

**General Safety Instructions:**

READ SAFETY INSTRUCTIONS

**Servicing:**

These products are not customer serviceable TDK-Lambda UK LTD and their authorised agents only are permitted to carry out repairs.

**Critical Components:**

These products are not authorised for use as critical components in nuclear control systems, life support systems or equipment for use in hazardous environments without the express written approval of the Managing Director of TDK-Lambda EMEA.

**Product Usage:**

These products are designed for use within a host equipment which restricts access to authorised competent personnel.

This product is a component power supply and is only to be installed by qualified persons within other equipment and must be not operated as a stand alone product.

This product is for sale to business to business customers and can be obtained via distribution channels. It is not intended for sale to end users.

This product is a component power supply and does not fall within the scope of the EMC directive. Compliance with the EMC directive must be considered in the final installation. Please contact your local TDK-Lambda office.

**Environmental:**

These products are IPX0, and therefore chemicals/solvents, cleaning agents and other liquids must not be used.

**Environment:**

This power supply is a switch mode power supply for use in applications within a Pollution Degree 2, overvoltage category II environment. Material Group IIIb PCB's are used within it.

**Output Loading:**

The output power taken from the power supply must not exceed the rating stated on the power supply label, except as stated in the product limitations in this handbook.

**Input Parameters:**

This product must be operated within the input parameters stated in the product limitations in this handbook.

**End of Life Disposal:**

The unit contains components that require special disposal. Make sure that the unit is properly disposed of at the end of its service life and in accordance with local regulations.



RISK OF ELECTRIC SHOCK

**High Voltage Warning:**

Dangerous voltages are present within the power supply. The professional installer must protect service personnel from inadvertent contact with these dangerous voltages in the end equipment.

**WARNING:** When installed in a Class 1 end equipment, this product must be reliably earthed and professionally installed.

The (+) or (-) output(s) can be earthed or left floating.

The unit cover(s)/chassis (where applicable) must not be made user accessible.

The mains input connector is not acceptable for use as field wiring terminals.

For encased products, do not use mounting screws, which penetrate the unit more than; See drawings.

Internal fuses protect the unit and must not be replaced by the user. In case of internal defect, the unit must be returned to TDK-Lambda UK LTD or one of their authorised agents.

A suitable mechanical, electrical and fire enclosure must be provided by the end use equipment for mechanical, electric shock and fire hazard protection.

**Energy Hazards:**

The main output of this product is capable of providing hazardous energy (240VA). Final equipment manufacturers must provide protection to service personnel against inadvertent contact with the output terminals.

The unit cover/chassis, where applicable, is designed to protect skilled personnel from hazards. They must not be used as part of the external covers of any equipment where they may be accessible to operators, since under full load conditions, part or parts of the unit chassis may reach temperatures in excess of those considered safe for operator access.

**Allgemeine Sicherheitsvorschriften:**

LESEN SIE DIE SICHERHEITSVORSCHRIFTEN

**Wartung:**

Diese Produkte können nicht durch den Kunden gewartet werden. Nur TDK-Lambda UK LTD. und deren zugelassene Vertriebshändler sind zur Durchführung von Reparaturen berechtigt.

**Kritische Komponenten:**

Diese Produkte sind nicht für die Verwendung als kritische Komponenten in nuklearen Kontrollsystemen, Lebenserhaltungssystemen oder Geräten in gefährlichen Umgebungen geeignet, sofern dies nicht ausdrücklich und in Schriftform durch den Geschäftsführer von TDK-Lambda EMEA genehmigt wurde.

**Produktverwendung:**

Diese Produkte sind zur Verwendung innerhalb von Host-Anlagen gedacht, die einen auf das Fachpersonal beschränkten Zugang haben.

Dieses Produkt ist eine Stromversorgungs-Komponente und sie darf nur von qualifiziertem Personal in andere Geräte eingebaut werden und sie darf NICHT als eigenständiges ("Stand-Alone") Gerät betrieben werden. Dieses Produkt ist für den Verkauf an Geschäftskunden entwickelt worden und es kann über Distributionskanäle bezogen werden.

Es ist NICHT für den Verkauf an Endkunden gedacht und konzipiert.

Dieses Produkt ist eine Stromversorgungsbaugruppe und sie fällt NICHT in den Bereich der EMV Direktive. Die Konformität mit der EMV Richtlinie muss in der finalen Gesamtinstallation betrachtet werden. Bitte kontaktieren Sie Ihr regionales TDK-Lambda Vertriebsbüro im Falle von Rückfragen.

**Umwelt:**

Diese Produkte sind IPX0, aus diesem Grund dürfen keine Chemikalien/Lösungsmittel, Reinigungsmittel und andere Flüssigkeiten verwendet werden.

**Umgebung:**

Dieses Netzteil ist ein Schaltnetzteil zur Verwendung in einer Umgebung mit einem Verschmutzungsgrad 2, Überspannungskategorie II. Materialgruppe IIIb mit darin verwendeten PCBs.

**Ausgangsstrom:**

Der Ausgangsstrom des Netzteiles darf die Leistung, die auf dem Label des Netzteiles vermerkt ist, nur dann überschreiten, wenn dies in den Produktgrenzen dieses Handbuches ausgezeichnet ist.

**Eingangsparameter:**

Dieses Produkt muss innerhalb der Eingangsparameter, die in den Produktgrenzen dieses Handbuches angegeben sind, betrieben werden.

**Entsorgung am Ende der Betriebszeit:**

Das Gerät enthält Komponenten die unter Sondermüll fallen. Das Gerät muss am Ende der Betriebszeit ordnungsgemäß und in Übereinstimmung mit den regionalen Bestimmungen entsorgt werden.

**GEFAHR DURCH ELEKTRISCHEN SCHLAG****Hochspannungswarnung:**

Innerhalb des Netzteiles gibt es gefährliche Spannungen. Der Elektroinstallateur muss das Wartungspersonal vor versehentlichem Kontakt mit den gefährlichen Spannungen im Endgerät schützen.

