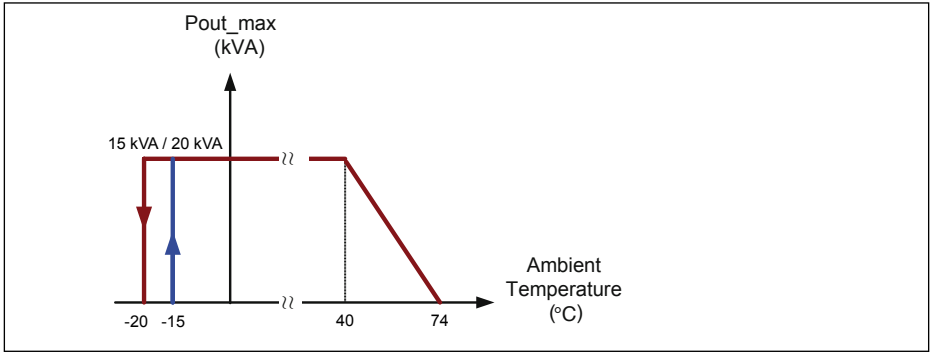


Figure 5.5.: Derating curve for 10 TL, 15 TL, 20 TL and 30 TL

## 6. Wiring the Inverter

### 6.1 Preparation before Wiring

1. To avoid accidents, please confirm that the PV inverter's power of both DC and AC are switched off.
2. Please confirm whether the input/output of PV inverter's wiring are clearly indicated. Make sure that the value, polarity, voltage and phase are correct.
3. The wiring procedure of a PV system is shown in figure 6-1 and 6-2. Wiring details are described in the following paragraphs.
  - When the DC input is floating, an external transformer is not necessary. Please refer to Figure 6-1 for the connection. The inverter can accept DC inputs in parallel (1 MPP tracker) or separate DC input connections (2 MPP Trackers).
  - When an asymmetrical DC load is detected, the solar inverter will automatically adjust for optimum output. Please see section 6.3.1 for more details. This is useful where there are two strings of modules on roof surfaces with different orientations, such as in the case of a dormer with north & south facing surfaces.

### CAUTION



#### **Machine and equipment damage may occur.**

- ▶ When the DC input is a positive ground or negative ground, all of the strings must be connected in parallel and then connected to the inverters. In addition, an external isolation transformer must be installed on the AC side, otherwise, damage will result and the inverter will not work properly. Different DC input wiring needs require different insulation detection settings. To learn more about the settings, please refer to [„6.3.6.2 Install Settings“ on page 54.](#)

## Wiring the Inverter

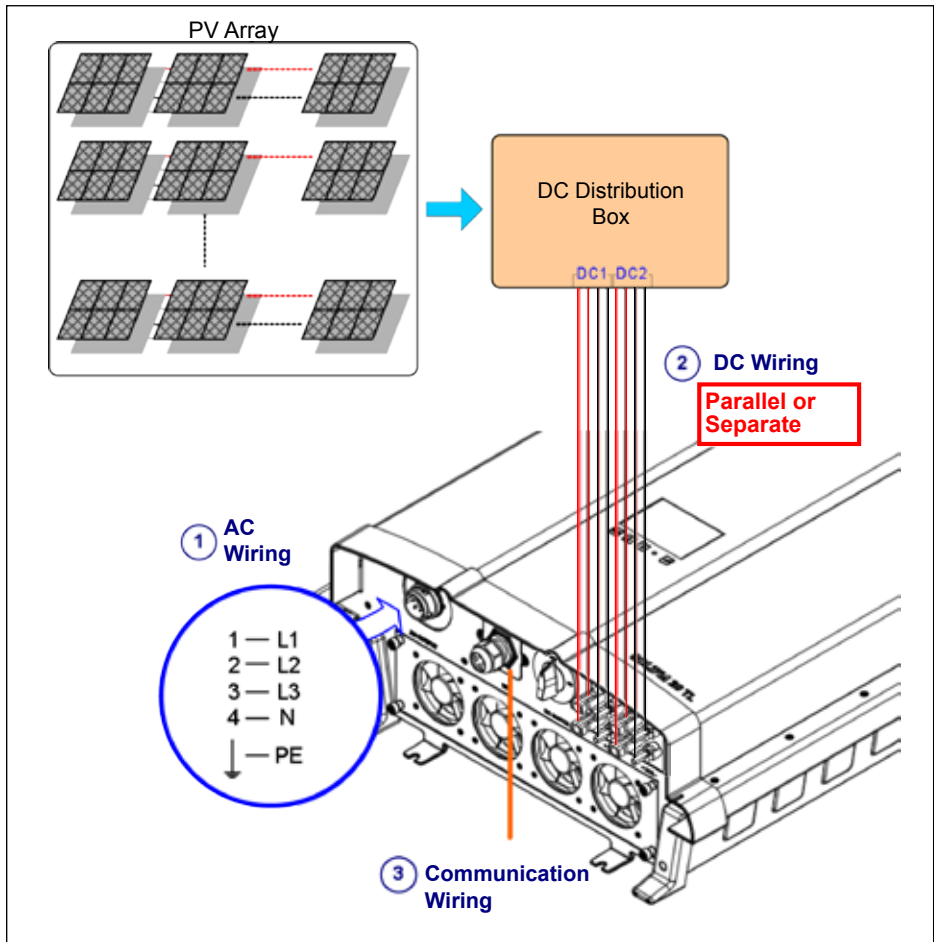


Figure 6.1.: Connection of system if DC inputs are floating

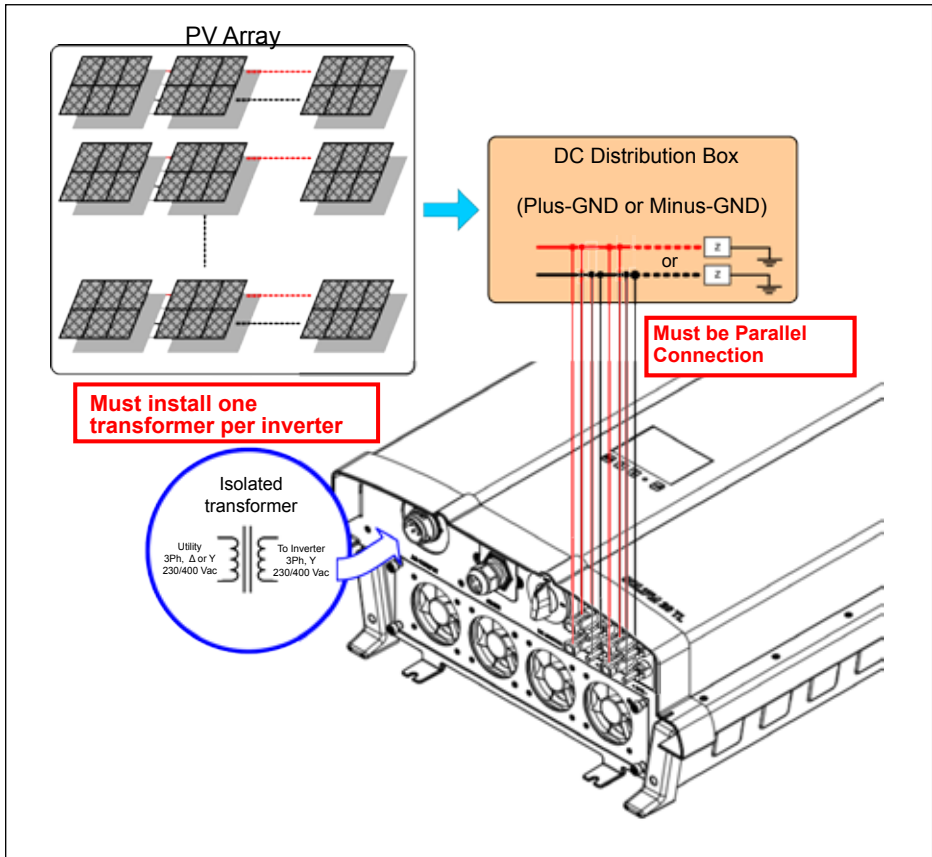


Figure 6.2.: Connection of system with Positive Ground or Negative Ground

## 6.2 AC Grid Connection: 3 Phase + N + PE

### WARNING



#### Death and serious injury may occur

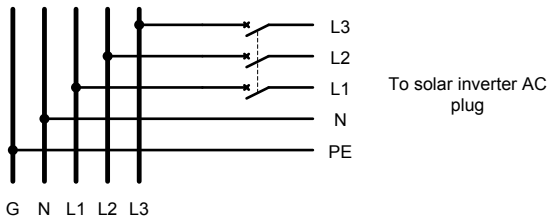
- ▶ Before engaging in the AC wiring, please ensure the AC 3-phase power is switched off.

## Wiring the Inverter

### 6.2.1 Required protective devices and cable cross-sections

Please use the proper upstream circuit breaker to protect the inverter according to the table:

Model	Upstream Circuit Breaker
SOLIVIA 10 TL	20 A
SOLIVIA 15 TL	30 A
SOLIVIA 20 TL	40 A
SOLIVIA 30 TL	60 A



#### 6.2.1.1 Residual Current Devices

The SOLIVIA 10 TL / 15 TL / 20 TL / 30 TL are not capable of feeding in DC residual currents due to their design. They fulfill this requirement in accordance with DIN VDE 0100-712.

The possibilities of faults were examined without taking the integrated residual-current monitoring unit (RCMU) into account. When examining these faults in terms of the current valid installation standards, no danger in combination with a type A upstream residual-current device can occur. Therefore faults that would otherwise require the use of a type B residual-current device due to the inverter can be excluded.

The integrated all-pole sensitive residual-current monitoring unit (RCMU) results in additional safety. For all above mentioned transformerless inverters from Delta RCDs of the type A can be used.

#### 6.2.1.2 AC Cable Requirements

Please use properly sized wire to connect to the correct poles (According to the table below)

Model	AC connector*	Current Rating	Min. / Max. Cable size allowed	Min. / Max. wire size allowed in screw terminals	Torque of terminal screws
10 TL / 15 TL / 20 TL	Amphenol C16-3	≤ 40 A	11 mm <sup>2</sup> / 20 mm <sup>2</sup>	4 mm <sup>2</sup> / 8 mm <sup>2</sup> (12 AWG / 9 AWG)	≥ 0.7 Nm (7 kg)
30 TL	Amphenol PPC AC 24	≤ 60 A	22 mm <sup>2</sup> / 32 mm <sup>2</sup>	10 mm <sup>2</sup> / 16 mm <sup>2</sup> (8 AWG / 6 AWG)	≥ 0.9 Nm (10 kg)

\* Please follow up with Amphenol for the latest information regarding the AC connectors

Table 6.1.: Cable cross sections and torques for AC connectors



AC wiring can be separated into 3-phase (L1, L2, L3), N, and PE. The following earthing configurations are allowed. IT is not allowed. Please see the appendix for further explanation of these earthing systems.

TN-S	TN-C	TN-C-S	TT	IT
Yes	Yes	Yes	Yes	No

Table 6.2.: Permitted earthing systems

## NOTE



TT is not recommended. Have to be sure the voltage of N is very close to PE ( $< 20 V_{rms}$ )

### 6.2.2 AC bayonet connectors for 10 TL, 15 TL, 20 TL

The AC bayonet connectors are approved for cable sheath diameters between 11 mm and 20 mm. To install an AC cable, first strip the voltage free line and cable ends as shown below and then follow the sequence in Figure 6.5 to assemble the cable and bayonet connector.

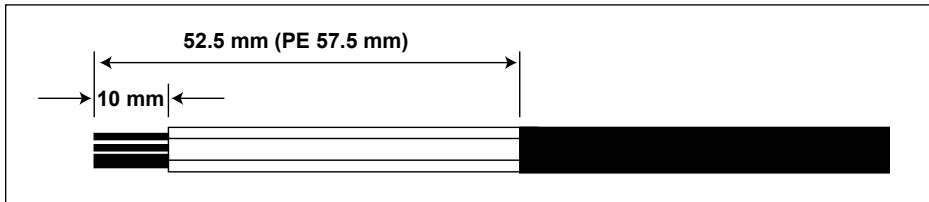


Figure 6.3.: AC cable stripping requirements for 10 TL, 15 TL, and 20 TL

## NOTE

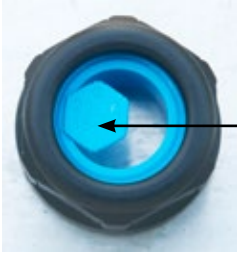


For lines with a cable sheath diameter from 16 mm to 20 mm, the cable gland must be adapted accordingly. To do this, cut out the inner section of the blue sealing ring.

In Figure 6.5, the Amphenol C connector shown can be mated with the 10 TL / 15 TL / 20 TL inverter's AC plug. After disassembly of the connector, please adhere to the correct polarity for proper AC wiring (this product allows either positive or negative phase sequence). That means the sequence of L1-L3 can be adjusted and the N and PE must be connected.

## Wiring the Inverter

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This is a rear view of the cable gland. For a cable sheath diameter between 16 mm to 20 mm, please remove the inner sealing ring.

*Figure 6.4.: AC plug sealing ring for AC connector 10 TL, 15 TL, and 20 TL*

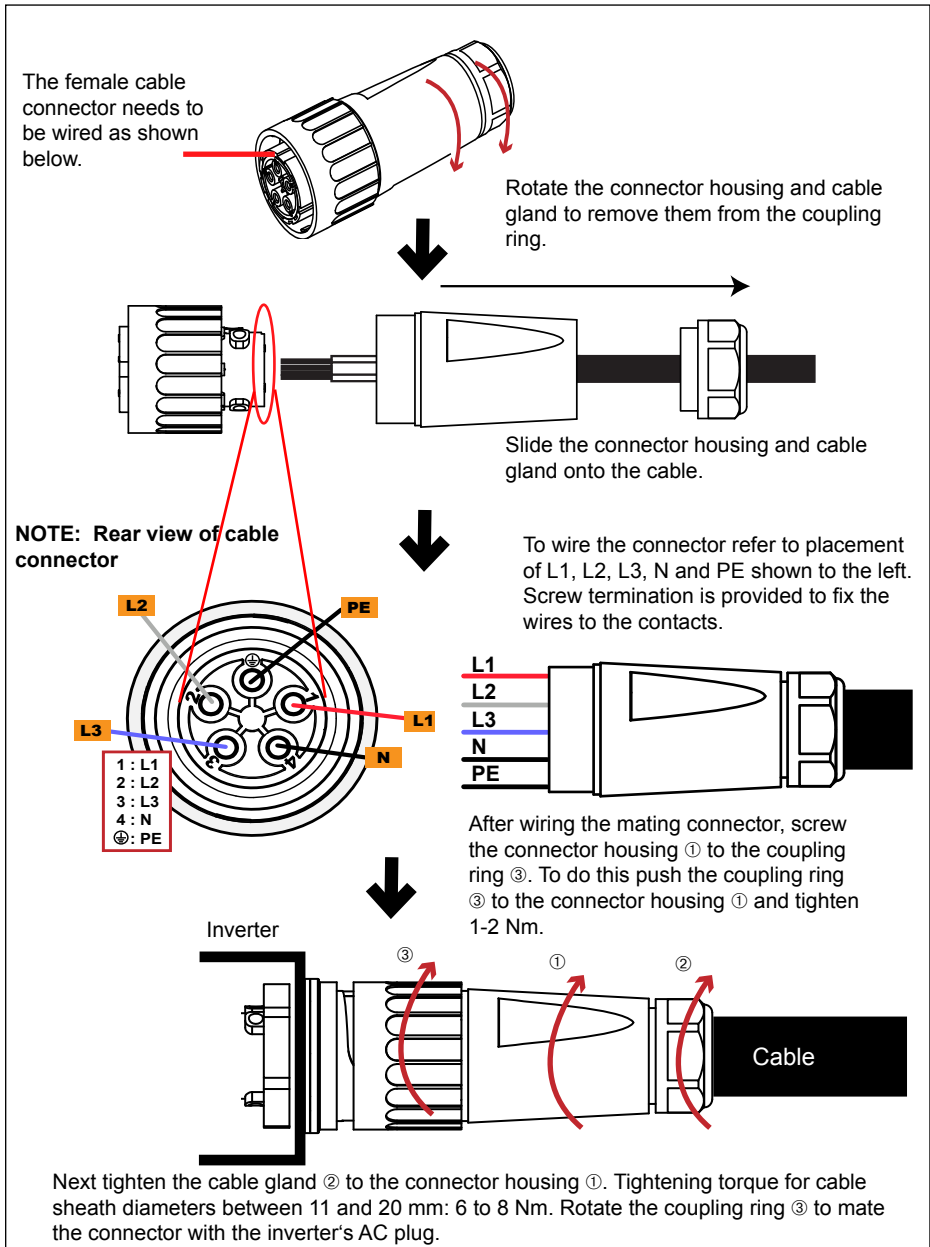


Figure 6.5.: AC connector 10 TL, 15 TL, and 20 TL

## CAUTION



**Machine and equipment damage may occur.**

- ▶ Observe the pin assignment of the AC bayonet connector. An incorrect assignment can result in the unit being destroyed. The Figure 6.5 pin out diagram shows the connections inside the AC connector.

## NOTE



Make sure the line is provided with a strain relief device. When using cables with a diameter of less than 13 mm (**11 mm ... 13 mm** diameter cable require strain relief), the cable must be relieved just behind the connector.

### 6.2.3 AC bayonet connectors for 30 TL

The AC bayonet connector for 30 TL are approved for cable sheath diameters between 22 mm and 32 mm. To install an AC cable, first strip the voltage free line and cable ends as shown below and then follow the sequence in Figure 6.7 to assemble the cable and bayonet connector.

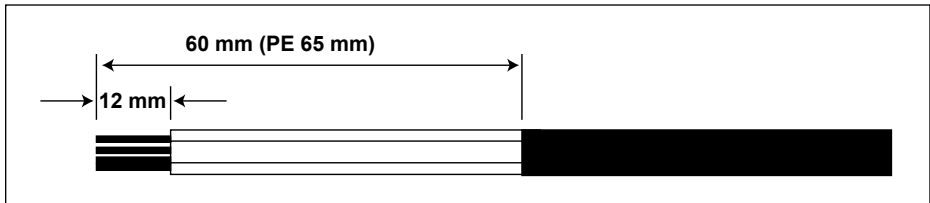


Figure 6.6.: AC cable stripping requirements for 30 TL

In Figure 6.7, the Amphenol PPC AC 24 connector shown can be mated with the 30 TL inverter's AC plug. After disassembly of the connector, please adhere to the correct polarity for proper AC wiring (this product allows either positive or negative phase sequence). That means the sequence of L1-L3 can be adjusted and the N and PE must be connected.

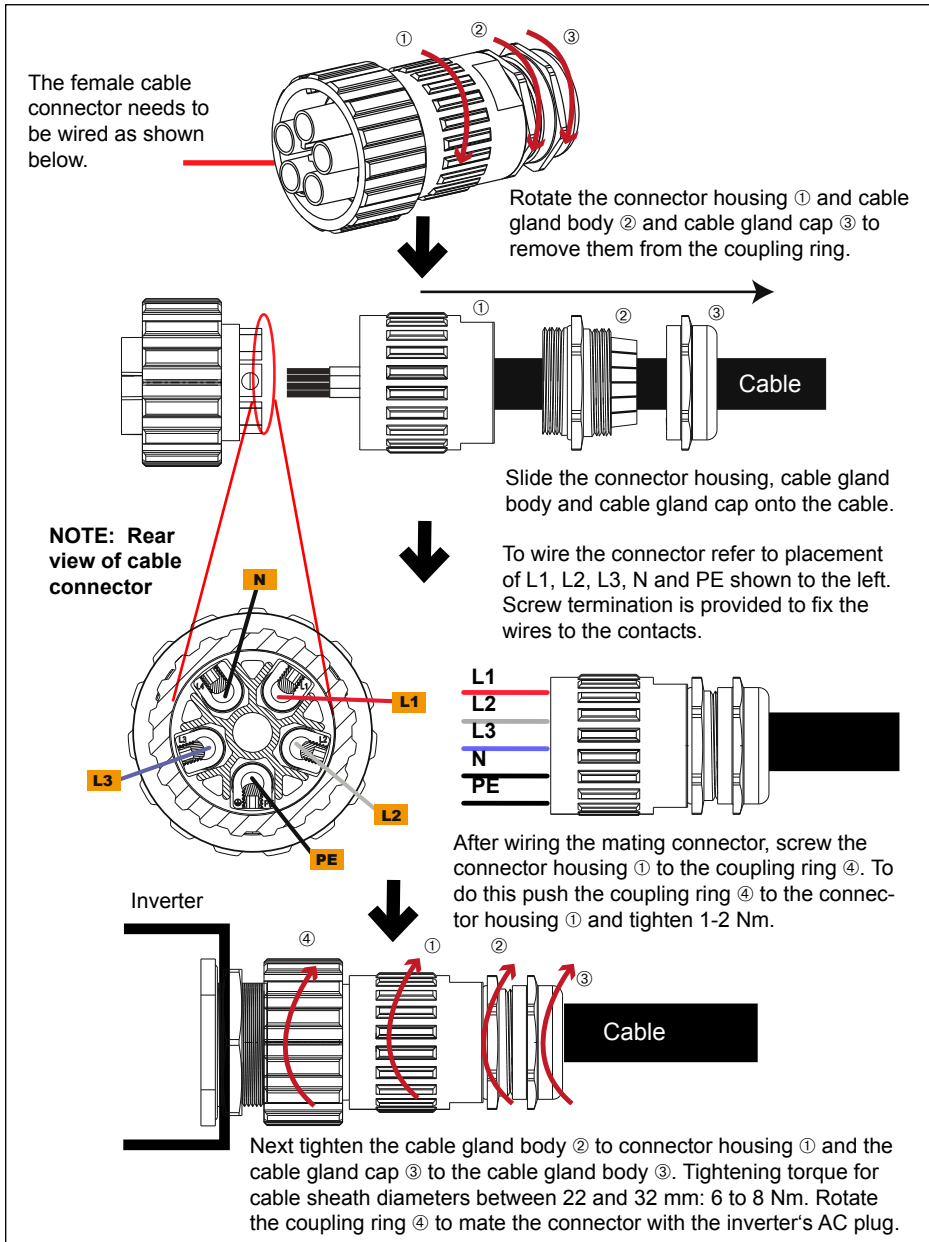


Figure 6.7.: AC connector for 30 TL

### 6.2.4 AC Wiring Considerations

The connection to the Amphenol AC connector for all models can be made with a flexible or rigid cable with a copper conductor that has the appropriate cross section according to table 6.1 and which has an installation condition that gives a correction factor equal to one. The AC cable should be protected by a minimum type B 40 Amp breaker for 10 TL / 15 TL / 20 TL and minimum type B 60 Amp breaker for 30 TL.

This connector is developed for connection to copper wires (for other applications please contact Amphenol). The cross section of the cable should be calculated by considering the material used, thermal conditions, length of the cable, the type of installation, and AC voltage drop.

Please note the cable length and the cable cross-section, due to the risk of undesirable temperature rise and power losses. In some countries, (e.g. France, Germany, Australia) system installation requirements have to be followed (UTE 15712-1, VDE 0100 712, AS/NZS 5033:2005). This recommendation will define minimum cable sections and protections against overheating due to high currents. Please make sure that you follow specific requirements in your country.

For the security of your installation and for the safety of the user, please install required safety and protection devices that are applicable for your installation environment (example: automatic circuit breaker and/or overcurrent protection equipment).



#### WARNING



##### Death and serious injury may occur

In the case of damage or bodily harm resulting from the use of this device in a way contrary to its intended purpose or as a result of unauthorized modifications made to the parameters of the inverter, Delta will not be held liable in these situations..

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The solar inverter must be grounded via the AC connector's PE conductor. To do this, connect the PE conductor to the designated terminal.

The AC connector is protected from unintentional disconnection by a clip mechanism which can be released with a screwdriver.

#### The AC voltage should be as follows:

- L1-N: 230 V<sub>AC</sub>
- L2-N: 230 V<sub>AC</sub>
- L3-N: 230 V<sub>AC</sub>

### 6.3 DC Connection (from PV array)



#### WARNING



##### Death and serious injury may occur

- ▶ When doing DC wiring, please ensure the wiring is connected with the correct polarity.
  - ▶ When doing DC wiring, please confirm that PV array's power switch is off.
-

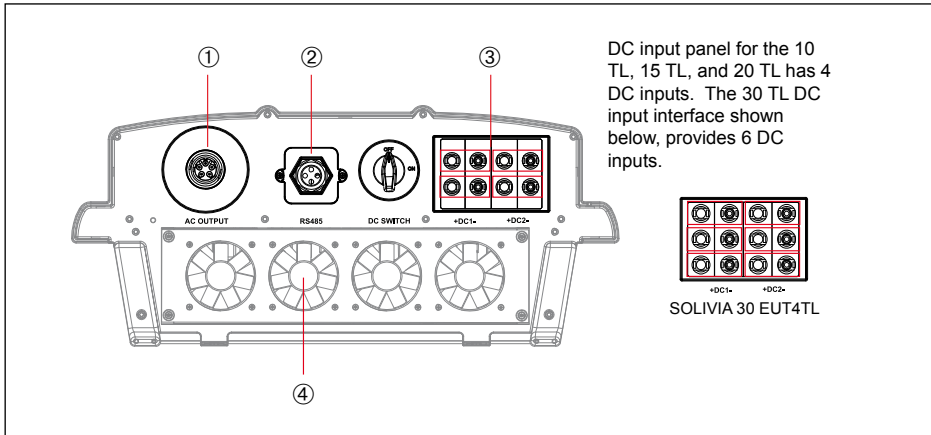


Figure 6.8.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V <sub>AC</sub> for 10 / 15 / 20 TL ; 500 V <sub>AC</sub> for 30 TL
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings (10 TL / 15 TL / 20 TL), 6 Strings (30 TL)
④	Fans	4 Fans (10 TL model with only one fan)

## NOTE



The fans shown are without the required protective screen for illustrative purposes

## CAUTION



**Machine and equipment damage may occur.**

- ▶ The connection number of PV ARRAY, open circuit voltage and power of String\_1 and String\_2 must be coherent.
- ▶ The connection number of PV ARRAY, open circuit voltage and power of String\_3 and String\_4 must be coherent.
- ▶ The maximum open circuit voltage of PV Array must not exceed 1000 V.
- ▶ The range of V<sub>mpo</sub> of Input DC1 and Input DC2 shall be 350~800 V<sub>DC</sub>.
- ▶ The device installed between PV array and inverter must meet the rating of voltage <1000 V<sub>DC</sub> and < short current.
- ▶ The input power connected to the inverter must not exceed the maximum rating of input power as shown in the table below.

## Wiring the Inverter

### Maximum rating of input power:

Type of limit	10 TL	15 TL	20 TL	30 TL
Total input power	11 kW	16.5 kW	22 kW	30 kW
Input 1 & Input 2	7.3 kW	11 kW	14.7 kW	20.1 kW

### Cable size:

Current rating	Wire size
DC 34 A	5-6 mm <sup>2</sup> / 10 AWG

DC wiring polarity is divided into positive and negative, which is shown in Figure 6-9. The connection should be consistent with the indicated polarity marked on the inverter.

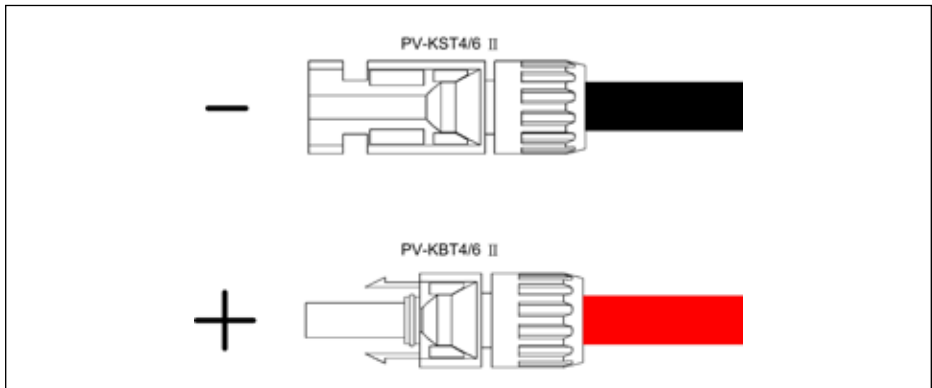


Figure 6.9.: DC Wiring Illustration

### 6.3.1 Asymmetrical Loading for 10 TL, 15 TL, 20 TL, and 30 TL

The inverters operate using two separate MPP trackers that can handle both symmetrical and asymmetrical loads to allow for optimum adjustment. This allows for the requirements of complex PV system designs to be fulfilled. For example: east/west-facing roof (symmetrical load) or a south facing roof such as a dormer (asymmetrical load).

See the following figures for explanation of how symmetrical and asymmetrical loading are handled:



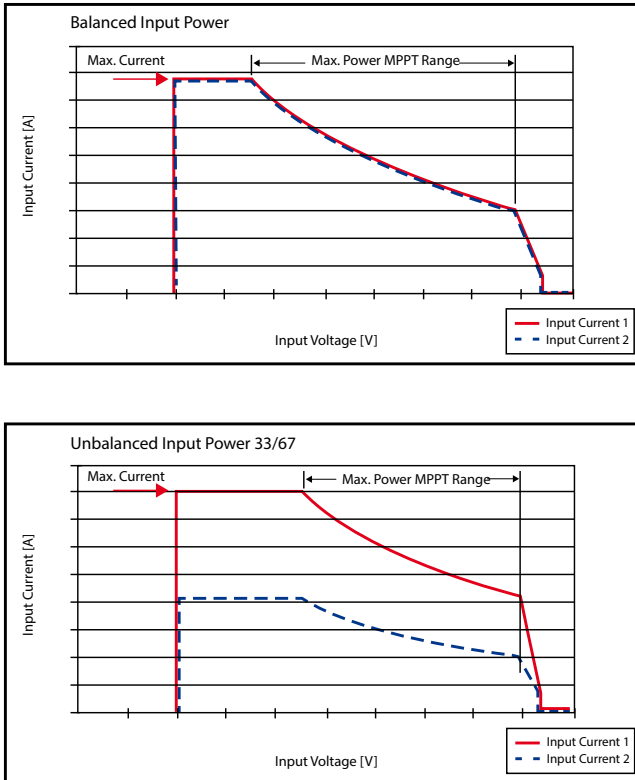


Figure 6.10.: Comparison diagram of Balanced Power Input and Unbalanced Power Input


#### Maximum rating of input power:

Model	Max. Input Current	Max. Power MPPT Range balanced (50/50)	Max. Power MPPT Range unbalanced (33/67)
SOLIVIA 10 TL	20 A x 2	350 - 850 Vdc	350 - 850 Vdc*
SOLIVIA 15 TL	24 A x 2	350 - 800 Vdc	470 - 800 Vdc
SOLIVIA 20 TL	30 A x 2	350 - 800 Vdc	480 - 800 Vdc
SOLIVIA 30 TL	34 A x 2	480 - 800 Vdc	620 - 800 Vdc

\*Note: Unlike the 15 / 20 / 30 TL, the 10 TL has a fixed max. power MPPT voltage range. For unbalanced loads, the 10 TL will adjust the input current to provide an optimum adjustment.

## Wiring the Inverter

A kit to meet UTE 15712-1 requirements is provided for the SOLIVIA 15 TL and 20 TL and can be ordered from Delta with the part number in the following table.

	Designation	Part number Delta
	UTE kit Multi-Contact*	EOE90000341
	*Kit contains caps for 4 strings. For 30 TL, 2 additional caps will be needed since 6 strings are available..	

## 6.4 Efficiency

The best efficiency of the solar inverter is obtained at an input voltage of 640 V.

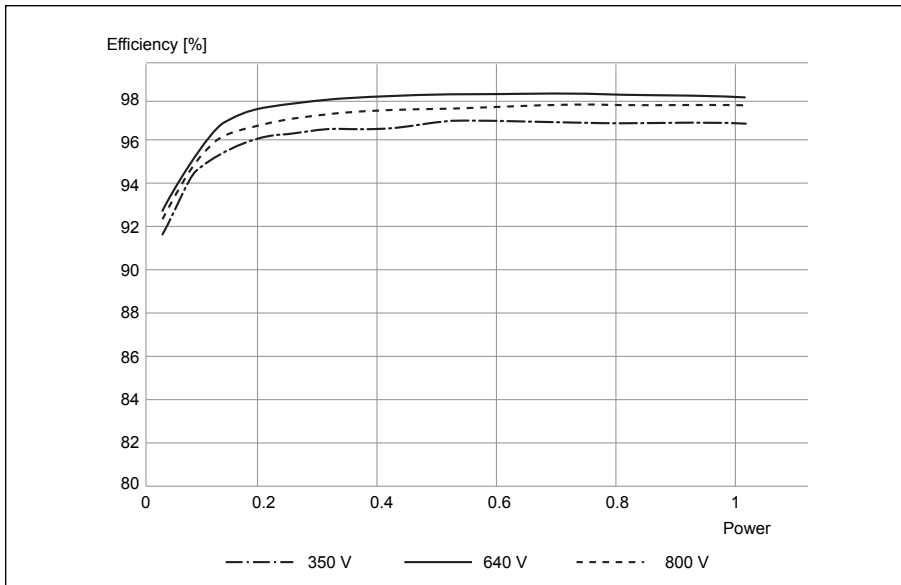


Figure 6.11.: SOLIVIA 10 TL Efficiency Curve

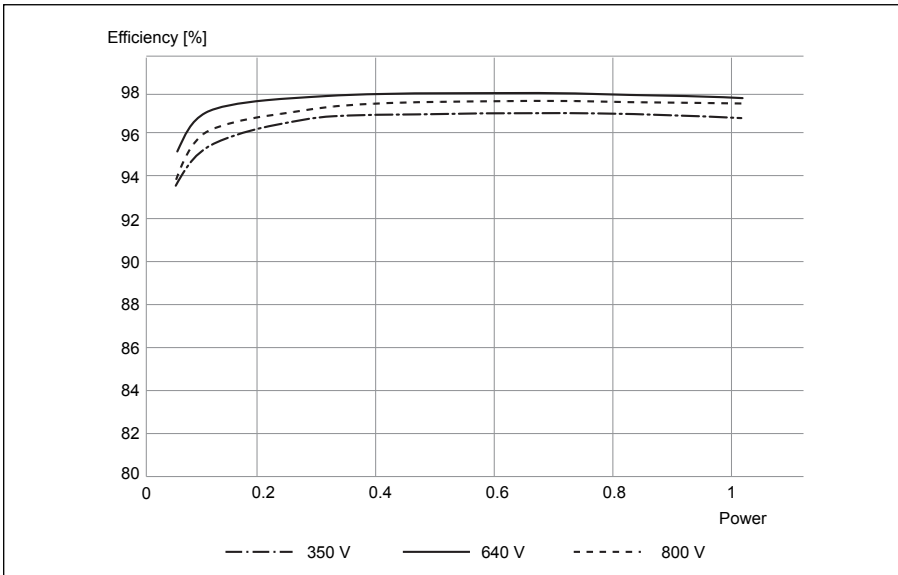


Figure 6.12.: SOLIVIA 15 TL Efficiency Curve

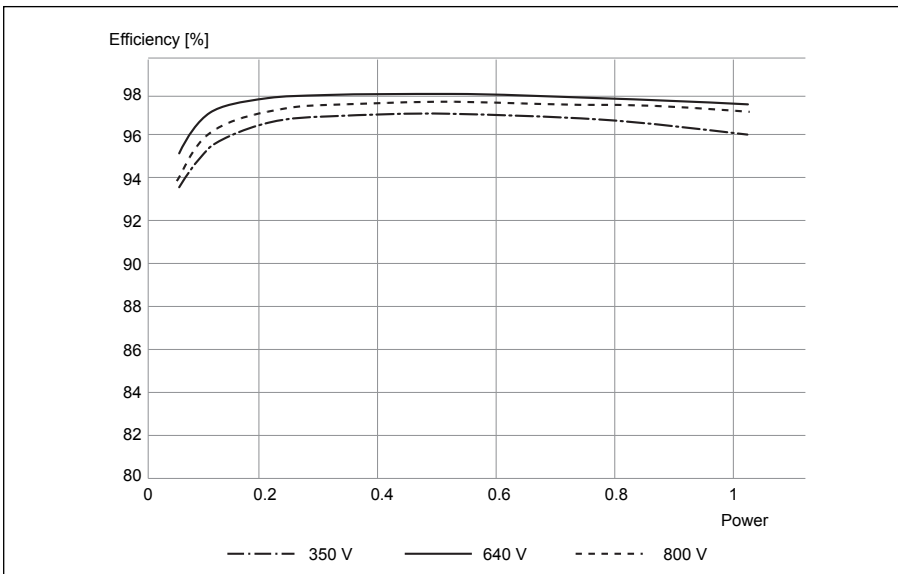


Figure 6.13.: SOLIVIA 20 TL Efficiency Curve

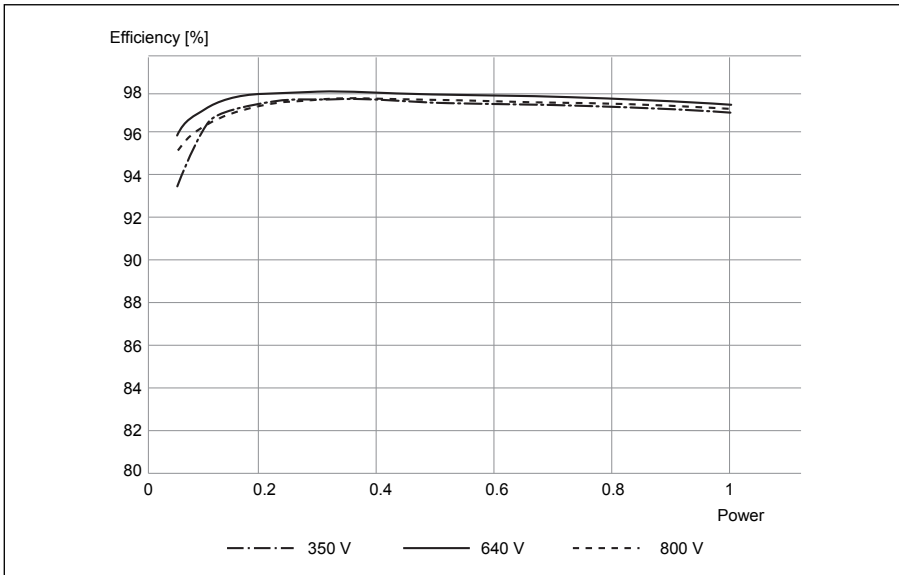


Figure 6.14.: SOLIVIA 30 TL Efficiency Curve

## 6.5 Communication Module Connections

The communication module supports the communication functions with a computer, also provides 1 EPO (Emergency Power Off) and 2 sets of dry contacts. The parts of the communication module are shown in Figure 6.15. The function of each part is detailed in sections 6.5.1 ... 6.5.3.