**WARNUNG!** Falls Sie unser Netzgerät in eine Anwendung mit Schutzklasse 1 eingebaut haben, stellen Sie sicher, dass es fachgerecht installiert und zuverlässig geerdet ist.

Die (+) oder (-) Ausgänge können geerdet werden oder unangeschlossen bleiben.

Die Abdeckung des Gerätes/das Gehäuse darf für den Benutzer nicht zugänglich sein.

Der Haupteingangsanschluss ist nicht für die Verwendung als Feldverdrahtungsanschluss geeignet.

Für ummantelt Produkte, verwenden Sie keine Schrauben, die das Gerät mehr als durchdringen; siehe Zeichnung. Eine interne Sicherung schützt das Gerät und darf durch den Benutzer nicht ausgetauscht werden. Im Fall von internen Defekten muss das Gerät an TDK-Lambda UK LTD oder einen der autorisierten Vertriebshändler zurückgeschickt werden.

Ein geeignetes mechanisches, elektrisches und brandgeschütztes Gehäuse muss als Schutz vor der Gefahr von mechanischen Risiken, Stromschlägen und Brandschutz in dem Endgerät vorgesehen werden.

Gefahren durch elektrische Energie:

Von bestimmten Modulen kann je nach Einstellung der Ausgangsspannung gefährliche elektrische Energie ausgehen (240 VA). Die Endgerätehersteller müssen einen Schutz für Servicepersonal vor unbeabsichtigtem Kontakt mit den Ausgangsanschlüssen dieser Module vorsehen. Kann aufgrund der Einstellung gefährliche elektrische Energie auftreten, dürfen die Modulanschlüsse für den Benutzer nicht zugänglich sein.

Die Geräteabdeckung/das Gehäuse ist so entworfen, dass das Fachpersonal vor Gefahren geschützt wird. Sie dürfen nicht als Teil der externen Abdeckung für Geräte verwendet werden, die für den Betreiber zugänglich sein müssen, da Teile oder das gesamte Gerätegehäuse unter voller Auslastung übermäßige Temperaturen erreichen kann, die für den Zugang des Betreibers nicht mehr als sicher betrachtet werden.

**Consignes générales de sécurité:**

LIRE LES CONSIGNES DE SECURITE

**Entretien:**

Ces produits ne peuvent pas être réparés par l'utilisateur. Seuls, TDK-Lambda UK LTD et ses agents agréés sont autorisés à effectuer des réparations.

**Composants critiques:**

Ces produits ne doivent pas être utilisés en tant que composants critiques dans des systèmes de commande nucléaire, dans des systèmes de sauvetage ou dans des équipements utilisés dans des environnements dangereux, sans l'autorisation écrite expresse du directeur général de TDK-Lambda EMEA.

**Utilisation du produit:**

Ces produits sont conçus pour être utilisés dans un équipement hôte dont l'accès n'est autorisé qu'aux personnes compétentes.

Ce produit est une alimentation considérée comme un composant devant être installé par des personnes qualifiées, dans un autre équipement. Il ne doit pas être utilisé en tant que produit fini.

Ce produit est destiné à la vente entre entreprises et peut être obtenu via des canaux de distribution.

Il n'est pas prévu à la vente pour les particuliers.

Ce produit est une alimentation considérée comme un composant, il ne relève pas du champ d'application de la directive CEM. Le respect de la directive CEM doit être pris en compte dans l'installation finale. Veuillez contacter votre bureau TDK-Lambda le plus proche.

**Environnement:**

Ces produits sont IPX0, et donc on ne doit pas utiliser des produits chimiques/solvants, des produits de nettoyage et d'autres liquides.

**Environnement fonctionnel :**

Cette alimentation fonctionne en mode commutation pour utilisation dans des applications fonctionnant dans un environnement avec Degré de Pollution 2 et catégorie de surtension II. Elle utilise des cartes des circuits imprimés (PCB) de Groupe IIIb.

**Intensité soutirée:**

L'intensité soutirée de l'alimentation ne doit pas dépasser l'intensité nominale marquée sur la plaque signalétique, sauf indications contraires dans les limitations du produit décrit dans ce manuel.

**Paramètres d'entrée:**

Ce produit doit être utilisé à l'intérieur des paramètres d'entrée indiqués dans les limitations du produit dans ce manuel.

**Elimination en fin de vie:**

L'alimentation contient des composants nécessitant des dispositions spéciales pour leur élimination. Vérifiez que cette alimentation est mise au rebut correctement en fin de vie utile et conformément aux réglementations locales en vigueur.



RISQUE DE CHOC ELECTRIQUE

**Attention-Danger haute tension:**

Des tensions dangereuses sont présentes dans l'alimentation. L'installateur doit protéger le personnel d'entretien contre un contact involontaire avec ces tensions dangereuses dans l'équipement final.

**AVERTISSEMENT:** Si ce produit est installé dans un équipement final de classe I, il doit être mis à la terre de manière fiable et installé par un professionnel averti.

Les sorties (+) ou (-) peuvent être raccordées à la terre ou laissées flottantes.

Le couvercle/châssis de l'alimentation ne doit pas être accessible à l'utilisateur. Le connecteur d'entrée d'alimentation principale ne doit pas être utilisé comme borne de raccordement.

N'utilisez pas de vis pénétrant dans le module sur une profondeur supérieure à : Voir dessins.

Un fusible interne protège le module et ne doit pas être remplacé par l'utilisateur. En cas de défaut interne, le module doit être renvoyé à TDK-Lambda UK LTD ou l'un de ses agents agréés.

Une enceinte appropriée doit être prévue par l'utilisateur final pour assurer la protection contre les chocs mécaniques, les chocs électriques et l'incendie.