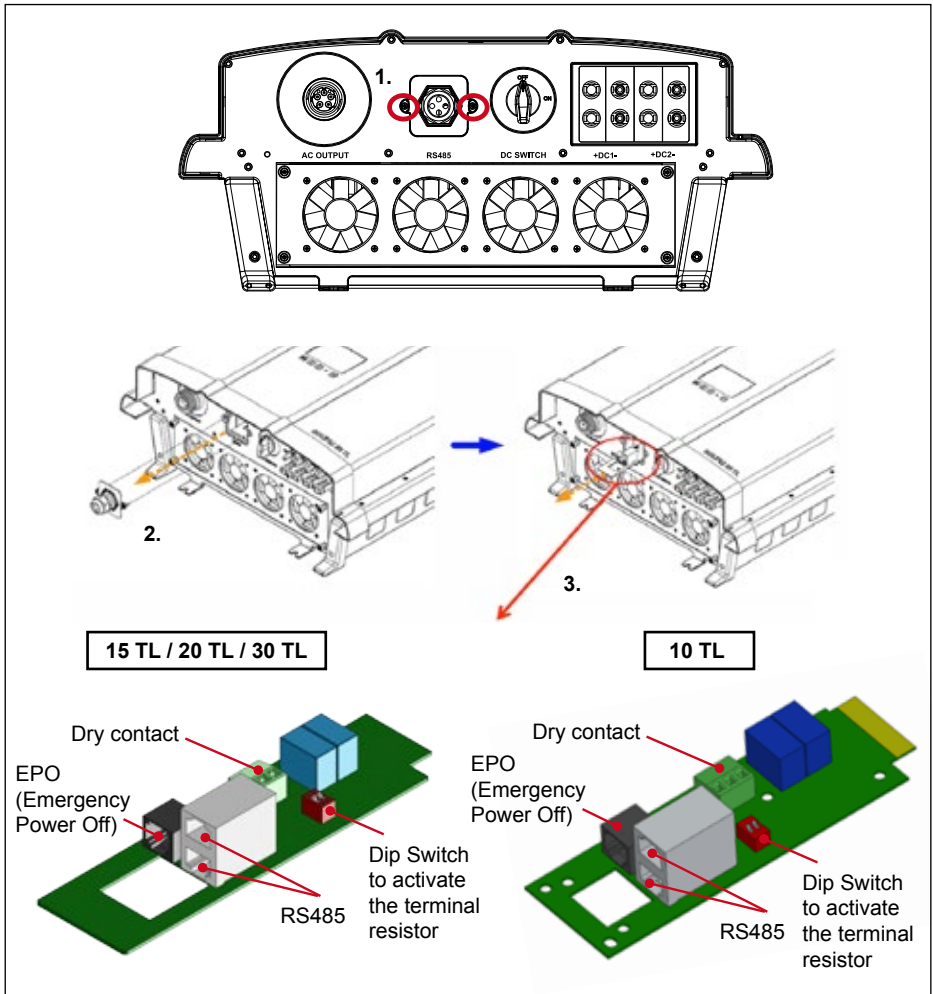


Figure 6.15.: Communication module removal

To remove the communication module follow these instructions:

1. Unscrew and remove the two Phillips screws highlighted above in Figure 6.15.
2. Remove the front plate as shown.
3. Carefully pull out the communication module from the inverter. Remove glands and plugs where applicable.

## Wiring the Inverter

### 6.5.1 RS485 Connection

The pin definition of RS485 is shown in Table 6.3. The wiring of multi-inverter connections is shown in Figure 6.16.

PIN	FUNCTION
4	GND
7	DATA+
8	DATA-

Table 6.3.: Definition of RS485 pin

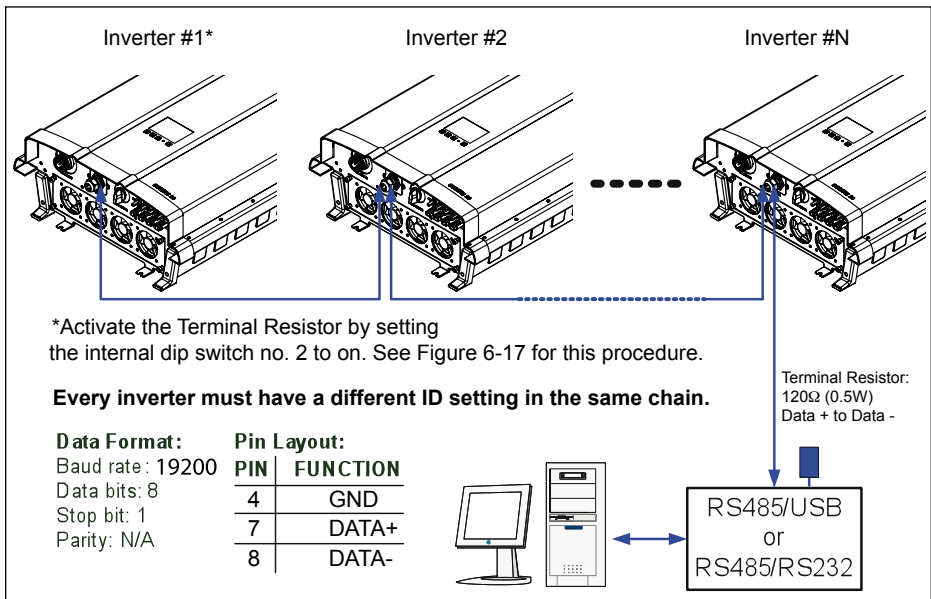


Figure 6.16.: Multi-inverter connection illustration

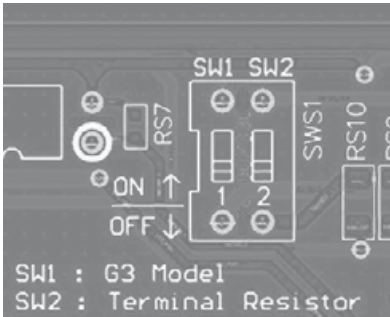


Figure 6.17.: Terminal resistor switch for Multi-inverter Connection

To engage the internal Terminal Resistor, place switch number 2 on the communication module in the on position. See figure 6.17 for more information.

Baud Rate	Programmable, 2400/4800/9600/19200/38400, default = 19200
Data Bit	8
Stop Bit	1
Parity	N/A

Table 6.4.: RS485 Data Format

## 6.5.2 EPO (Emergency Power Off) Connections

The SOLIVIA 10 TL / 15 TL / 20 TL / 30 TL provides two sets of emergency power off functions. When the outer external switch is shorted, the inverter will shut down immediately. Please see Table 6.5 for the pin definition.

PIN	Definition
1	EPO1
2	EPO1
3	N/A
4	EPO2
5	EPO2
6	N/A
7	N/A
8	N/A

Table 6.5.: EPO pin assignment

**NOTE**



To shutdown the inverter, short pin 1 and 2 or short pin 4 and 5.

**6.5.3 Dry Contact Connection**

Provides 2 sets of Dry Contact functions - NO1 and NO2. Please refer to Figure 6.16 for connection diagram and read below for more details.

NO1: When a fault is detected, COM and NO1 will be shorted.

NO2: When the inverter is on grid, the COM and NO2 will be shorted.

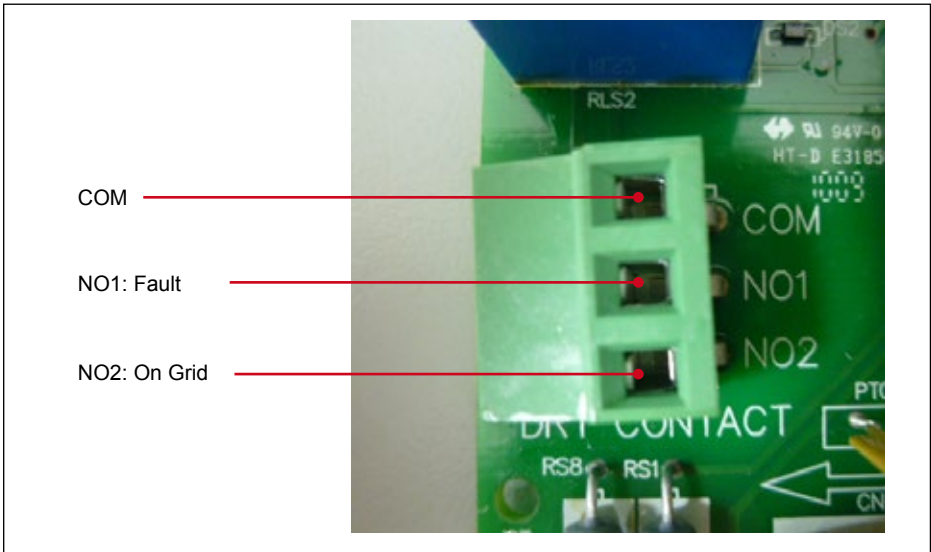


Figure 6.18.: Dry contact connection



## 7. Operating the PV inverter

### WARNING



#### **Burn hazard!**

The enclosure temperature may exceed 70° C while in operation. Injury may occur owing to the hot surface.

- ▶ Please do not touch!

After installation, please confirm the AC, DC, and Communication connections are correct. Follow the steps below to startup the inverter:

1. Check the PV array DC voltage:
  - Uncover the PV arrays and expose them to full sunlight.
  - Measure the PV array open circuit DC voltage across the DC positive (+) and negative (-) terminals in the DC distribution box. This voltage must be greater than 250 V<sub>DC</sub> and less than 1000 V<sub>DC</sub>.
2. Check the AC utility voltage:
  - Using an AC voltmeter to measure the AC utility voltage and ensure the voltage is at approximately the nominal value (Nominal = 230 Vac Line-N).
3. Set all necessary settings:
  - Switch on AC breaker to provide power to the inverter (40 seconds)
  - Check the inverter display.
  - Country & Language settings appear on the display at first startup.

### NOTE



The country list may change due to ongoing certification processes. If you have any questions, please contact the Delta Support Team.

**Countries supported\*:** Belgium, France, Italy, Netherlands, Spain, Greece, Germany, Czech Republic, Slovakia, Slovenia, Portugal, Bulgaria, Romania, United Kingdom, United Kingdom (240 V), Australia, French Islands, Denmark.

**Language supported:** English, Italian, French, German, Dutch, & Spanish

\*Please note at the time of printing, all countries shown may not necessarily be available for 30 TL model, but are expected to be completed within Q1 2013. Please check with the Delta support team for questions about countries approved.

The next step is to set up the inverter for the appropriate grid on the first startup. The grid selection for each inverter model can be found on the following list:

## Operating the PV inverter

Grid (As shown on the Display)	Description	10 TL	15 TL	20 TL	30 TL
Australia	Australia AS 4777		x	x	
Belgium	Belgium as per C10/11, June 2012		x	x	
Bulgaria	Bulgaria as per VDE 0126		x	x	
Czech	Czech Republic as per VDE 0126		x	x	
Denmark	Denmark as per VDE AR N 4105		x	x	
France	France as per UTE 15 712-1		x	x	
France (60Hz)	French Islands 60 Hz		x	x	
Germany (VDE0126)	Germany as per VDE 0126	x	x	x	
Germany (LVD)	Germany as per VDE AR N 4105	x	x	x	x
Germany (MVD)	Germany as per BDEW		x	x	
Greece	Greece as per VDE 0126		x	x	
Italy BT CEI 0-21	Italy as per CEI 0-21:2012-06 for PV Installations smaller or equal to 6 kW		x	x	x
Italy MT A70	Italy as per CEI 0-21:2012-06 for PV Installations larger than 6 kW	x	x	x	
Netherlands	Netherlands as per VDE 0126 + EN 50438		x	x	
Portugal	Portugal as per EN 50438		x	x	
Romania	Romania as per VDE 0126		x	x	
Slovakia	Slovakia as per VDE 0126		x	x	
Slovenia	Slovenia as per SONDO Class C		x	x	x
Spain (RD661)	Spain as per RD 661		x	x	
Spain (RD1663)	Spain as per RD 1663		x	x	
Spain (RD1699)	Spain as per RD 1699		x	x	
UK	United Kingdom G59-2 230 V		x	x	
UK (240)	United Kingdom G59-2 240 V		x	x	



Figure 7.1.: Country Settings on initial startup

- Set all settings for Date, Time, Inverter ID, Insulation, etc.

**NOTE**

- ▶ If selecting **Germany or Italy** as the country, it could be necessary to adjust active and reactive power settings (Information for the settings will come from the local grid operator).
- ▶ If needed please call the local support hotline for assistance in setting up Germany MVD/LVD or Italy CEI 0-21/A70 grid settings.

## 4. Start up the inverter:

- After finishing the basic settings, turn on DC switches (including the DC switch in inverter), inverter will do some self-tests and start a countdown if there is no problem.
- When operating, check all information on the display is correct (ex. Input voltage, current and power; output voltage, current, power and frequency)

When solar irradiation is sufficient, the device will operate automatically, after the self-auto test is completed successfully (about 2 minutes on the first startup of a day). Please refer to Figure 7.2 showing the LCD Display and Control Panel details. The display includes a 5" graphic LCD with 320x240 dots of resolution and a LED indicator showing inverter status. There are green and red colored LED indicator lights to represent various inverter states of operation. Please refer to Table 7-1 for more detail on the LED indicator.

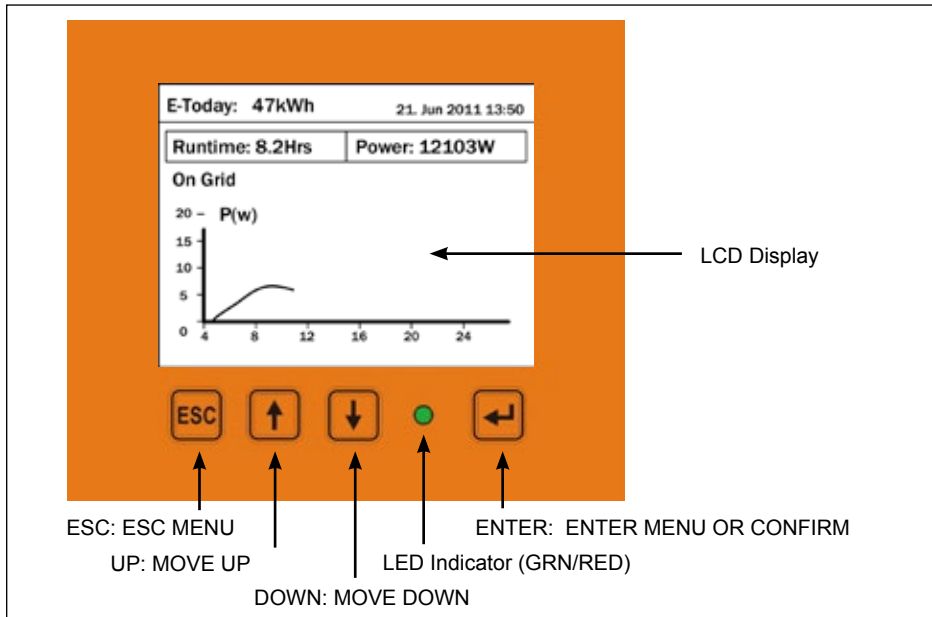


Figure 7.2.: LCD Display and Control Panel

## Operating the PV inverter

Inverter Status	Green LED	Red LED
Standby or Countdown	FLASHING - on 1 sec. and off 1 sec.	OFF
Power ON	ON	OFF
Error or Fault	OFF	ON
Night time (No DC)	OFF	OFF
Bootloader mode	FLASHING - on 1 sec. and off 1 sec., first the green LED then the red LED in alternating sequence	

Table 7.1.: LED indicator

## 7.1 Disconnection Parameter Settings

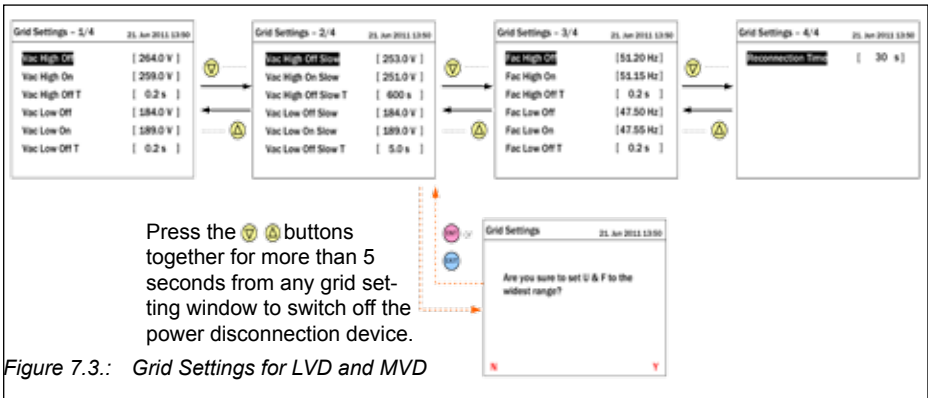
### 7.1.1 Power Disconnection Device (PDD) Settings

This applies to LVD and MVD settings when selecting the grid as DE LVD or DE MVD.