Energies dangereuses :

Certains modules peuvent générer une énergie dangereuse (240 VA) selon le réglage de tension de sortie. Le fabricant de l'équipement final doit assurer la protection des techniciens d'entretien contre un contact involontaire avec les bornes de sortie de ces modules. Si une telle tension dangereuse risque de se produire, les bornes ou les connexions du module ne doivent pas être accessibles par l'utilisateur.

Le couvercle et le châssis du module sont conçus pour protéger des personnels expérimentés. Ils ne doivent pas être utilisés comme couvercles extérieurs d'un équipement, accessible aux opérateurs car en condition de puissance maximum, des parties du châssis peuvent atteindre des températures considérées comme dangereuses pour l'opérateur.

**Norme generali di sicurezza:**

SI PREGA DI LEGGERE LE NORME DI SICUREZZA

**Manutenzione:**

Il cliente non può eseguire alcuna manutenzione su questi prodotti. L'esecuzione delle eventuali riparazioni è consentita solo a TDK-Lambda UK LTD e ai suoi agenti autorizzati.

**Componenti critici:**

Non si autorizza l'uso di questi prodotti come componenti critici all'interno di sistemi di controllo nucleari, sistemi necessari alla sopravvivenza o apparecchiature destinate all'impiego in ambienti pericolosi, senza l'esplicita approvazione scritta dell'Amministratore Delegato di TDK-Lambda EMEA.

**Uso dei prodotti:**

Questi prodotti sono progettati per l'uso all'interno di un'apparecchiatura ospite che limiti l'accesso al solo personale competente e autorizzato.

Questo prodotto è da considerarsi come un alimentatore professionale componente e come tale deve essere installato da personale qualificato all'interno di altre apparecchiature e non può essere utilizzato come prodotto indipendente.

Questo prodotto non è inteso per la vendita al dettaglio o agli utilizzatori finali.

Questo alimentatore è da considerarsi come un componente e come tale non è assoggettato dagli scopi della direttiva EMC. Conformità alla direttiva EMC deve essere considerata nell'installazione finale di utilizzo. Gli uffici di TDK-Lambda Sas Succursale Italiana sono a vostra disposizione per ulteriori raggugli.

**Condizioni ambientali:**

Questi prodotti sono classificati come IPX0, dunque non devono essere utilizzati sostanze chimiche/solventi, prodotti per la pulizia o liquidi di altra natura.

**Ambiente:**

Questo prodotto è un alimentatore a commutazione, destinato all'uso in applicazioni rientranti in ambienti con le seguenti caratteristiche: Livello inquinamento 2, Categoria sovratensione II. Questo prodotto contiene schede di circuiti stampati in materiali di Gruppo IIIb.

**Carico in uscita:**

La potenza in uscita ottenuta dall'alimentatore non deve superare la potenza nominale indicata sulla targhetta dell'alimentatore, fatto salvo dove indicato nei limiti per il prodotto specificati in questo manuale.

**Parametri di alimentazione:**

Questo prodotto deve essere utilizzato entro i parametri di alimentazione indicati nei limiti per il prodotto, specificati in questo manuale.

**Smaltimento:**

L'unità contiene componenti che richiedono procedure speciali di smaltimento. Accertarsi che l'unità venga smaltita in modo corretto al termine della vita utile e nel rispetto delle normative locali.



RISCHIO DI SCOSSA ELETTRICA

**Avvertimento di alta tensione:**

All'interno dell'alimentatore sono presenti tensioni pericolose. Gli installatori professionali devono proteggere il personale di manutenzione dal rischio di contatto accidentale con queste tensioni pericolose all'interno dell'apparecchiatura finale.

**ATTENZIONE:** Se installato in un'attrezzatura di classe I, questo prodotto deve essere collegato a terra in modo affidabile ed installato in modo professionale.

Le uscite (+) o (-) possono essere messa a terra o lasciate isolate.

I coperchi/il telaio dell'unità non devono essere accessibili da parte dell'utente.

Il connettore dell'alimentazione principale non può essere utilizzato come terminale di collegamento di campo.

Non utilizzare viti che penetrano nell'unità per più di : Vedi disegni

Un fusibile interno protegge l'unità e non deve essere sostituito dall'utente. Nell'eventualità di un difetto interno, restituire l'unità a TDK-Lambda UK LTD o a uno dei suoi agenti autorizzati.

L'apparecchiatura finale deve includere una recinzione meccanica, elettrica e antincendio per proteggere dai pericoli di natura meccanica, dalle scosse elettriche e dai pericoli di incendio.

Pericoli energetici:

Alcuni moduli sono in grado di erogare energia pericolosa (240 VA) a seconda della tensione in uscita impostata. I produttori delle apparecchiature finali sono tenuti a proteggere il personale di manutenzione dal rischio di contatto accidentale con questi terminali dei moduli di uscita. Se impostati su livelli che non escludono l'erogazione di energia pericolosa, questi terminali o collegamenti non devono risultare accessibili da parte dell'utente.

Il coperchio/telaio dell'unità è realizzato per proteggere il personale esperto dai pericoli. Non deve essere usato come parte degli involucri esterni di qualsiasi apparecchiatura, se risulta accessibile da parte degli addetti, poiché è possibile che in condizioni di pieno carico una o più parti del telaio dell'unità giunga/ giungano a temperature superiori ai limiti considerati sicuri per l'accesso da parte degli addetti.



**Instrucciones generales de seguridad:**

LEA LAS INSTRUCCIONES DE SEGURIDAD

**Servicio:**

Estos productos no pueden ser reparados por los clientes. TDK-Lambda UK LTD. y sus agentes autorizados son los únicos que pueden llevar a cabo las reparaciones.

**Componentes fundamentales:**

Estos productos no pueden ser utilizados como componentes fundamentales en sistemas de control nuclear, sistemas de soporte vital o equipos a utilizar en entornos peligrosos sin el consentimiento expreso por escrito del Director General de TDK-Lambda EMEA.