#### NOTE



DE LVD refers to Germany Low Voltage Directive and DE MVD refers to Germany Midvoltage Directive.



The grid settings for Germany LVD and MVD can be tuned according to the local utility requirements. The integrated power disconnection device can be set in three modes: 1) set to default values as recommended by LVD/MVD regulations, or 2) adjustments can be done manually within the allowed parameter ranges according to the LVD/MVD regulations depending on the selected mode, or 3) the device can be switched off.

At any time, while you are viewing one of the 4 grid setting windows, you are able to switch off the power disconnection device by simultaneously pressing the up and down buttons and holding for more than 5 seconds.

See the tables below for the LVD/MVD allowed parameter ranges according to the regulations:

When the selected grid is LVD, the following adjustable values are allowed:

Parameter	Name in display	Adjustable values
Rise-in-voltage protection U>	Umax	110 ... 115%

As defined in VDE AR N 4105, only the rise-in-voltage protection Umax shall be designed as 10-minute running mean value protection which prevents the upper voltage limit specified in DIN EN 50160 from being exceeded (monitoring over the power).

When the selected grid is MVD (BDEW), the following adjustable values are allowed:

Parameter	Name in display	Adjustable values	Recommended settings of protection relays as per BDEW	
Rise-in-voltage protection U>>	Crit. Umax	1.00 ... 1.30 $U_n$	1.20 $U_{ns}$	≤ 100 ms
Under-voltage protection U<	Umin	0.10 ... 1.00 $U_n$	0.80 $U_{ns}$	1.5 - 2.4 s
Under-voltage protection U<<	Crit. Umin	0.10 ... 1.00 $U_n$	0.45 $U_{ns}$	300 ms
Rise-in-frequency protection f>	Fmax	50.0 ... 52.0 Hz	51.5 Hz	≤ 100 ms
Under-frequency protection f<	Fmin	47.5 ... 50 Hz	47.5 Hz	≤ 100 ms
Delay time for U<	tUmin	1.5 ... 2.4 s	1.5 ... 2.4 s	

Table 7.1.: Recommended settings of protection equipment as per BDEW Technical Guidelines - June 2008 issue from Table 3.2.3.3 - 2

## 7.1.2 SPI device

The SPI is a system interface protection device for use in Italy. There is no internal SPI required for this inverter but an external SPI device may be requested. Care must be taken so disconnection settings on the inverter are set so they do not interfere with external SPI device disconnection settings. The password "5555" entered in the Install Settings page when Italy is selected as the Country, enables disconnection parameters to be adjusted directly within the grid settings menu.

## 7.2 Home Page

When the inverter is operating normally, the LCD will show the home page as shown in Figure 7.4. On the home page the user can find the output power, inverter status, E-today, date and time.

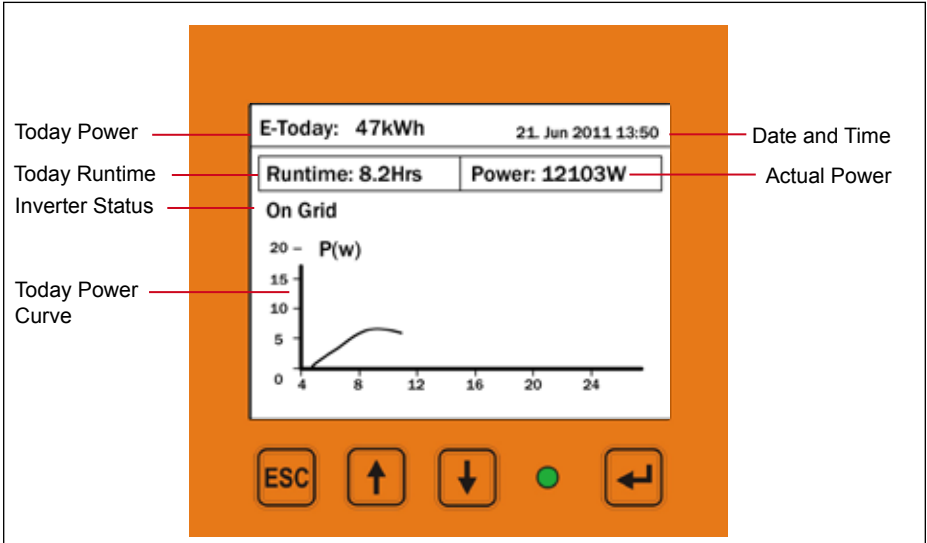


Figure 7.4.: Home page

## 7.3 LCD Flow Chart

Press any button to enter the menu page, the selections are shown in Figure 7.5. E-today is on the home page; the content of the rest of the pages will be explained in detail from 7.3.1 ... 7.3.6.

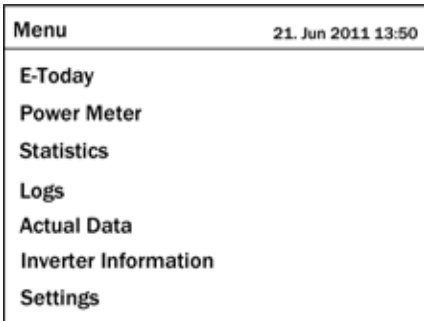


Figure 7.5.: Main menu page

„7.3.1 Power Meter“ on page 71

„7.3.2 Statistics“ on page 71

„7.3.3 Logs“ on page 72

„7.3.4 Actual data“ on page 73

„7.3.5 Inverter Information“ on page 74

„7.3.6 Settings“ on page 74

### 7.3.1 Power Meter

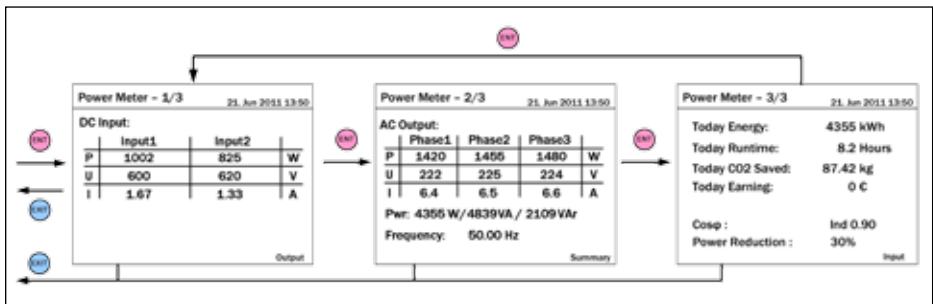


Figure 7.6.: Power Meter Pages

### 7.3.2 Statistics

After pressing **ENT** on this page, the user can view the historical data about power generation on a yearly, monthly and daily basis.

## Operating the PV inverter

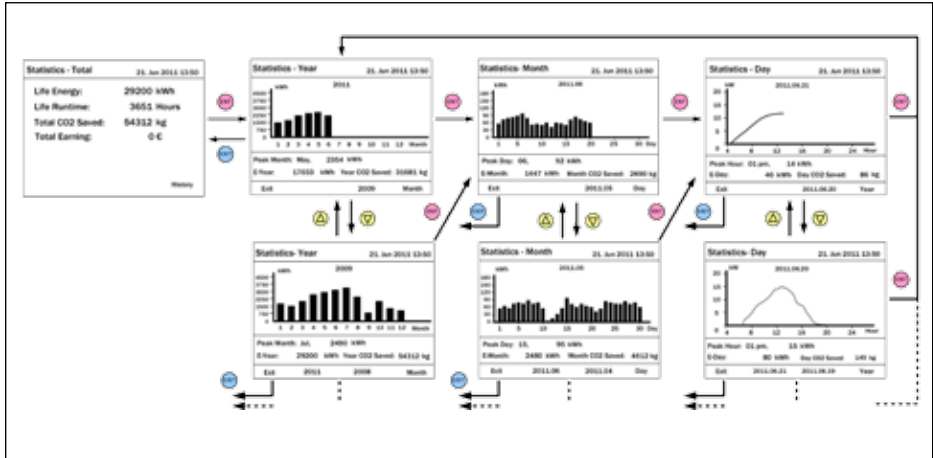


Figure 7.7.: Statistics Pages

### 7.3.3 Logs

After pressing **ENT** on this page, the user can view the internal log and can view the events log.

#### 7.3.3.1 Internal Data

The internal data shows all messages coming from the inverter. These messages indicate the status of internal processes and also changes on the AC and DC terminals, for example: frequency, voltage, etc.

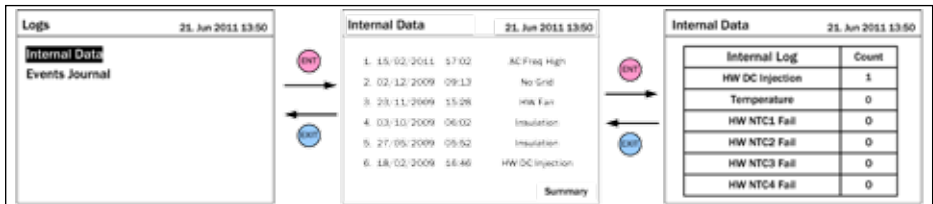


Figure 7.8.: Internal Data Flow Chart

#### 7.3.3.2 Events Journal (Germany LVD or MVD Grid Only)

The events journal records all events coming through the RS485 link or made on the display at the user level. Only events that could affect global production are shown in this log.



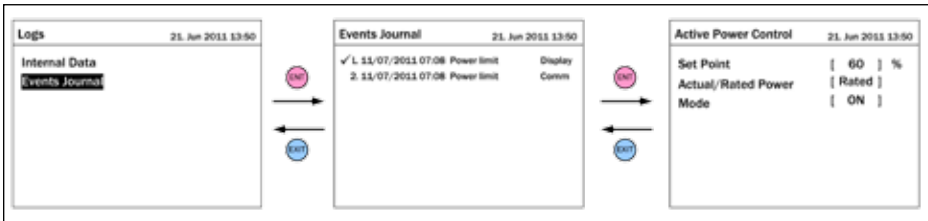


Figure 7.9.: Events Journal Flow Chart

### 7.3.4 Actual data

Actual data includes 4 pages and records the maximum and/or minimum historical values, including voltage, current, power and temperature.

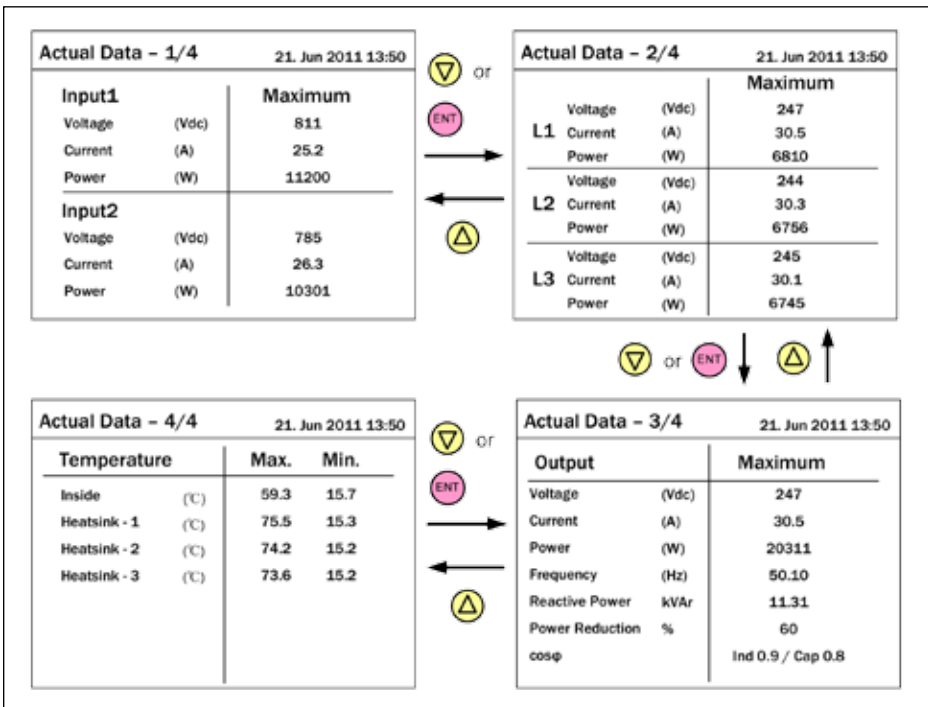


Figure 7.10.: Actual Data Flow Chart

### 7.3.5 Inverter Information

This page includes the following information: serial number, firmware version, installation date, and inverter ID. To change the inverter ID, please refer to „7.3.6.2 Install Settings“ on page 75.

Inverter Information		21. Jun 2011 13:50
Serial Number	0946000006	
DSP-Version	1.80	
Red.-Version	1.17	
Comm.-Version	1.16	
Installation Date	05.Jan.2009	
Inverter ID	001	
Baudrate	19200	
Country*	Italy CEI 0-21	
IT-Grid Version TN*	0.10	

Figure 7.11.: Inverter Information Page

## NOTE



The information shown in Figure 7.11 is for illustration purposes and may not match the actual information displayed on your inverter.

\*The last menu items are only applicable for installations in Italy. If BT CEI 0-21 or Italy MT A70 are selected as the country, then the Country name will show on the 2nd page. For Italy, the software version will show.

### 7.3.6 Settings

Settings includes General Settings, Install Settings, and Active/Reactive Power Control.

Settings	21. Jun 2011 13:50
General Settings	
Install Settings	
Active/Reactive Power Control	
FRT	

Figure 7.12.: Settings Page

**NOTE**

FRT is only accessible if you have selected Germany MVD, Italy CEI 021 or Italy A70 as your grid selection.

**7.3.6.1 General Settings**

Settings in the General Settings include Language, Date, Time, Screen Saver, Brightness, Contrast, Baud Rate, CO2 saved, Earning Value, and Currency.

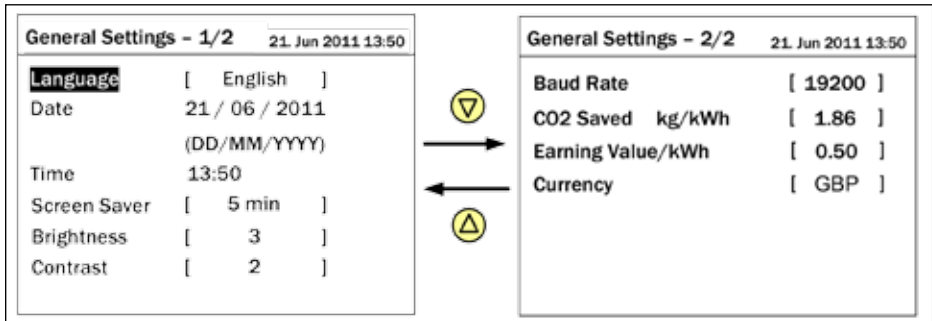


Figure 7.13.: General Settings Page

User can set the Language, Date, Time, Screen Saver, LCD Brightness, and Contrast appear on the General Settings page 1. Screen Saver can be adjusted from 5 minutes to 60 minutes. When over the setting time limitation, without the pressing of any buttons, the LCD backlight will go off automatically. Brightness and contrast can be adjusted from 1-5 levels (low to high). On General Settings page 2 the Baud Rate, CO2 Saved, Earning Value and Currency are adjustable. Currency is selectable as Australian Dollar (AUD), Euro (EUR) and Great Britain Pound (GBP).

**7.3.6.2 Install Settings**

Correct passwords are requested when entering Install Settings. Install Settings for user and installation technicians are different. The password can not be revised. After confirmation of the installer password (5555), user can set Inverter ID and Insulation settings. Country is viewable but not adjustable.

## Operating the PV inverter

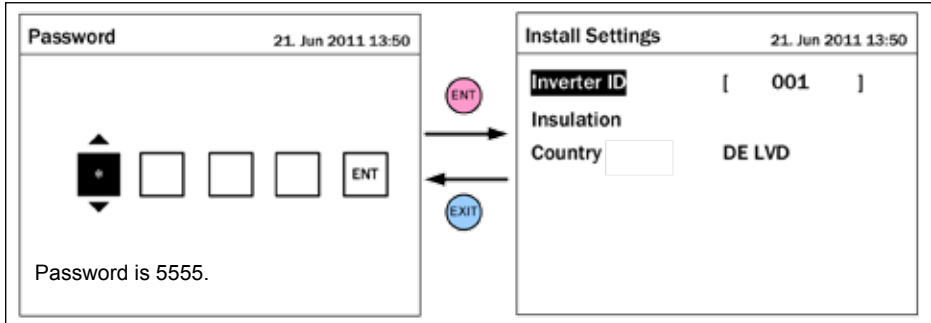


Figure 7.14.: Install Settings Page - Installer Mode

- **Inverter ID:** This setting is used to set unique ID's for installations with more than one inverter. In a multi-inverter installation where the inverters will be in a network, each inverter must have a unique ID.
- **Insulation:** ON means enable the measurement of impedance between Array and PE, will not connect to Grid if failure. Depending on DC wiring conditions, user can set 6 kinds of insulation detecting methods - ON, Positive Ground, Negative Ground, DC1 only, DC2 Only, or Disable. Installer can select different resistance criteria according the actual conditions.
- **Country:** This is the Country selected during startup (nonadjustable).

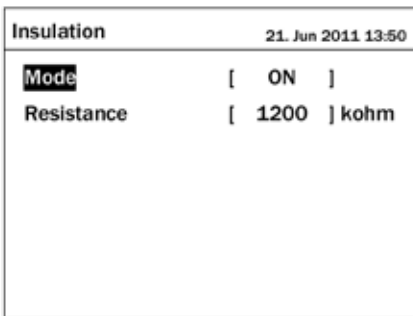


Figure 7.15.: Insulation Settings - Installer Mode

### 7.3.6.3 Active/Reactive Power control for DE LVD and DE MVD

Below is an overview of the features that are adjustable to control the production of active and reactive power for Germany LVD and MVD

Feature	Available for		Description
	LVD	MVD	
Active power control			

Feature	Available for		Description
	LVD	MVD	
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradient in dependency of the frequency
Reactive power control			
Constant $\cos \varphi$	x	x	To set a fixed $\cos \varphi$ (inductive or capacitive)
$\cos \varphi (p)$	x	x	To set a $\cos \varphi$ (inductive or capacitive) in dependency of the active power ratio $P/P_n$
Constant reactive power		x	To set the reactive power ratio $Q/S_n$ . For MVD grids only.
Q (V)		x	To set the reactive power ratio $Q/S_n$ in dependency of the voltage V. For MVD grids only.

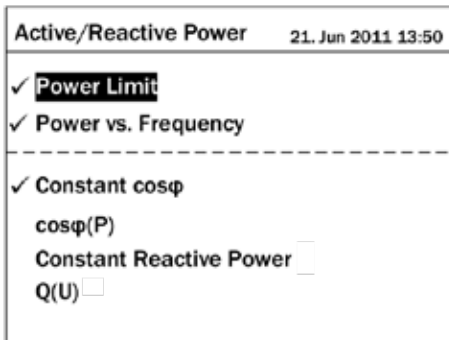
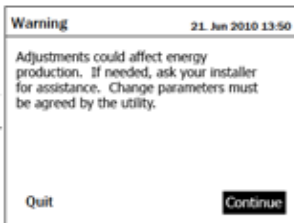


Figure 7.16.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages below related to adjusting the settings.

**CAUTION**



**Machine and equipment damage may occur.**

- ▶ Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
  - ▶ Adjustments may affect energy production
  - ▶ Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments
- 

**7.3.6.3.1 Power Limit**

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for LVD and MVD grids.

Active Power Control		21. Jun 2011 13:50
<b>Set Point</b>	[ 60 ]	%
<b>Actual/Rated Power</b>	[ Rated ]	
<b>Mode</b>	[ ON ]	

Figure 7.17.: Power Limit settings page

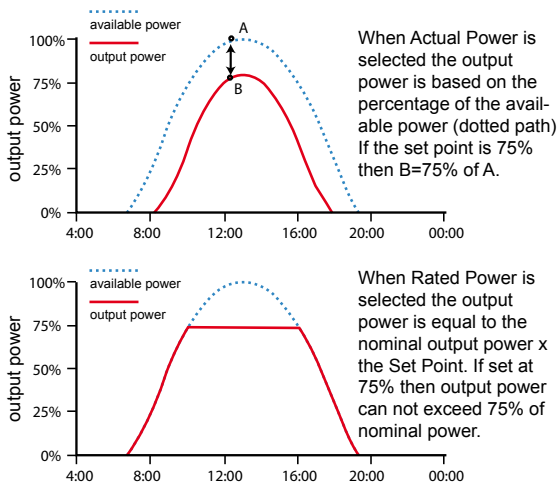


Figure 7.18.: Actual Power vs Rated Power

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual   Rated	Select Actual or Rated Power
Mode	ON   OFF	Switches the feature on and off.

### 7.3.6.3.2 Power vs. Frequency

User can have two modes: LVD and MVD. The figures below explain the different behaviors for these modes. The inverter activates these modes depending on the country that is selected and the requirements for that country.

This feature is available for LVD and MVD grids. This feature allows the user to set a power reduction in a percent of the maximum power.

## Operating the PV inverter

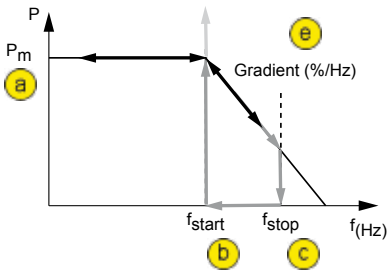


Figure 7.19.: LVD Curve power vs. frequency

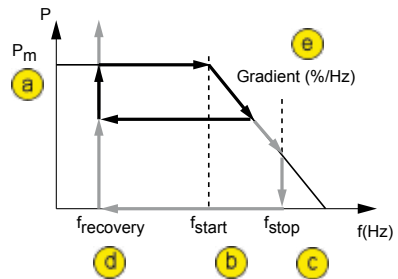


Figure 7.20.: MVD Curve power vs. frequency

Active Power Control		21. Jun 2010 13:50
a	Actual/Rated Power	[ Actual ]
b	Start Frequency	[ 50.20 ] Hz
c	Stop Frequency	[ -- ] Hz
d	Recovery Frequency	[ 50.05 ] Hz
e	Gradient	[ 40 ] %
	Recovery Time	[ -- ] s
	Mode	[ ON ]

Figure 7.21.: Power vs. Frequency

### NOTE



The Power vs Frequency function is required for LVD and MVD. Please make sure the Mode is ON and do not turn off.

### Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual or Rated can be selected
Start frequency	50.00 ... 55.00	The frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.
Recovery frequency	50.00 ... 55.00	This feature is only for MVD. This value is equal to the frequency of the grid connection.
Gradient	0 ... 100 %	This feature adjusts the gradient. The units are % / Hz.
Recovery Time		Not applicable for LVD or MVD
Mode	ON   OFF	Switches the feature on and off



### 7.3.6.3.3 Constant $\cos \varphi$

This feature is available for LVD and MVD grids. This feature allows the user to set up a constant  $\cos \varphi$ .

Reactive Power Control		21. Jun 2011 13:50
cos $\varphi$	[ Ind 0.90 ]	
Mode	[ ON ]	

Figure 7.22.: Constant  $\cos \varphi$  settings page

#### Adjustable parameters

Parameter	Adjustable values	Description
cos $\varphi$	inductive   capacitive Ind 0.8 ... Ind 0.99, 1, Cap 0.8 ... Cap. 0.99	Sets the $\cos \varphi$ to the adjusted value.
Mode	ON   OFF	Switches the feature on and off

### 7.3.6.3.4 $\cos \varphi(P)$

This feature is available for LVD and MVD grids.

With this feature a  $\cos \varphi$  can be assigned to a power ratio  $P/P_n$ .

The following curve is an example how the values could be set:

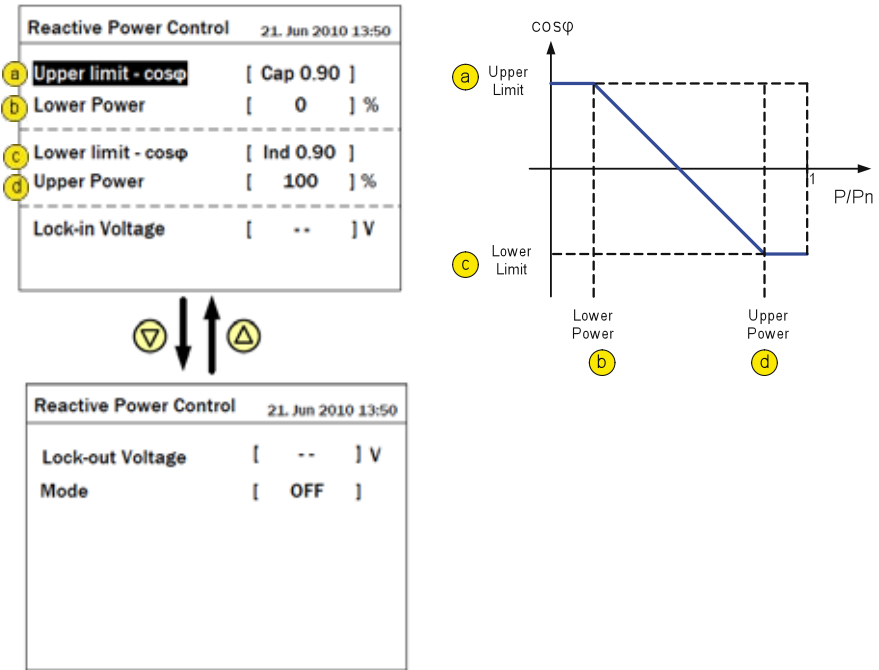


Figure 7.23.:  $\cos\phi(P)$  settings page

### Adjustable parameters

Parameter	Adjustable values	Description
Upper limit - $\cos\phi$	Ind 0.80 ... Cap 0.80	The upper limit $\cos\phi$ must be greater than the lower limit $\cos\phi$
Lower Power	0 ... 100 %	
Lower limit - $\cos\phi$	Ind 0.80 ... Cap 0.80	
Upper Power	0 ... 100 %	The upper power must be greater than the lower power
Lock-in Voltage		Not used for DE LVD/MVD
Lock-out Voltage		Not used for DE LVD/MVD
Mode	ON   OFF	This switches the feature on and off

#### 7.3.6.3.5 Constant Reactive Power

This feature is available for MVD grids only.

This feature allows a constant  $\cos$  reactive power to be set.

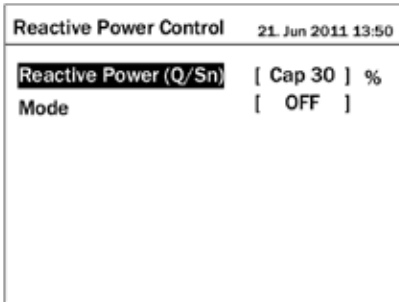


Figure 7.24.: Constant Reactive Power settings page

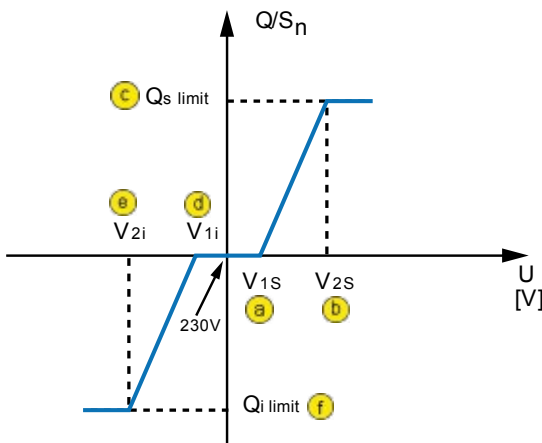
**Adjustable parameters**

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive   capacitive	Reactive power ratio in relation to apparent power.
Mode	ON   OFF	This switches the feature on and off

**7.3.6.3.6 Q(V)**

This feature is available for MVD grids only.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V



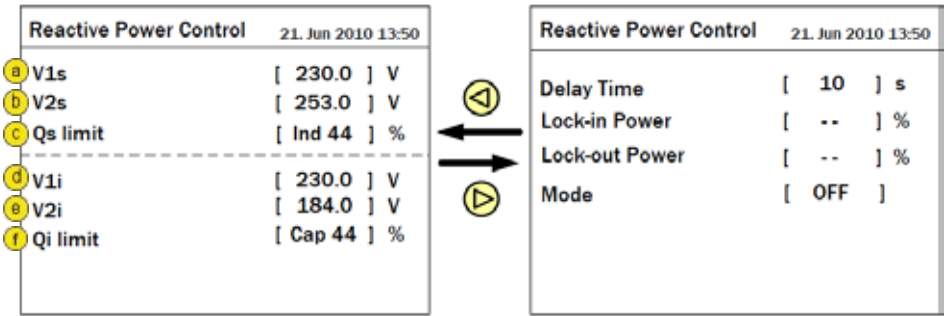


Figure 7.25.: Q(V) settings page

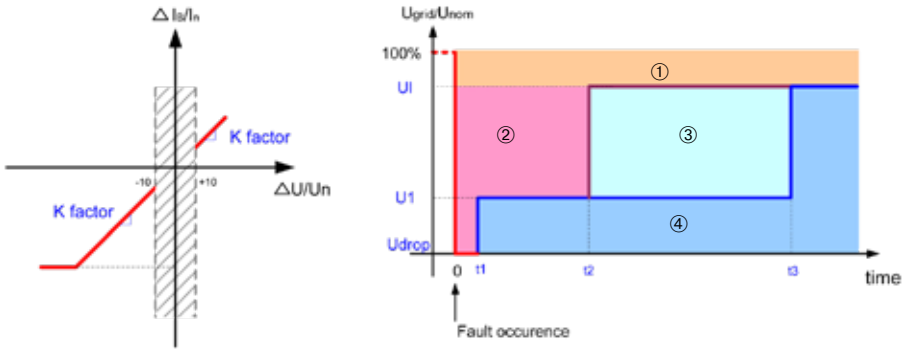
**Adjustable parameters**

Parameter	Menu Name	Adjustable values	Description
Lower Q/Sn	Qi Limit	0 ... 60% inductive   capacitive	Must be within the range Ind 60% ... Cap 60%
Upper Q/Sn	Qs Limit	0 ... 60% inductive   capacitive	Must be within the range Ind 60% ... Cap 60%
Lower capaci- tive point	V2i	184 ... 264 V	
Upper capaci- tive point	V1i	184 ... 264 V	For DE MVD the default V1i = V1s = 230 V
Lower inductive point	V1s	184 ... 264 V	
Upper inductive point	V2s	184 ... 264 V	
Delay time		0 ... 10 s	
Lock-in Power		not applicable	Not used for DE MVD
Lock-out Power		not applicable	Not used for DE MVD
Mode		ON   OFF	This switches the feature on and off

**7.3.6.3.7 Fault Ride Through (FRT)**

This feature is available for MVD grids only.

This feature allows the Fault Ride Through features to be set.



- ① No instability or disconnection from the network
- ② Feed-in reactive current depends on K factor
- ③ Same as area 2, Feed-in reactive current depends on K factor
- ④ Disconnects from the network

FRT - 1/2			FRT - 2/2
	21. Jun 2011 13:50		21. Jun 2011 13:50
Dead band - Vh	[ +10 ]	%	t3
Dead band - Vl	[ -10 ]	%	[ 3.00 ]
K factor	[ 2.0 ]		Mode
Vdrop	[ 0 ]	%	[ ON ]
t1	[ 200 ]	ms	
U1	[ 20 ]	%	
t2	[ 3.00 ]	s	

Figure 7.26.: Fault Ride Through settings page

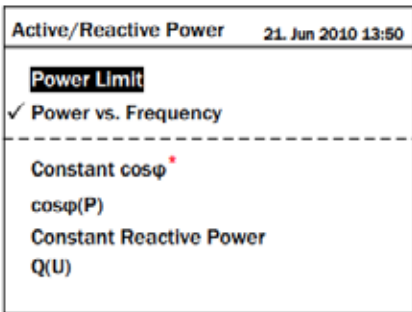
**Adjustable parameters**

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	
Dead band - Vlow	-20 ... 0 %	
K factor	0 ... 10	
Vdrop	0 ... 90%	
t1	0 ... 500 ms	
U1	20 ... 90%	
t2	0.01 ... 5 s	
t3	0.01 ... 5 s	
Mode	ON   OFF	This switches the feature on and off

**7.3.6.4 Active/Reactive Power control for Italy CEI 0-21 and Italy A70**

Below is an overview of the features that are adjustable to control the production of active and reactive power for Italy CEI 0-21 and Italy A70. Italy CEI 0-21 is applicable for low voltage grids and A70 is applicable for medium voltage grids.

Feature	Available for		Description
	CEI 0-21	A70	
Active power control			
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradient in dependency of the frequency
Reactive power control			
Constant $\cos \varphi$			This feature is not available for CEI 0-21 and A70.
$\cos \varphi (p)$	x	x	To set a $\cos \varphi$ (inductive or capacitive) in dependency of the active power ratio $P/P_n$
Constant reactive power	x	x	To set the reactive power ratio $Q/S_n$ .
Q (V)	x	x	To set the reactive power ratio $Q/S_n$ in dependency of the voltage V.



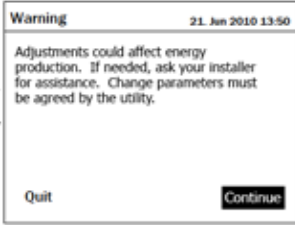
Note: User can activate both the Power Limit and the Power vs. Frequency at the same time.

For the reactive power control features:  $\cos\varphi(P)$ , Constant Reactive Power, and  $Q(V)$  only one of these items can be activated at a time.

✓ indicates a function is executing

\* This feature is disabled for CEI 0-21 and A70 although it will appear in the menu

Figure 7.27.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages related to adjusting the settings.

## CAUTION

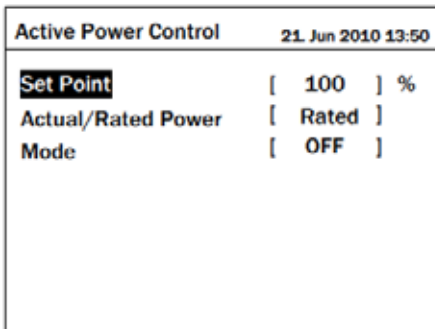


### Machine and equipment damage may occur.

- ▶ Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ▶ Adjustments may affect energy production
- ▶ Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

### 7.3.6.4.1 Power Limit

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for Italy CEI 0-21 and Italy A70.



Note: For explanation of Actual vs Rated Power please see figure 7.18.

Figure 7.28.: Power Limit settings page

## Operating the PV inverter

### Adjustable parameters

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual   Rated	Select Actual or Rated Power
Mode	ON   OFF	Switches the feature on and off.

#### 7.3.6.4.2 Power vs. Frequency

This function is available for CEI 0-21 and A70. The figure below explain the behavior of this function. Note that the Italy CEI 0-21 and A70 curves are different than the Germany LVD and MVD curves.

This feature allows the user to set a power reduction in a percent of the maximum power.