**Uso de los productos:**

Estos productos han sido diseñados para ser utilizados en un equipo central que restrinja el acceso al personal cualificado autorizado.

Este producto es una fuente de alimentación y sólo puede ser instalado por personal cualificado dentro de otros equipos y no debe ser tratado como un producto independiente. Este producto debe ser vendido entre empresas profesionales y solo puede obtenerse a través de los canales de distribución. No está destinado para la venta a usuarios finales.

Este producto es una fuente de alimentación y no se ve afectada por la directiva EMC. El cumplimiento de la directiva EMC se debe considerar en la instalación final. Por favor, póngase en contacto con su oficina local de TDK – Lambda.

**Medioambiental:**

Estos productos son IPX0 y, por tanto, no pueden utilizarse sustancias químicas/disolventes, agentes de limpieza ni otros líquidos.

**Medio ambiente:**

Esta fuente de alimentación es una fuente de alimentación de modo conmutado a utilizar en aplicaciones dentro de un entorno con un Grado de contaminación 2 y una Categoría de sobretensión II. En él se utilizan policloruros de bifenilo del Grupo de materiales IIIb.

**Carga de salida:**

La potencia de salida tomada de la fuente de alimentación no puede sobrepasar el valor nominal indicado en la etiqueta de la fuente de alimentación, excepto en los casos indicados en las limitaciones del producto en este manual.

**Parámetros de entrada:**

Este producto debe ser utilizado dentro de los parámetros de entrada indicados en las limitaciones del producto en este manual.

**Desecho de la unidad:**

La unidad contiene componentes que deben ser desechados de una manera especial. Asegúrese de desechar correctamente la unidad al final de su vida útil y conforme a las normas locales vigentes.



PELIGRO DE DESCARGAS ELÉCTRICAS

**Advertencia de alta tensión:**

En esta fuente de alimentación hay tensiones peligrosas. El instalador profesional debe proteger al personal de servicio contra cualquier contacto accidental con estas tensiones peligrosas en el equipo final.

**ADVERTENCIA:** La instalación de este producto en un equipo de clase I la deben llevar a cabo profesionales y el producto debe estar conectado a tierra.

La salida o salidas (+) o (-) pueden conectarse a tierra o se las puede dejar flotando.

Debe impedirse el acceso de los usuarios a la cubierta o cubiertas y al chasis de la unidad.

El conector de entrada de la red no es apto para ser utilizado a modo de bornes de cableado de campo.

No utilice tornillos de montaje susceptibles de penetrar en la unidad más de: Ver dibujos.

Un fusible interno protege la unidad y este no debe ser nunca reemplazado por el usuario. En caso de existir algún defecto interno, la unidad debe ser enviada a TDK-Lambda UK LTD o a uno de sus agentes autorizados.

El equipo de uso final debe constituir un recinto de protección mecánica, eléctrica y contra incendios de protección mecánica, contra descargas eléctricas y contra el peligro de incendios.

Peligros de energía:

Algunos módulos pueden generar energía peligrosa (240VA) dependiendo de la configuración de la tensión de salida. Los fabricantes de equipos finales deben proteger al personal de servicio contra un contacto accidental con estos bornes de salida de los módulos. Si se configura de modo que pueda generarse energía peligrosa, hay que evitar que el usuario pueda acceder a los bornes o conexiones del módulo.

La cubierta/chasis de la unidad ha sido diseñada para que proteja a las personas cualificadas de los peligros. No deben ser utilizadas como parte de las cubiertas externas de cualquier equipo al que pueden acceder los operarios, ya que bajo unas condiciones de carga completa, la pieza o piezas del chasis de la unidad pueden alcanzar temperaturas superiores a las consideradas seguras para el acceso de los operarios.

**Instruções gerais de segurança:**

LEIA AS INSTRUÇÕES DE SEGURANÇA

**Manutenção:**

Estes produtos não são podem ser submetidos a manutenção por parte do cliente. Apenas a TDK-Lambda UK LTD e os seus agentes autorizados têm permissão para realizar reparações.

**Componentes essenciais:**

Não é autorizada a utilização destes produtos como componentes essenciais de sistemas de controlo nuclear, sistemas de suporte de vida ou equipamento para utilização em ambientes perigosos sem a expressa autorização por escrito do Director-Geral da TDK-Lambda EMEA.

**Utilização do produto:**

Estes produtos foram concebidos para utilização dentro de um equipamento de alojamento que apenas permita o acesso a pessoal qualificado autorizado.

Este produto é uma alimentação considerado com um componente para ser instalado por pessoas qualificadas, em outros equipamentos. Não deve ser usado como um produto acabado.

Este produto é destinado para venda entre as empresas e pode ser obtido através de canais de distribuição. Não se destina à venda aos particulares.

Este produto é uma alimentação considerado com um componente, não é dentro do application âmbito da directiva CEM.

Conformidade com a directiva CEM devem ser considerados na instalação final.

Entre em contacto com seu escritório TDK-Lambda mais próximo.

**Ambiental:**

Estes produtos são IPX0 e, como tal, não se devem utilizar químicos/solventes, agentes de limpeza e outros líquidos.

**Ambiente:**

Esta fonte de alimentação é uma fonte de alimentação do modo de comutação para utilização em aplicações com um Nível de Poluição 2 e ambientes da categoria de sobretensão II. São utilizadas placas de circuitos impressos do grupo de materiais IIIb.

**Carga de saída:**

A potência de saída extraída da fonte de alimentação não deve exceder a classificação assinalada na etiqueta da fonte de alimentação, excepto quando indicado nas limitações do produto neste guia.

**Parâmetros de entrada:**

Este produto deve ser utilizado dentro dos parâmetros de entrada indicados nas limitações do produto neste guia.