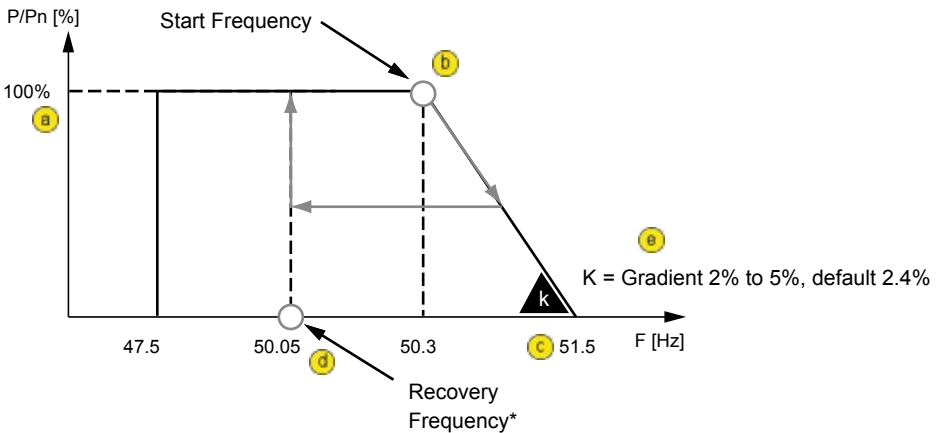


Figure 7.29.: Curve power vs. frequency



Active Power Control		21. Jun 2010 13:50
a	Actual/Rated Power	[ Actual ]
b	Start Frequency	[ 50.30 ] Hz
c	Stop Frequency	[ -- ] Hz
d	Recovery Frequency	[ -- ] Hz
e	Gradient	[ 2.4 ] %
	Recovery Time	[ 300.00 ] s
	Mode	[ ON ]

**NOTE**

The Power vs Frequency function is required for CEI 0-21 and A70. Please make sure the Mode is ON and do not turn off.

\*Recovery Frequency is defined in the grid setting parameters 49.9 - 50.1 Hz by default.

Figure 7.30.: Power vs. Frequency

### Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual will be default
Start frequency	50 - 55 Hz	50.3 Hz will be the default. This is the frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.
Recovery frequency	Nonadjustable	
Gradient	2.0 ... 5.0 %	2.4 % is the default
Recovery time	300 seconds	
Mode	ON   OFF	Switches the feature on and off

#### 7.3.6.4.3 Constant $\cos\phi$

This feature is not available for CEI 0-21 or A70.

#### 7.3.6.4.4 $\cos\phi(P)$

This feature is available for Italy CEI 0-21 and Italy A70.

With this feature a solar inverter can regulate the power factor as a function of the actual delivered active power.

The following graph is an example how the values could be set:

## Operating the PV inverter

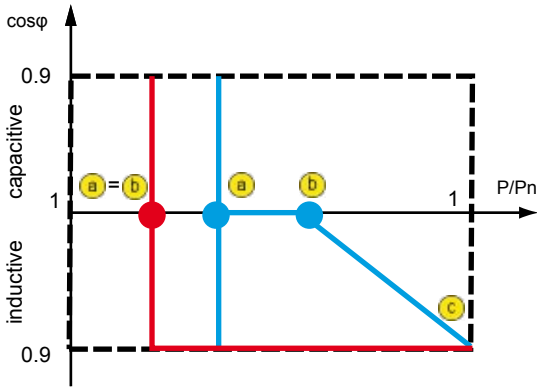


Figure 7.31.:  $\cos\phi(P)$  graph

There are two possible curves defined in the  $\cos\phi(P)$  graph, curve A in blue (the default) and curve B in red.  $P_n$  = nominal power

### Curve A (in blue on Figure 7.31)

A is identified from Plock-out = value from local grid operator and  $\cos\phi = 1$

B is identified from Plock-in = value from local grid operator and  $\cos\phi = 1$

C is identified from  $P = P_n$  and  $\cos = \cos\phi_{max}$

### Curve B (in red on Figure 7.31)

A is identified from Plock-out =  $P =$  value from local grid operator and  $\cos\phi = 1$

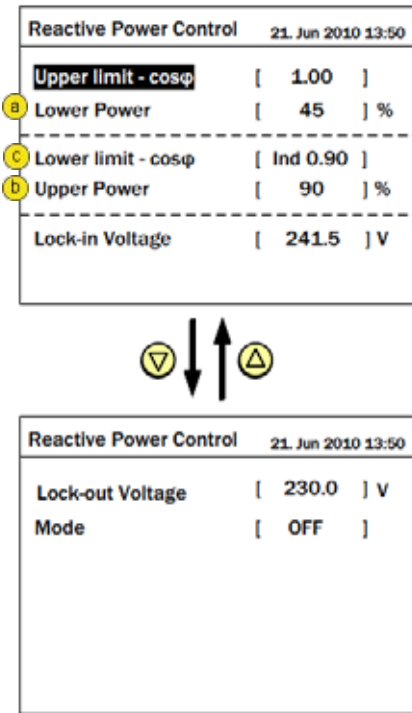
B is identified from Plock-in = value from local grid operator and  $\cos\phi = 1$

C is identified from  $P = P_n$  and  $\cos = \cos\phi_{max}$

### Important:

When Plock-out = Plock-in then Curve B will be followed.

When Plock-out is  $\neq$  Plock-in then Curve A will be followed.



**Notes:**

In the formulas on the previous page, the parameters mentioned are named differently as in the menu page

**Curve A (in blue) Figure 6.30**

Point A = Plockout = Lower Power

Point B = Plockin = Upper Power

Point C = Lower limit • cosφ

Curve A is followed when Lower Power is not equal to Upper Power

**Curve B (in Red) Figure 6.30**

Point A (Lower Power) = Point B (Upper Power)

Point C = Lower limit • cosφ

Curve B is followed when Lower Power = Upper Power

Figure 7.32.: cos φ(P) settings page

**Adjustable parameters for cos φ(P)**

Parameter	Adjustable values	Curve A	Curve B
Upper limit - cos φ	Ind 0.80 ... Cap 0.80	Cap 1.0	Cap 1.0
Lower Power	0 ... 100 %	45% is shown but adjust to grid operator requested value	should equal Upper Power
Lower limit - cos φ	Ind 0.80 ... Cap 0.80	Ind 0.90	Ind 0.90
Upper Power	0 ... 100 %	90% is shown but adjust to grid operator requested value	should equal Lower Power
Lock-in Voltage*	230-253 V	241.5 V is default value and is 1.05Vn (Vn = 230V)	
Lock-out Voltage*	207-230 V	230 V is default value (adjustable at 0.98 Vn to Vn; Vn=230V). When the grid voltage ≤ the Lock-out voltage	

## Operating the PV inverter

Parameter	Adjustable values	Curve A	Curve B
Mode	ON   OFF	This switches the feature on and off. Default mode is OFF.	

\*These values are only adjustable if Country setting is Italy CEI-021 or Italy A70. This means the inverter will feed in reactive power depending on the active power once the grid voltage is higher than Lock-in Voltage. When grid voltage is lower than Lock-out voltage then inverter would go back to pure active power control.

For countries other than Italy,  $\cos \varphi(P)$  control would not be effected by the grid voltage.

### 7.3.6.4.5 Constant Reactive Power

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows a constant  $\cos$  reactive power to be set.

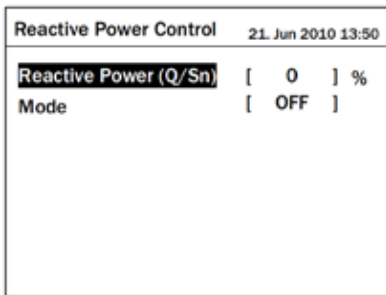


Figure 7.33.: Constant Reactive Power settings page

### Adjustable parameters

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive   capacitive	Reactive power ratio in relation to apparent power. Enter the value requested by the grid operator
Mode	ON   OFF	This switches the feature on and off

### 7.3.6.4.6 Q(V)

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V.

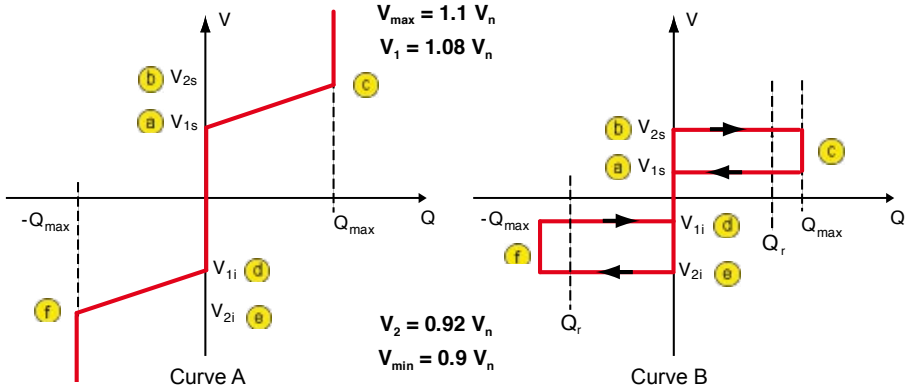


Figure 7.34.: Q(V)

Reactive Power Control		21. Jun 2010 13:50
a	V1s	[ 248.4 ] V
b	V2s	[ 253.0 ] V
c	Qs limit	[ Ind 44 ] %
-----		
d	V1i	[ 211.6 ] V
e	V2i	[ 207.0 ] V
f	Qi limit	[ Cap 44 ] %

Note: Qs limit and Qi limit are calculated based on Q/Sn.



Reactive Power Control		21. Jun 2010 13:50
Delay Time	[ 10 ] s	
Lock-in Power	[ 20 ] %	
Lock-out Power	[ 5 ] %	
Mode	[ OFF ]	
		[OFF] [Curve A] [Curve B]

Figure 7.35.: Q(V) Settings Page

## Operating the PV inverter

### Adjustable parameters

Parameter	Adjustable values	Description
Qs limit (Q/Sn)	0 ... 60% inductive   capacitive	Ind 44%
Qi limit (Q/Sn)	0 ... 60% inductive   capacitive	Cap 44%
V1s	230 ... 264.5 V	248.4 V
V2s	230 ... 264.5 V	253 V
V1i	184 ... 230 V	211.6 V
V2i	184 ... 230 V	207 V
Plock-in*	10 ... 100%	20% is shown but use value from the grid operator
Plock-out*	5 ... 10%	5% is shown but use value from the grid operator
Delay time	0 ... 120 s	10 s
Mode	Curve A   Curve B   OFF	This switches between Curve A and Curve B or OFF

\*This item is only adjustable and enabled if Country settings is Italy CEI 0-21 or Italy A70.

#### 7.3.6.4.7 LVFRT Low Voltage Fault Ride Through (LVFRT)

This feature is available for CEI 0-21 and A70.

This feature allows the Fault Ride Through features to be set.

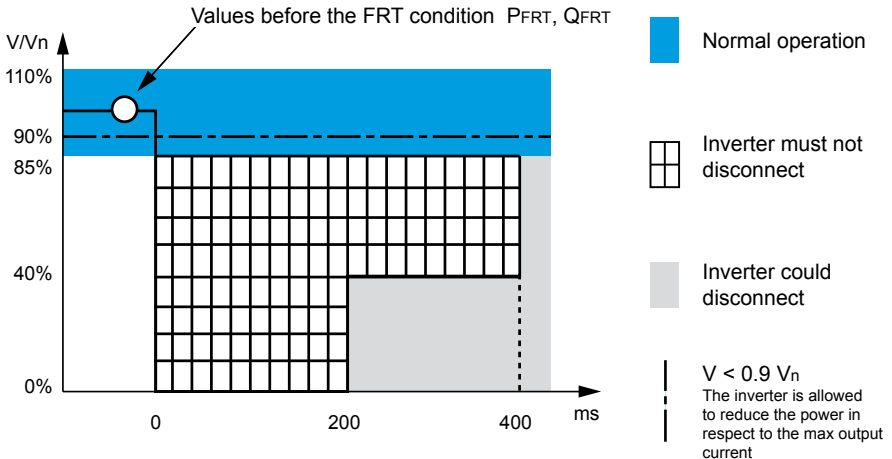


Figure 7.36.: Low Voltage Fault Ride Through graph

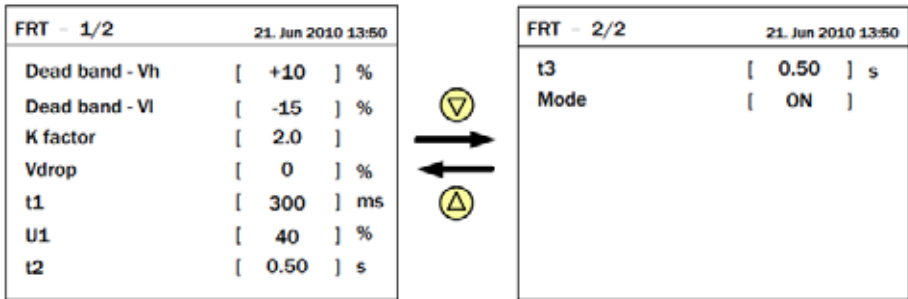


Figure 7.37.: Fault Ride Through settings page

**Adjustable parameters**

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	10%
Dead band - Vlow	-20 ... 0 %	-15%
K factor	Do not adjust	
Vdrop	Do not adjust	
t1	Do not adjust	
U1	Do not adjust	
t2	Do not adjust	
t3	Do not adjust	
Mode	ON   OFF	This switches the feature ON and OFF

7.3.6.5 Reactive Power Control for Slovenia (SONDO) for 15 / 20 / 30 TL Models

When selecting Slovenia from the Country setting list on initial start up, it is possible to adjust reactive power parameters for Q(V) according to two curves, class B and class C. The Slovenian requirements are known as SONDO or SOIEDN (System operation instructions for electricity distribution network). Q(V) is the reactive power ratio  $Q/S_n$  in dependency of the voltage V.

**CAUTION**



**Machine and equipment damage may occur.**

- ▶ Please only adjust these reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ▶ Adjustments may affect energy production
- ▶ Some values entered in the Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

**NOTE**



The inverter is only able to feed-in reactive power in Class B or Class C settings when the Power output is greater than 5% of  $P_n$ .

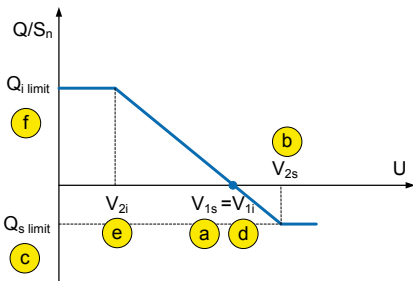


Figure 7.38.: SONDO Class B curve

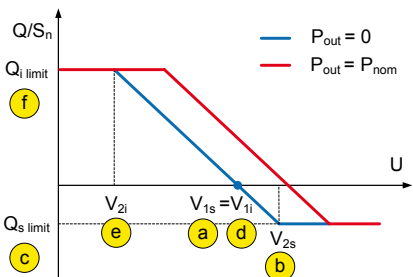


Figure 7.39.: SONDO Class C curve



Reactive Power Control		21. Jun 2010 13:50
a	V1s	[ 230 ] V
b	V2s	[ 236 ] V
c	Qs limit	[ Ind 15 ] %
-----		
d	V1i	[ 230 ] V
e	V2i	[ 207.0 ] V
f	Qi limit	[ Cap 60 ] %

Reactive Power Control		21. Jun 2010 13:50
Delay Time	[ 10 ]	s
Lock-in Power	[ 0 ]	%
Lock-out Power	[ 0 ]	%
Mode	[ Class B ]	
	↓	
	[ Class B ]	
	[ Class C ]	
	[ Off ]	

Figure 7.40.: Q(V) settings

**Adjustable parameters (Class C)**

Parameter	Adjustable values	Description
Qs limit (Q/Sn)	0 ... 63% inductive	Ind 15%
Qi limit (Q/Sn)	0 ... 63% capacitive	Cap 60%
V1s	230 ... 264.5 V	default 230 V
V2s	230 ... 264.5 V	default 236 V (limit 264.5 / V1s < V2s)
V1i	184 ... 230 V	default 230 V
V2i	184 ... 230 V	default 207 V (V2i < V1i)
Lock-in Power	0	Not applicable
Lock-out Power	0	Not applicable
Delay time	0 ... 120 s	10 s
Mode	Class B   Class C   OFF	This switches between Class B and Class C or OFF

Note: At the time of the manual printing, SONDO Class C was implemented in the inverter, but not yet Class B. Please check for Class B setting availability on our web site at [www.solar-inverter.com](http://www.solar-inverter.com). We will post the certificate for SONDO Class B when it is available.

## 8. Maintenance

In order to ensure the normal operation of the PV Inverter, please check it regularly at least once every 6 months. Check that all the terminals, screws, cables are securely in place. If there are any damaged parts, please contact a qualified technician to repair it or to replace it with a new spare part. To ensure that no foreign contaminants enter the warm air outlets, please have them cleaned every 6 months by qualified technicians.



### WARNING



**Death and serious injury may occur!**

- ▶ Before engaging in maintenance of the inverter, please disconnect AC and DC power to avoid risk of electric shock.!

---

### 8.1 Cleaning the Fans

Loosen the 4 screws in the four corners of the fan bracket first (circled below). Pulling the bracket slightly away from the inverter, the user will notice 4 sets of fan connectors. Disconnect the fan connectors one by one and then pull the fan bracket from the inverter for cleaning. Call the support hotline for assistance in procuring a new replacement fan.

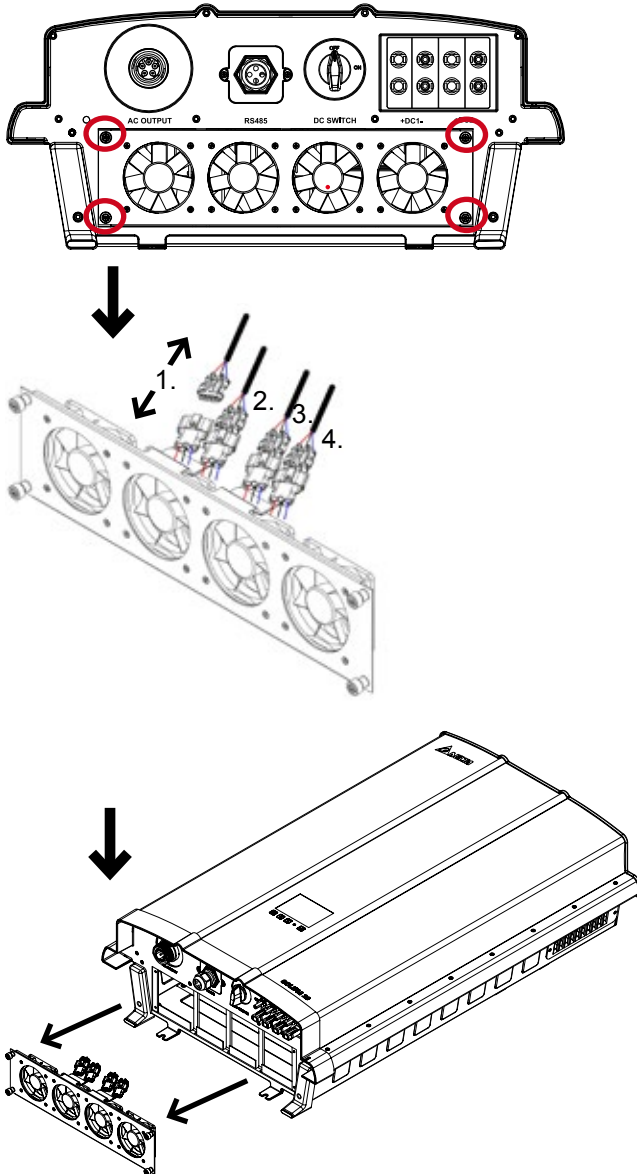


Figure 8.1.: Steps of removing the fan bracket from the inverter

## 8.2 Replace a Fan

If one of the fans has failed and needs to be replaced, user should remove the 4 screws (circled below) that attach the fan to the fan bracket. Next, pull the fan slightly away from the bracket and disconnect the fan connector located behind the fan bracket. The fan can now be removed and replaced with a new fan. Follow the procedure in reverse to install the new fan. (Figure 8-2 illustrates the replacement of the first fan on the fan bracket. Call the support hotline for assistance in procuring a replacement fan.

Note: The fan bracket shown is for the 15 TL, 20 TL, and 30 TL. The 10 TL fan bracket will have just one fan. The procedure to replace the fan on the 10 TL will be the same.

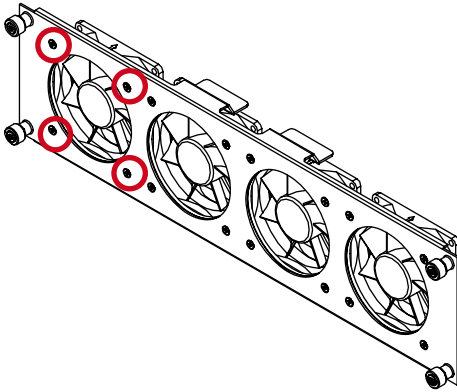


Figure 8.2.: Removing the fan from the fan bracket

## 8.3 Cleaning the Air Outlets

Figure 8.3 shows the removal of the vent covers for cleaning. First remove the 4 screws that hold the vent cover to the inverter enclosure. Next, remove the vent cover from the inverter. With the vent cover removed, clean it on both sides. After cleaning one of the vents, proceed to take off the vent on the opposite side and clean in the same manner. Reinstall the vent covers securely after they have been cleaned. The cleaning of the air outlets as described above should be done on a regular basis for optimum inverter performance.

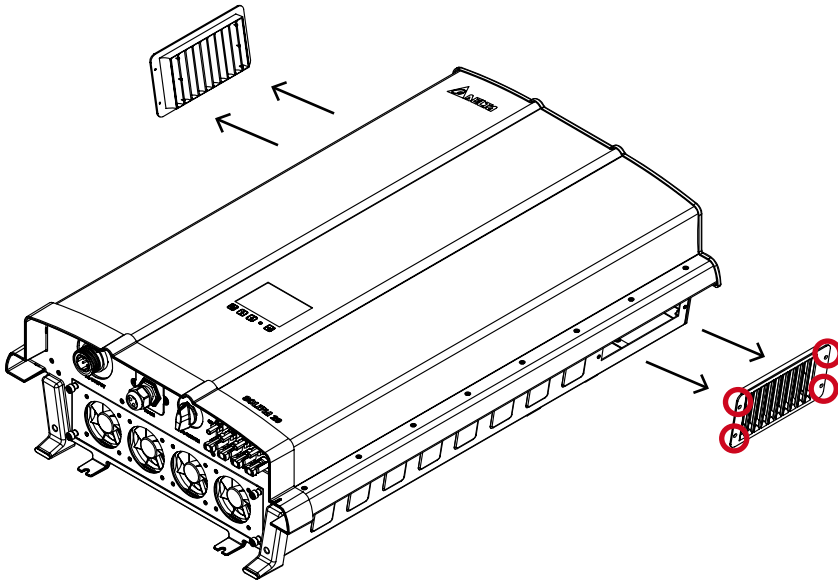


Figure 8.3.: Removing the Vent Covers for Cleaning

## 9. Measurements and Messages

### 9.1 Measurements

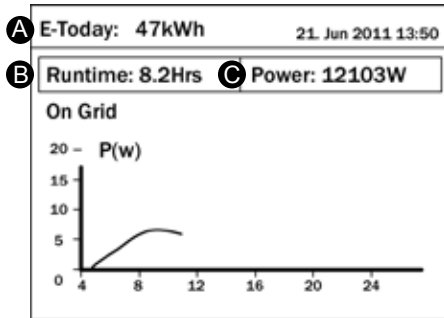


Figure 9.1.: Measurements on the Home Page

	Measurement	Description
A	E-Today	Total energy generated today
B	Runtime	Total PV inverter operation time for the day
C	Power	Actual power being generated

Table 9.1.: Home Page Measurements and Description

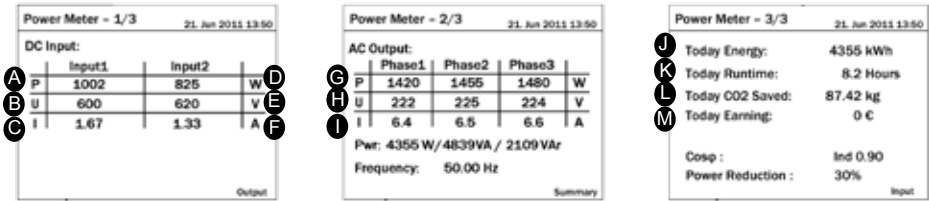


Figure 9.2.: Measurements on the Power Meter Pages

Measurement	Description
A	Input 1 P
B	Input 1 V
C	Input 1 I
D	Input 2 P
E	Input 2 V
F	Input 2 I
G	Output P
H	Output V
I	Output I
J	Today Energy
K	Today Runtime
L	Total CO2 saved
M	Today Earning

Table 9.2.: Power Meter Pages Measurements and Description

## Measurements and Messages

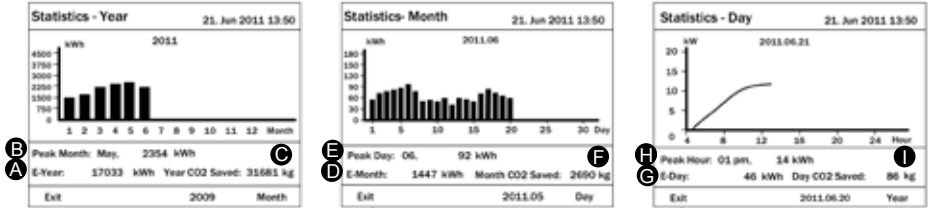


Figure 9.3.: Measurements on the Statistics Pages

	Measurement	Description
A	E-Year	Total accumulated electricity generated in a year
B	Peak Month	The peak month of electricity generated in the past year
C	Year CO2 saved	Total accumulated CO2 emissions retrenched in a year
D	E-Month	Total accumulated electricity generated in a month
E	Peak Day	The peak day of electricity generated in the past month
F	Month CO2 saved	Total accumulated CO2 emission retrenched in a month
G	E-Day	Total accumulated electricity generated in a day
H	Peak Hours	The peak hour of electricity generated in the past day
I	Day CO2 saved	Total accumulated CO2 emission retrenched for a day

Table 9.3.: Statistics Pages Measurements and Description



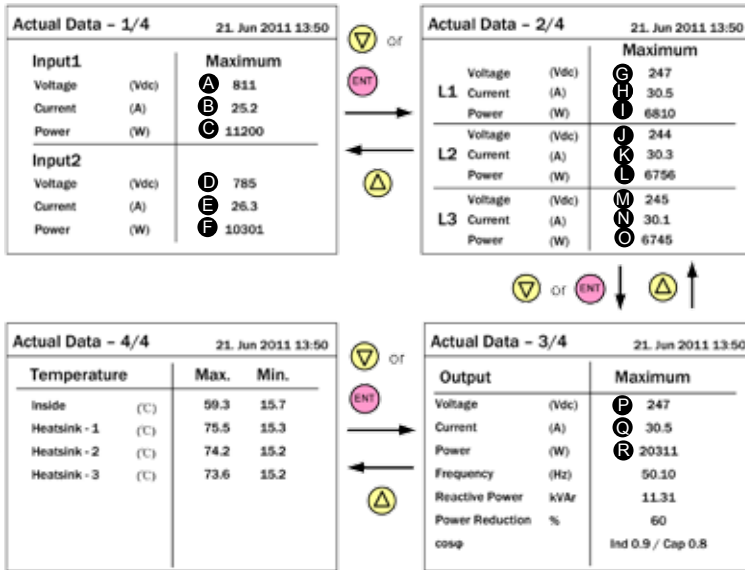


Figure 9.4.: Measurements on the Actual Data Pages

Measurement	Description
A Input 1 Volt. maximum	The maximum DC input 1 voltage
B Input 1 I maximum	The maximum DC input 1 current
C Input 1 P maximum	The maximum DC input 1 power
D Input 2 Volt. maximum	The maximum DC input 2 voltage
E Input 2 I maximum	The maximum DC input 2 current
F Input 2 P maximum	The maximum DC input 2 power
G L1 Volt. maximum	The maximum AC L1 phase voltage
H L1 I maximum	The maximum AC L1 phase current
I L1 P maximum	The maximum AC L1 phase power
J L2 Volt maximum	The maximum AC L2 phase voltage
K L2 I maximum	The maximum AC L2 phase current
L L2 P maximum	The maximum AC L2 phase power
M L3 Volt. maximum	The maximum AC L3 phase voltage
N L3 I maximum	The maximum AC L3 phase current
O L3 P maximum	The maximum AC L3 phase power
P Output Volt. maximum	The maximum AC 3 phase voltage
Q Output I maximum	The maximum AC 3 phase current
R Output P maximum	The maximum AC 3 phase power

## Measurements and Messages

Table 9.4.: Actual Data Pages Measurement and Description

Actual Data - 4/4		21. Jun 2011 13:50	
Temperature		Max.	Min.
Inside	(°C)	<b>A</b> 59.3	15.7 <b>B</b>
Heatsink - 1	(°C)	<b>C</b> 75.5	15.3 <b>D</b>
Heatsink - 2	(°C)	<b>E</b> 74.2	15.2 <b>F</b>
Heatsink - 3	(°C)	<b>G</b> 73.6	15.2 <b>H</b>

Figure 9.5.: Measurements of Temperature on the Actual Data Pages

Temperature		
A	Inside max.	The maximum inverter inner temperature value
B	Inside min.	The minimum inverter inner temperature value
C	Heatsink-1 max.	The maximum Heatsink-1 temperature value
D	Heatsink-1 min.	The minimum Heatsink-1 temperature value
E	Heatsink-2 max.	The maximum Heatsink-2 temperature value
F	Heatsink-2 min.	The minimum Heatsink-2 temperature value
G	Heatsink-3 max.	The maximum Heatsink-3 temperature value
H	Heatsink-3 min.	The minimum Heatsink-3 temperature value

Table 9.5.: Temperature Measurement and Description

## 9.2 Messages

Message	Red LED on	Red LED blinks	Description
<b>Errors</b>			
AC Freq High	X		Grid frequency is over rating
AC Freq Low	X		Grid frequency is under rating
Grid Quality	X		Poor grid quality
HW Connect Fail	X		Can't detect grid sequence
No Grid	X		Grid voltage < 100V
AC Volt Low	X		Phase-L1, L2, or L3 voltage is under rating
AC Volt High	X		Phase-L1, L2, or L3 voltage is over rating
Solar1 High	X		DC1 voltage > 1000V
Solar2 High	X		DC2 voltage > 1000V
<b>Faults</b>			
HW DC Injection	X		DC injection is over rating
Temperature	X		Ambient, heatsink, or choke temperature is higher or lower than the normal operation range
HW NTC1 Fail	X		Temperature sensor 1 has failed
HW NTC2 Fail	X		Temperature sensor 2 has failed
HW NTC3 Fail	X		Temperature sensor 3 has failed
HW NTC4 Fail	X		Temperature sensor 4 has failed
Firmware Fail	X		Firmware is incompatible
HW DSP ADC1	X		DSP A/D failure – Vgrid or Iout
HW DSP ADC2	X		DSP A/D failure – Vin or Vbus
HW DSP ADC3	X		DSP A/D failure – Iin or Iboost
HW Red ADC1	X		Red. A/D failure – Vgrid or Vinv
HW Red ADC2	X		Red. A/D failure – Iout_dc
HW Efficiency	X		Efficiency is abnormal
HW COMM2	X		Can't communicate with Red. CPU
HW COMM1	X		Can't communicate with DSP
Ground Current	X		Residual current is over rating
Insulation	X		Array insulation has failed
HW Connected Fail	X		AC internal wire is disconnected
RCMU Fail	X		HW RCMU failure
Relay Test Short	X		One or more relays are defective - short

## Measurements and Messages

Message	Red LED on	Red LED blinks	Description
Relay Test Open	X		One or more relays are defective - open
Bus Unbalance	X		Bus voltage is unbalanced
HW Bus OVR	X		BUS or BUS+ or BUS- voltage is over rating
HW Bus UVR	X		BUS+ or BUS- voltage is under rating
AC Current High	X		Phase-L1, L2, or L3 current is over rating
HW CT A Fail	X		Current sensor-L1 failure
HW CT B Fail	X		Current sensor-L2 failure
HW CT C Fail	X		Current sensor-L3 failure
HW AC OCR	X		Output current is over hardware limit
Inverter Failure	X		Inverter Failure
HW ZC Fail	X		HW zero-crossing circuit failure
DC Current High	X		DC1 or DC2 current is over rating
<b>Warnings</b>			
HW FAN		X	Fan is locked or failed during operation
Solar1 Low		X	DC1 voltage is under rating
Solar2 Low		X	DC2 voltage is under rating

## 10. Troubleshooting

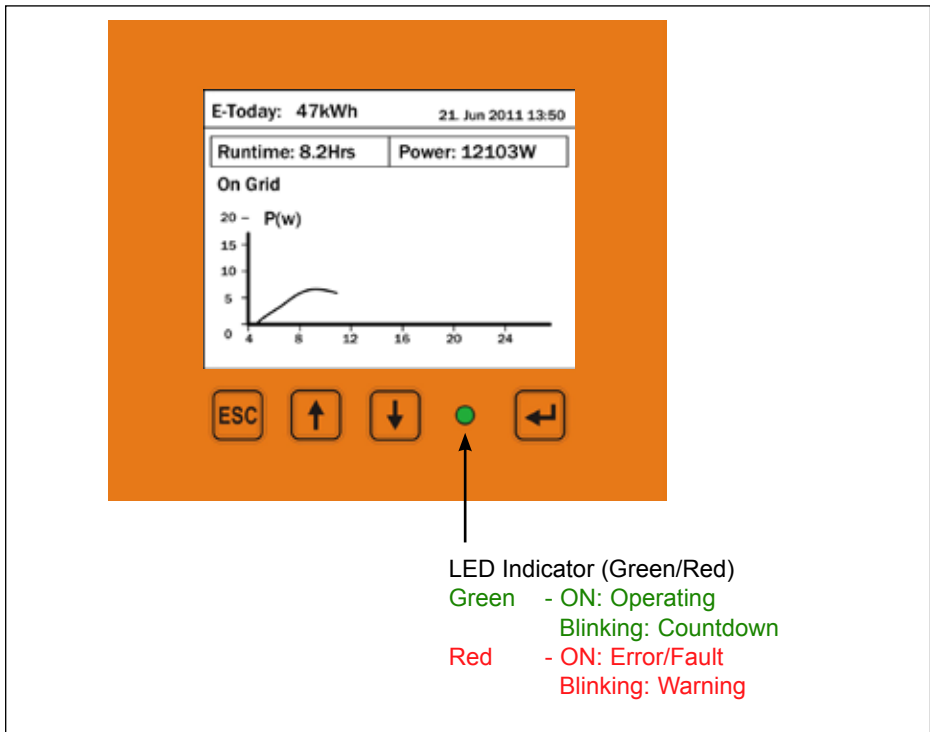


Figure 10.6.: LED Indicator

Message	Red LED on	Red LED blinks	Solution
<b>Errors</b>			
AC Freq High	X		<ul style="list-style-type: none"> <li>▶ Check grid frequency on the inverter terminal</li> <li>▶ Check the country setting</li> </ul>
AC Freq Low	X		<ul style="list-style-type: none"> <li>▶ Check grid frequency on the inverter terminal</li> <li>▶ Check the country setting</li> </ul>
Grid Quality	X		<ul style="list-style-type: none"> <li>▶ Check the harmonics of the grid voltage</li> <li>▶ Grid connection of the inverter may need to be further away from a non-linear load.</li> </ul>

## Troubleshooting

Message	Red LED on	Red LED blinks	Solution
HW Connect Fail	X		<ul style="list-style-type: none"> <li>▶ Check the AC connection, must be according to the manual instructions</li> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
No Grid	X		<ul style="list-style-type: none"> <li>▶ Check the connection of the AC plug, ensure it is connected to the inverter and the AC breaker is on</li> </ul>
AC Volt Low	X		<ul style="list-style-type: none"> <li>▶ Check the utility voltage connection to the inverter terminal</li> <li>▶ Check the country setting</li> </ul>
AC Volt High	X		<ul style="list-style-type: none"> <li>▶ Check the utility voltage connection to the inverter terminal</li> <li>▶ Check the country setting</li> </ul>
Solar1 High	X		<ul style="list-style-type: none"> <li>▶ Modify the solar array setting and make the Voc less than 1000 Vdc</li> </ul>
Solar2 High	X		<ul style="list-style-type: none"> <li>▶ Modify the solar array setting and make the Voc less than 1000 Vdc</li> </ul>
<b>Faults</b>			
HW DC Injection	X		<ul style="list-style-type: none"> <li>▶ Check the utility waveform. Grid connection of the inverter may need to be further from the non-linear load.</li> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
Temperature	X		<ul style="list-style-type: none"> <li>▶ Check the installation ambient and environment</li> </ul>
HW NTC1 Fail	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW NTC2 Fail	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW NTC3 Fail	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW NTC4 Fail	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
Firmware Fail	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW DSP ADC1	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW DSP ADC2	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA technical support</li> </ul>
HW DSP ADC3	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA tech. support</li> </ul>
HW Red ADC1	X		<ul style="list-style-type: none"> <li>▶ Please contact your installation technician or DELTA tech. support</li> </ul>