**Eliminação no fim de vida:**

A unidade contém componentes que necessitam de procedimentos especiais de eliminação. Certifique-se de que a unidade é devidamente eliminada no fim da sua vida útil e que tal é feito em conformidade com os regulamentos locais.



RISCO DE CHOQUE ELÉCTRICO

**Aviso de alta tensão:**

Estão presentes tensões perigosas dentro da fonte de alimentação. O profissional que realizar a instalação deve proteger o pessoal de assistência contra contactos inadvertidos com estas tensões perigosas do equipamento final.

**AVISO:** Quando instalado num equipamento de Classe I, este produto deve ser ligado à terra de forma fiável e instalado por um profissional.

As saídas (+) e (-) podem ser ligadas à terra ou deixadas soltas.

O chassis/cobertura(s) da unidade não deve estar acessível ao utilizador.

O conector de entrada de alimentação não deve ser utilizado como terminal de cablagens no local.

Não utilize parafusos de montagem, uma vez que estes penetrarão na unidade em mais do que: Veja os desenhos

Existe um fusível interno que protege a unidade e que não deve ser substituído pelo utilizador. Em caso de defeito interno, a unidade deve ser devolvida à TDK-Lambda UK LTD ou a um dos seus agentes autorizados.

O equipamento de utilização final deve fornecer um bastidor com protecção mecânica, eléctrica e contra incêndios adequada.

Perigos de energia:

Alguns módulos tem a capacidade de fornecer energia perigosa (240 VA), de acordo com a configuração da tensão de saída. O equipamento final do fabricante deve garantir que o pessoal de assistência está protegido contra contactos inadvertidos com estes terminais de saída do módulo. Se essa energia perigosa for produzida, as ligações e os terminais do módulo não devem ser acessíveis pelos utilizadores.

O chassis/cobertura da unidade está concebido de forma a proteger o pessoal especializado de perigos. Não devem ser utilizados como parte das coberturas externas de qualquer equipamento em que possam estar acessíveis aos operadores, uma vez que em condições de carga máxima, algumas peças do chassis da unidade podem atingir temperaturas superiores às consideradas seguras para o acesso do operador.

## **TDK-Lambda**

TDK-Lambda UK Ltd

Kingsley Avenue, Ilfracombe

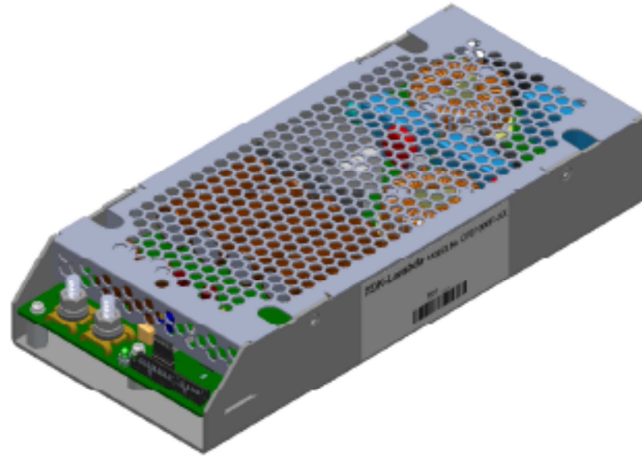
Devon, EX34 8ES

Telephone - Sales and Service +44 (0)1271 856666

Head Office and Works +44 (0)1271 856600

Facsimile +44 (0)1271 864894

WEBSITE: [www.uk.tdk-lambda.com](http://www.uk.tdk-lambda.com)



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## GENERAL SAFETY INSTRUCTIONS

### High Voltage Warning

Dangerous voltages are present within the power supply.

### Critical Components

This product is not authorized for use as a critical component in nuclear control systems, life support systems or equipment for use in hazardous environments without the express written approval of the Engineering Director of TDK-Lambda Americas.

### Servicing

This product is not customer serviceable.

Unit repairs shall only be carried out by TDK- Lambda Americas or their Authorized agents.

Contact: TDK-Lambda Americas  
401 Mile of Cars Way, Suite 125  
National City, CA 91950  
Tel 619-575-4400  
Fax 619-575-7185

### Safety Class of Protection

The unit is designed for the following parameters: Material Group IIIb, Pollution Degree 2, Overvoltage Category II, Class 1 (earthed), Indoor use. The unit is considered as fixed and rated IPX0. The CPFE1000FI-12 and CPFE1000FI-28 are classed as having SELV outputs. The CPFE1000FI-48 is classed as having a NON SELV output. All outputs are capable of providing hazardous energy (>240VA). The final equipment should provide protection to service personnel against inadvertent contact with the PSU output terminals.

### Installation

This product is designed for use within other equipment which restricts access to Authorized competent personnel only. The unit covers/chassis must not be made user accessible.

The appliance may be mounted in any orientation. The customer has to ensure the baseplate temperature remains below certain limits.

CPFE1000FI-12, CPFE1000FI-28 & CPFE1000FI-48: Input 90V-265V baseplate temperature limited to 85°C

The mains input connector is not acceptable for use as field wiring terminals.

The appliance must be securely mounted and the baseplate properly bonded to the main protective earth contact before any connection to AC mains supply is made.

The ventilation openings must not be impeded – ensure a space at least 5cm between any obstruction and the ventilation openings.

## BEFORE USING THE POWER SUPPLY UNIT

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

### DANGER

- Never use this product in locations where flammable gas or ignitable substances are present.

### WARNING

- Do not make unauthorized changes to power supply unit, otherwise you might have electric shock and void your warranty.
- Do not touch this unit and the internal components in operation or shortly after shut down. They might have high voltage or high temperature and as the unit dissipates its heat so the surface of the unit is hot. You might receive electric shock or burn.
- When the unit is operating, keep your hands and face away from it; you might be injured by an accident.
- Do not use unit under unusual conditions such as emission of smoke or abnormal smell and sound etc. It might cause fire and electric shock. In such case, please contact us; do not repair by yourself, as it is dangerous for the user.
- Do not drop or insert anything into unit. It might cause failure and fire.
- Do not operate these units under condensation condition. It might cause fire and electric shock.

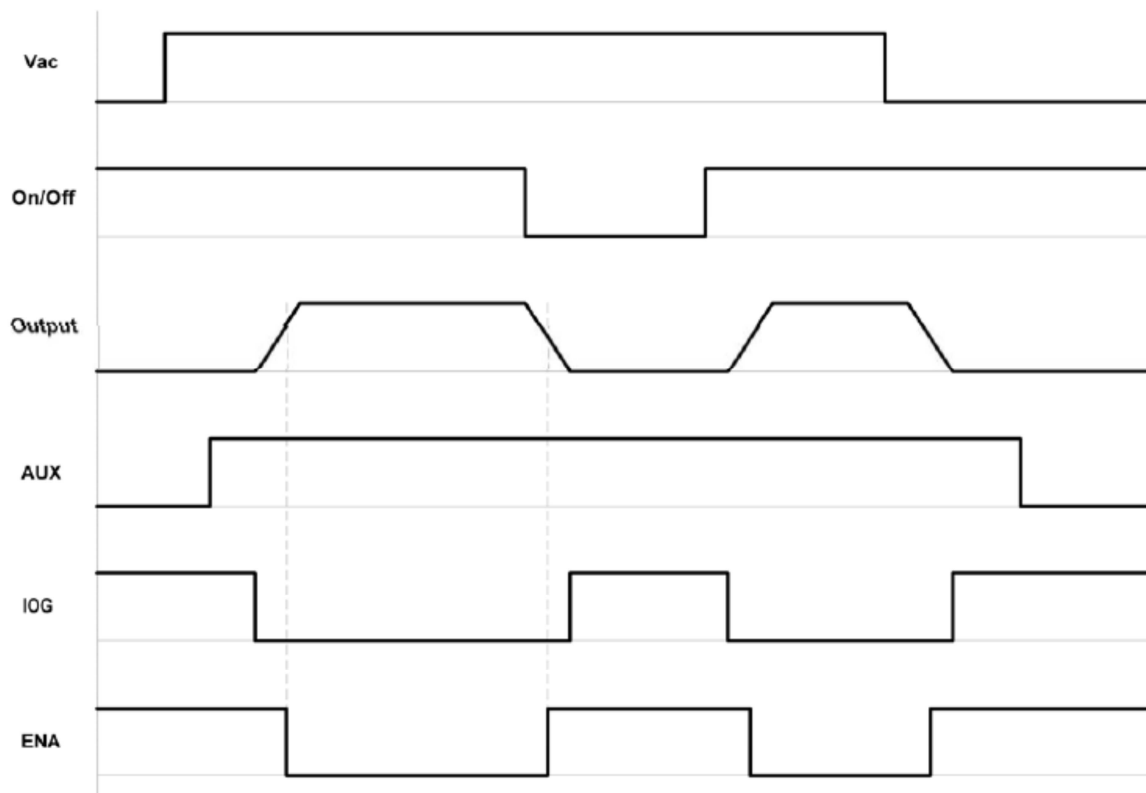
## **⚠ CAUTION**

- As a component part, compliance with the standard will be based upon installation in the final application. This product must be installed in a restricted access location, accessible to authorized competent personnel only. These AC to DC converters have reinforced insulation between the input and the output. The outputs of these products are energy hazards. All models with an output greater than 28V model are considered to be non-SELV. As such, the instructions for use must refer to these energy hazardous outputs and Non-SELV outputs in that the outputs must not be accessible to the operator. The installer must also provide protection against inadvertent contact by a service engineer.
- The equipment has been evaluated for use in a Pollution Degree 2 environment.
- This power supply is primarily designed and manufactured to be used and enclosed in other equipment.
- Confirm connections to input/output terminals and signal terminals are correct as indicated in the instruction manual.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be used within specifications, otherwise the unit will be damaged.
- For application equipment, which requires very high reliability (Nuclear related equipment, traffic control equipment, medical equipment, etc.), please provide fail safety function in the equipment.
- Do not use the product in environment with strong electromagnetic field, corrosive gas and conductive substance.
- Do not operate and store this unit at an environment where condensation occurs. In such case, waterproof treatment is necessary
- Never operate the unit under over current or shorted conditions for 30 seconds or more and out of Input Voltage Range as specification. Insulation failure, smoking, burning or other damage might occur to the unit.
- The output voltage of this power supply unit is considered to be a hazardous energy level (The voltage is 2V or more and the electric power is 240VA or more). Prevention from direct contact with output terminal is highly necessary. While installing or servicing this power supply unit, avoid dropping tools by mistake or direct contact with output terminal. This might cause an electrical shock. While repairing this power supply unit, the AC input power must be switched off and the input and output voltage should be level.
- To maintain the SELV output for outputs less than 28VDC, under fault conditions, the output must be connected to earth in the final application.
- The application circuits and their parameter are for reference only. Be sure to verify effectiveness of application circuits and their parameters before finalizing circuit design.
- Do not inject abnormal voltage to output terminal and signal terminal from the outside. The injection of reverse voltage or over voltage exceeding nominal output voltage to output terminals might cause damage to internal components.
- This information in this document is subject to change without prior notice. For actual design-in, please refer to the latest publications of data sheet, etc., for the most up-to date specifications of the unit.

## **Note : CE MARKING**

CE Marking when applied to a product covered by this handbook indicates compliance with the low voltage directive (2006/95/EC) in that it complies with EN60950-1.

## 1. Timing Sequence



Note: IOG is an internal factory measurement test point that is not accessible to the user.

When recovering from any fault or reapplication of AC input, the output recovery may be delayed for up to 20 seconds.

## 2. Output Voltage Adjustment Range

Output Voltage Adjustment Range:

**+/-20% of the typical voltage rating**

When increasing or decreasing the output voltage, care must be taken such as not to exceed the maximum output power. If remote sensing is used, this must also be considered as not to exceed the maximum output power.