Message	Red LED on	Red LED blinks	Solution
HW Red ADC2	X		▶ Please contact your installation technician or DELTA tech. support
HW Efficiency	X		▶ Please contact your installation technician or DELTA technical support
HW COMM2	X		▶ Please contact your installation technician or DELTA technical support
HW COMM1	X		▶ Please contact your installation technician or DELTA technical support
Ground Current	X		▶ Check the insulation of Solar inputs ▶ Check the capacitance ( +<-> GND & - <-> GND), must be < 2.5 μF. Install an external transformer if necessary ▶ Please contact your installation technician or DELTA technical support
Insulation	X		▶ Check the insulation of solar inputs ▶ Please contact your installation technician or DELTA technical support
HW Connected Fail	X		▶ Please contact your installation technician or DELTA technical support
RCMU Fail	X		▶ Please contact your installation technician or DELTA technical support
Relay Test Short	X		▶ Please contact your installation technician or DELTA technical support
Relay Test Open	X		▶ Please contact your installation technician or DELTA technical support
Bus Unbalance	X		▶ Check the inputs connections ▶ Check the PV Array insulation ▶ Please contact your installation technician or DELTA technical support
HW Bus OVR	X		▶ Check the inputs connections ▶ Check the PV Array insulation ▶ Please contact your installation technician or DELTA technical support ▶ Modify the solar array setting and make the Voc less than 1000 Vdc
AC Current High	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT A Fail	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT B Fail	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation

## Troubleshooting

Message	Red LED on	Red LED blinks	Solution
HW CT C Fail	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW AC OCR	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
Inverter Failure	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW ZC Fail	X		▶ Please contact your installation technician or DELTA technical support
DC Current High	X		▶ Please contact your installation technician or DELTA technical support if it will not go back to normal operation
<b>Warnings</b>			
HW FAN		X	<ul style="list-style-type: none"> <li>▶ Remove the object that is stuck in the fan(s)</li> <li>▶ Replace the defective fan(s)</li> <li>▶ Check the connections of all fans</li> </ul>
Solar 1 Low		X	<ul style="list-style-type: none"> <li>▶ Check the DC1 voltage connection to the inverter terminal</li> <li>▶ Check all switching devices in boost1</li> </ul>
Solar 2 Low		X	<ul style="list-style-type: none"> <li>▶ Check the DC2 voltage connection to the inverter terminal</li> <li>▶ Check all switching devices in boost2</li> </ul>

Table 10.1.: Troubleshooting Message/Solution Description



## 11. Decommissioning

### Decommissioning Procedure

If it is necessary to put the SOLIVIA TL out of operation for return or maintenance, please follow the instructions below:

#### **WARNING**



#### **Death and serious injury may occur.**

To avoid injuries, please follow the below procedures:

1. Switch off AC circuit breaker to disconnect with electrical grid.
2. Switch off the DC Disconnect switch to disconnect with DC power input.
3. Use the proper voltage meter to confirm that the AC and DC power connections are void of any current.
4. Remove the AC wiring immediately to completely disconnect with electrical grid.
5. Remove the DC wiring to disconnect with PV array.
6. Remove the Communication module RS485 with the computer connection.
7. After finishing all the procedures, you can remove the SOLIVIA TL inverter from the mounting bracket.

## 12. Technical data

### 12.1 Specification

#### NOTE



The specification is subject to change. Please check the web site at [www.solar-inverter.com](http://www.solar-inverter.com) for the latest version.

	10EUT4TL	15EUG4TL	20EUG4TL	30EUT4TL
<b>INPUT (DC)</b>				
Max. recommended PV power <sup>1)</sup>	13.2 kW <sub>p</sub>	19 kW <sub>p</sub>	25 kW <sub>p</sub>	38 kW <sub>p</sub>
Recommended PV power range	8.8 ... 13.2 kW <sub>p</sub>	14 ... 19 kW <sub>p</sub>	18 ... 25 kW <sub>p</sub>	26 ... 38 kW <sub>p</sub>
Nominal power	10.5 kW	15.3 kW	20.4 kW	31 kW
Operating voltage	250 ... 1000 V			
MPP voltage range @ nominal power, balanced inputs	350 ... 850 V <sub>DC</sub>	350 ... 800 V <sub>DC</sub>	350 ... 800 V <sub>DC</sub>	480 ... 800 V <sub>DC</sub>
MPP voltage range unbalanced inputs	350 ... 850 V <sub>DC</sub>	470 ... 800 V <sub>DC</sub>	480 ... 800 V <sub>DC</sub>	620 ... 800 V <sub>DC</sub>
Nominal voltage	635 V <sub>DC</sub>	650 V <sub>DC</sub>		
Start up power	40 W			
Absolute maximum voltage	1000 V	1000 V	1000 V	
Number of inputs	4 inputs (2 MPP trackers)			6 inputs (2 MPP trackers)
Max. current	30 A (20 A x 2)	48 A (24 A x 2)	60 A (30 A x 2)	68 A (34 A x 2)
<b>OUTPUT (AC)</b>				
Max. apparent power <sup>2)</sup>	10.5 kVA	15.75 kVA	21.0 kVA	31.5 kVA
Nominal apparent power	10.0 kVA	15.0 kVA	20.0 kVA	30.0 kVA
Voltage range (3 phase) <sup>3)</sup>	3 x 230 / 400 V (± 20 %) + N + PE (3 phases, 5 wires)			
Nominal current	14.5 A	22 A	29 A	43 A
Max. current	16 A	25 A	32 A	46 A
Nominal frequency	50/60 Hz			
Frequency range <sup>3)</sup>	50 / 60 Hz ± 5 Hz			
Power factor adjustable	0.80 Cap ... 0.80 Ind			

	10EUT4TL	15EUG4TL	20EUG4TL	30EUT4TL
Total harmonic distortion	< 3 % @ nominal apparent power			
DC current injection	< 0.5 % rated current			
Night-time loss	< 2 W			
<b>GENERAL SPECIFICATION</b>				
Maximum efficiency	98.3 %		98.0 %	98.2 %
EU efficiency	> 97.8 %		> 97.8 %	> 97.9 %
Operating temperature	-20 - +60° C (Derating > 40° C)			
Storage temperature	-25 - +70° C	-20 - +70° C		-25 - +70° C
Humidity	5 - 95 %		0 - 90 %	
Max. Operating Altitude	2000 m			
<b>MECHANICAL DESIGN</b>				
Size (L x W x D)	620 x 625 x 275 mm		952 x 625 x 275 mm	
Weight	41 kg	67.2 kg	67.2 kg	72.2 kg
Enclosure	Powder coated aluminum			
Cooling	Fan			
AC connector	Amphenol C16-3			Amphenol PPC AC 24
DC connector pairs	4 Multicontact MC4			6 Multicontact MC4
Communication interfaces	2 RJ45 / RS485			
DC disconnecter	Integrated			
Display	Black / white graphical LCD			
<b>STANDARDS / DIRECTIVES</b>				
Protection degree <sup>4)</sup>	IP55 lower section / IP65 upper section (see figure 5-1 for further detail)			
Safety class	1			
Configurable trip parameters	Yes			
Insulation monitoring	Yes			
Overload behavior	Current limitation, power limitation			
Safety	IEC62109-1 / -2, CE compliance	IEC62109-1 / -2, CE compliance, AS/NZS 3100		IEC62109-1 / -2, CE compliance

## Technical data

	10EUT4TL	15EUG4TL	20EUG4TL	30EUT4TL
Grid Interface	VDE-AR-N 4105, CEI 0-21, VDE 0126-1-1	VDE-AR-N 4105, BDEW, VDE 0126-1-1; G59/1-2 (230 V & 240 V); EN 50438; UTE C15-712-1, Synergrid C10/C11 BT, Synergrid C10/C11 2012, RD661/2007, RD1699/2011, CEI 0-21, French Islands 60 Hz., TERNA A70, AS 4777, SONDO Class C		VDE-AR-N 4105, CEI 0-21, SONDO Class C
EMC	EN61000-6-2; EN61000-6-3	EN61000-6-2; EN61000-6-3; EN61000-3-11, EN61000-3-12, C-Tick		EN61000-6-2; EN61000-6-3, EN61000-3-11, EN61000-3-12

<sup>1)</sup> When operated with balanced DC inputs (50/50 %)

<sup>2)</sup> The maximum AC apparent power indicates the power an inverter is able to deliver. This maximum apparent power may not necessarily be reached.

<sup>3)</sup> AC voltage and frequency range will be programmed according to the individual country requirements.

<sup>4)</sup> IP55 for cooling section / IP65 for electronics

## 12.2 Cable Recommendations

### Power wiring

Current rating	Cross-section	Recommended max. cable loss calculation
AC - < 40 A (10 TL / 15 TL / 20 TL) < 60 A (30 TL)	Calculated based on needed length, used material, cable losses and etc.	<1 %
DC 34 A	6 mm <sup>2</sup>	<1 %

### Communication cable

RS485 modular communication cable / cross wired 8 poles

### 12.3 Earthing Systems for 10 TL, 15 TL, 20 TL, 30 TL

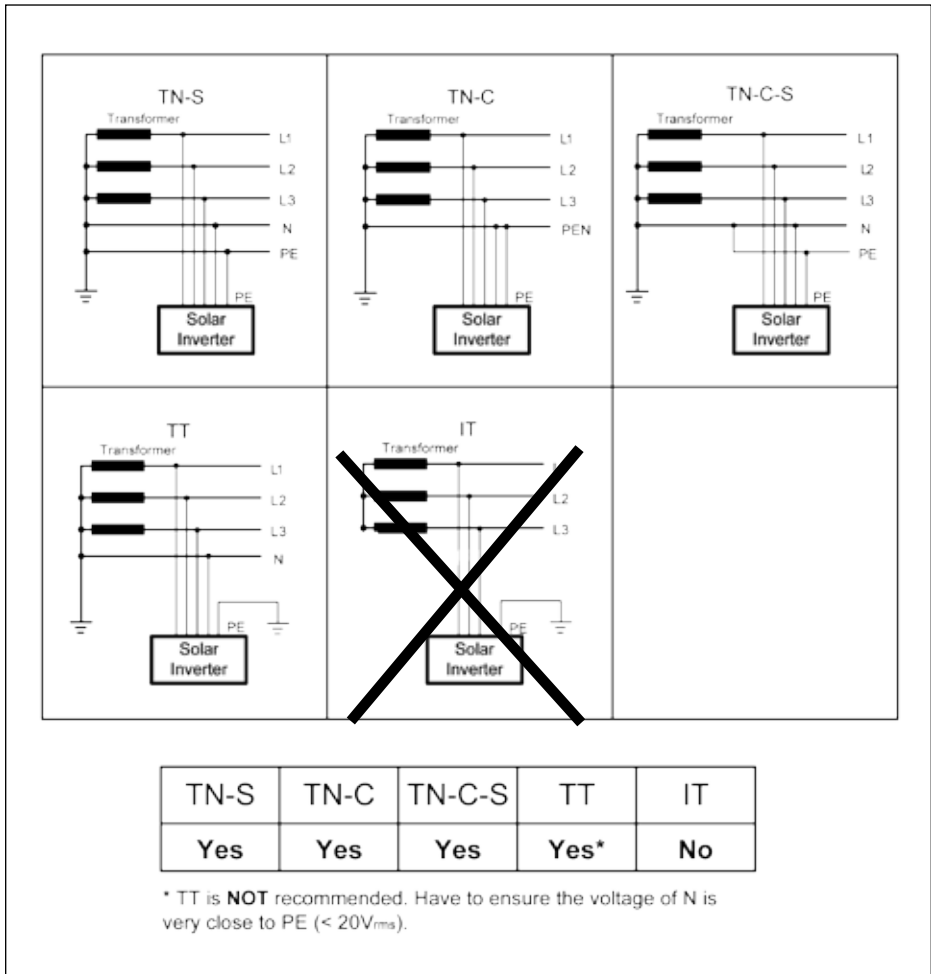


Figure 12.1.: Earthing Systems

## 12.4 15 TL and 20 TL Models With Earlier DC Input Panel

Please note that 15 TL and 20 TL inverter models have two different DC input connector configurations, while the models are operationally the same and the DC connectors are the same type. Please see the figures below for the layout of the DC inputs for 15 TL and 20 TL models produced before and after September 1, 2012.

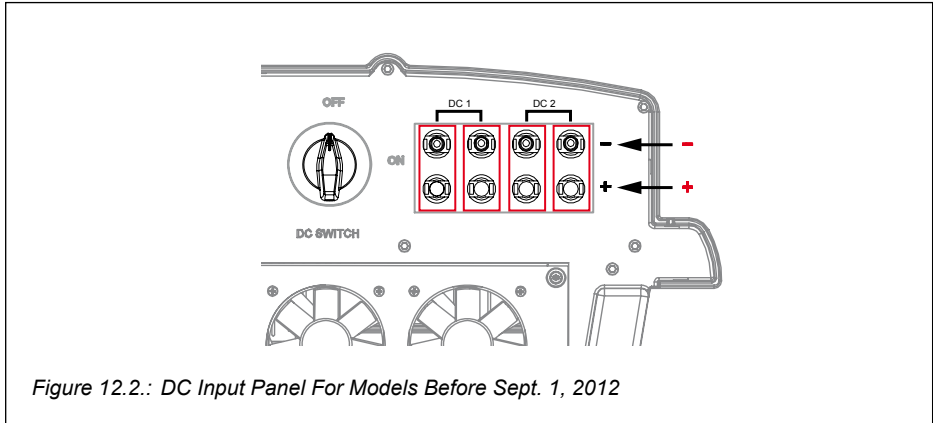


Figure 12.2.: DC Input Panel For Models Before Sept. 1, 2012

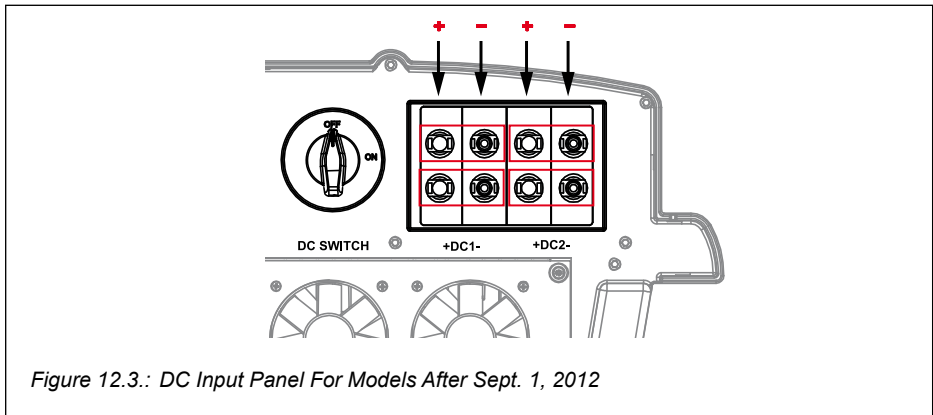



Figure 12.3.: DC Input Panel For Models After Sept. 1, 2012

# 13. Certificates



## EC Declaration of Conformity

**Producer:** Delta Energy Systems (Germany) GmbH  
**Address:** Tachaustr. 21, D - 79331 Teinigen, Germany  
**Product description:** Solar Inverter for Grid operation  
**Model:** SOLWA15EU04TL EDE4801332  
 SOLWA20EU04TL EDE4801334

**The product described above in the form as delivered is in conformity with the provisions of the following European Directives:**  
**2004/108/EG** Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility  
 EN 50145-1 : 2006 + A1 : 2009  
 EN 50145-2 : 2006 + A1 + EN 61000-3-11 : 2001  
 EN 61000-4-2 : 2006  
 EN 61000-4-3 : 2010  
 EN 61000-4-4 : 2006  
 EN 61000-4-5 : 2006  
 EN 61000-4-6 : 2006  
 EN 61000-4-7 : 2006  
 EN 61000-4-8 : 2006  
 EN 61000-4-9 : 2006  
 EN 61000-6-2 : 2006 / EN 61000-6-1 : 2007  
 EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

**2006/95/EC** Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits  
 EN 62108-1 : 2010  
 EN 62108-2 : 2011

The product described above does also comply with the VDE 0124-100.  
 Teinigen, July 7<sup>th</sup> 2012

Vincent Lin  
 Head of Product Management LOB ISPV  
Name, function


*Vincent Lin*  
Signature

Andreas Heischen  
 Head of BU LOB ISPV  
Name, function

*Andreas Heischen*  
Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

DELTA SOLWA15EU04TL\_EC\_Decl\_en 20127.doc



## EC Declaration of Conformity

**Producer:** Delta Energy Systems (Germany) GmbH  
**Address:** Tachaustr. 21, D - 79331 Teinigen, Germany  
**Product description:** Solar Inverter for Grid operation  
**Model:** SOLWA3HEU14TL EDE4800458

**The product described above in the form as delivered is in conformity with the provisions of the following European Directives:**  
**2004/108/EG** Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility  
 EN 50145-1 : 2006 + A1 : 2009  
 EN 50145-2 : 2006 + A1 + EN 61000-3-11 : 2006  
 IEC 61000-4-2 : 2006  
 IEC 61000-4-3 : 2009  
 IEC 61000-4-4 : 2006  
 IEC 61000-4-5 : 2006  
 IEC 61000-4-6 : 2006  
 IEC 61000-4-7 : 2006  
 IEC 61000-4-8 : 2006  
 EN 61000-6-2 : 2006 / EN 61000-6-1 : 2007  
 EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

**2006/95/EC** Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits  
 IEC 62108-1 : 2010  
 IEC 62108-2 : 2011

Teinigen, November 30<sup>th</sup> 2012

Vincent Lin  
 Head of Product Management LOB ISPV  
Name, function

*Vincent Lin*  
Signature

Andreas Heischen  
 Head of BU Management LOB ISPV  
Name, function

*Andreas Heischen*  
Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

DELTA SOLWA3HEU14TL\_EC\_Decl\_en 20129.doc

Please visit the web site at [www.solar-inverter.com](http://www.solar-inverter.com) to find all applicable certificates for the SOLIVIA 10 TL / 15 TL / 20 TL / 30 TL solar inverters.





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