### 2.1 Output Voltage Adjustment by voltage adjustment potentiometer.

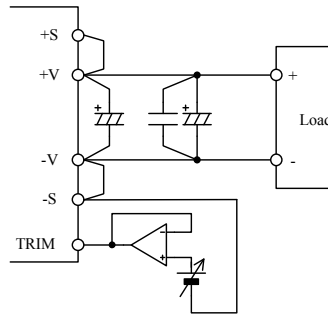
A multi-turn potentiometer is located between the (+) and (-) output studs. Turning the adjustment screw on the potentiometer clockwise increases the output voltage; likewise, turning the screw counter clockwise decreases the output voltage. Note: Care must be taken as not to adjust the output voltage higher than the highest voltage specified within the specified voltage range; doing so may cause the over voltage protection (OVP) circuit to activate thus immediately reducing the output voltage to zero.

### 2.2 Output Voltage Adjustment by applying external voltage

By applying an external voltage at the TRIM terminal, the output voltage can be adjusted within the same output voltage adjustment range of +/- 20% of the nominal output voltage. Exceeding the maximum specified output voltage will cause activation of the Over Voltage Protection (OVP) circuit.

Likewise, exceeding the minimum output voltage will cause activation of the Low Voltage Protection (LVP) circuit. The nominal output voltage is present without using the external output voltage adjustment circuit.





**Fig. 2-1 Output Voltage Adjustment  
by applying external voltage**

Model	Adjustment Range	Typical External Voltage Range
CPFE1000FI-12	9.6 – 14.4V	0.65 – 1.0V
CPFE1000FI-28	22.4 – 33.6V	0.65 – 1.0V
CPFE1000FI-48	38.4 – 57.6V	0.67 – 1.0V

Note: The Trim terminal voltage must be limited to 1.00V maximum; otherwise, the over-voltage protection circuit will activate and shut down the output voltage.

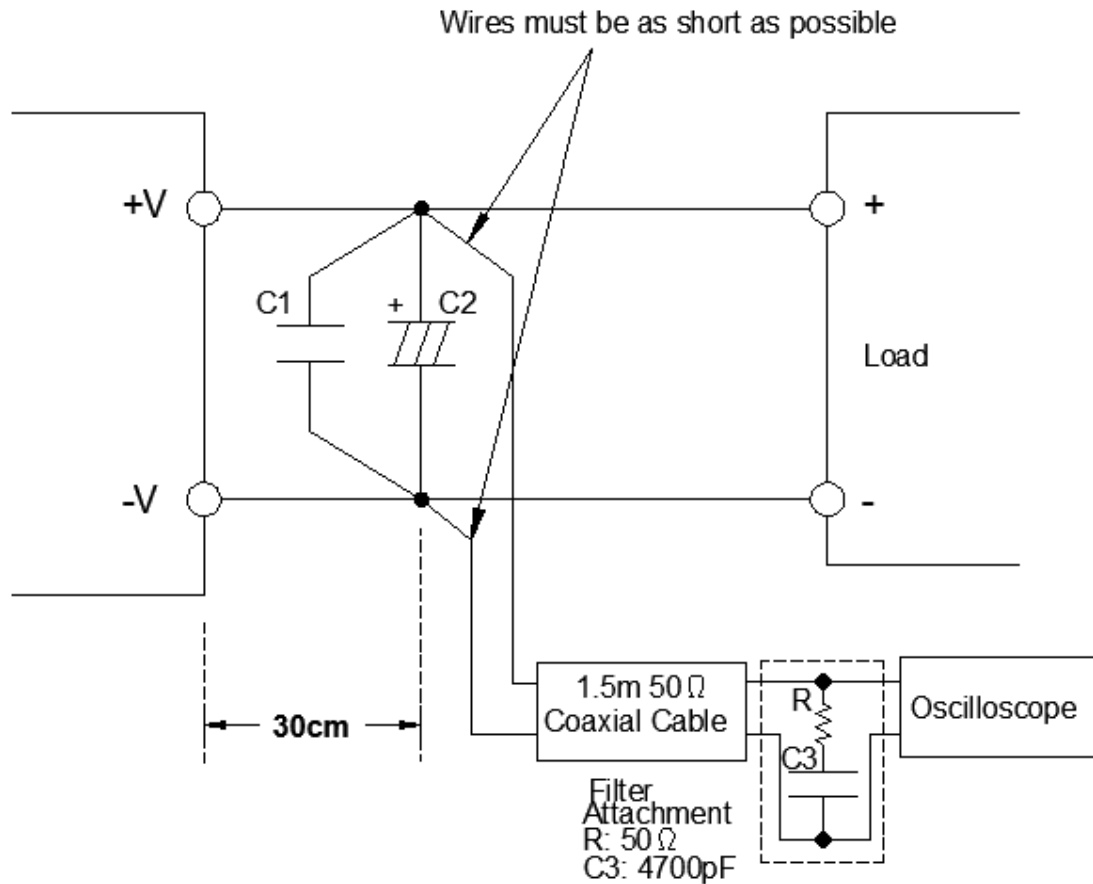
### 3. Ripple and Noise

Ripple and Noise is measured according to the description below in accordance with JEITA RC-9131C (Sections 7.16, 7.17 and 7.18).

The measurement connection is shown in Fig. 3-1.

C1 (0.1 $\mu$ F Ceramic Capacitor), C2 (47 $\mu$ F Aluminum Electrolytic Capacitor) must be connected in parallel at 30cm from the output terminals, along the load cable. Attach a maximum 1.5m 50 $\Omega$  coaxial cable from the ceramic capacitor electrodes to a filter attachment installed on the oscilloscope. The filter attachment consists of C3 (4700pF film capacitor) in series with R (50 $\Omega$  resistor). Use 100MHz bandwidth oscilloscope or equivalent.

In general, output ripple voltage and output spike noise voltage can be reduced by increasing external capacitance.



**Fig. 3-1**  
**Output Ripple Voltage (including Spike Noise)**  
**Measurement Method**

## 4. Maximum Line Regulation

Maximum line regulation is defined as the maximum output voltage change when the input voltage is gradually changed within the specification range.

## 5. Maximum Load Regulation

Maximum load regulation is defined as the maximum output voltage change when output load current is gradually changed within specification range.

## 6. Over Current Protection (OCP)

The CPFE1000FIxx is equipped with an OCP feature; constant current limiting. The output will enter hiccup mode when the output current is between 105 to 140% of its output current rating. OCP value is fixed and cannot be adjusted externally.

The power supply is also protected from a short circuit on the output. The output voltage will recover within 20 seconds after the short is removed.

If OCP occurs while the OTW signal is HIGH, the unit will not try to recover until after the OTW signal goes LOW.

## 7. Over Voltage Protection (OVP)

The CPFE1000FIxx is equipped with OVP feature. The unit will shut down if the voltage on the output is between 125% and 145% of nominal output voltage.

The output voltage will recover within 20 seconds after the OVP condition is removed.

If OVP occurs while the OTW signal is HIGH, the unit will not try to recover until after the OTW signal goes LOW.

## 8. Over Temperature Protection (OTP)

The CPFE1000FIxx is equipped with an OTP feature. Upon detection of an over temperature condition (OTP trip point = 95°C, typical), the OTP circuit will shut down the output. The output voltage will recover after the baseplate has been allowed to cool and the OTW signal goes LOW.

The output voltage will recover within 20 seconds after the OTW signal goes LOW.

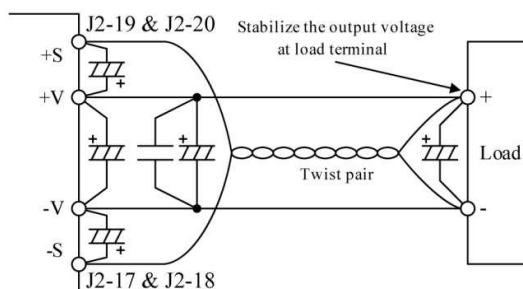
## 9. Remote Sensing (+S, -S terminals)

This unit has remote sensing terminals to compensate for voltage line drop from the output terminals to the output load. When remote sensing is not required, leave the sense terminals disconnected.

Note that line drop (voltage drop due to wiring) compensation voltage range must be such that the output voltage is within the output voltage adjustment range and that the voltage between -V and -S must be within 0.5V.

Consider power loss due to line drop and use this unit within the maximum allowable output power. Reduce the effect of noise induced into the remote sensing lines by using shielded lines, a twist pair, or a parallel pattern, etc.

When remote sensing lines are long, add the electrolytic capacitor as shown in Fig 9-1. (if needed)



**Fig. 9-1 Remote Sensing is used**

## 10. ON/OFF Control

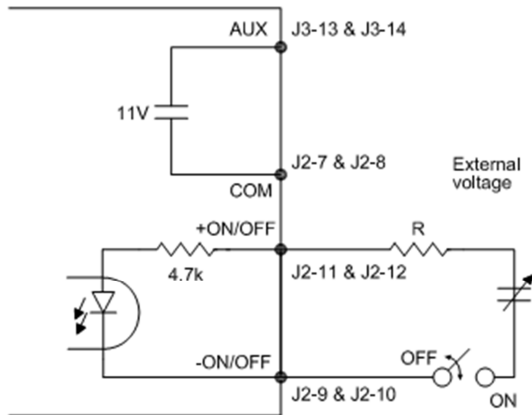
### (+ON/OFF, -ON/OFF terminal)

The CPFE1000FIxx is equipped with a ON/OFF control function. Without turning the input supply on and off, the output can be enabled and disabled using this function.

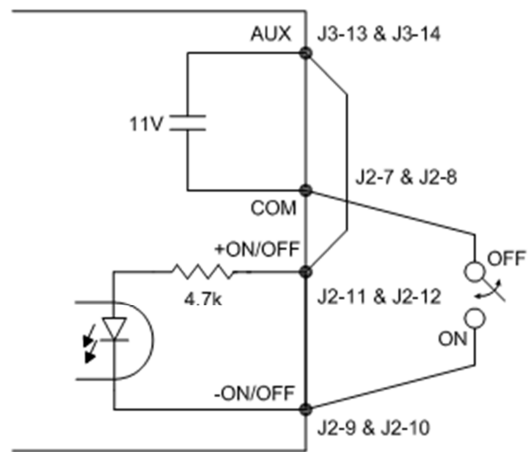
The ON/OFF control circuit is isolated from input circuit of the power supply by a photo-coupler.

The unit comes factory set for local ON/OFF control, via jumpers on the J4 connector. For external control, the J4 jumpers need to be removed.

Fig. 10-1 and Fig. 10-2 are examples of how to connect to the ON/OFF control. When the external ON/OFF control is not used, re-install jumpers onto J4 connector (J4-1 & J4-2 shorted, J4-3 & J4-4 shorted).



**Fig. 10-1 ON/OFF Control  
Connection Example 1  
(ON/OFF Control by External Voltage)**



**Fig. 10-2 ON/OFF Control  
Connection Example 2  
(ON/OFF Control by Built-in AUX)**

Select the external voltage and external resistance per the ON/OFF terminal current shown in the table below.

ON/OFF terminal current	Output Voltage
2.5mA (+/-0.5mA)	ON
Less than 0.15mA	OFF

**Recommended ON/OFF Terminal Current**

## 11. Parallel Operation (PS terminal)

By connecting the PS terminal of each CPFE1000FIxx, output current can be equally drawn from each unit. A maximum of 6 units of the same model can be connected.

Maximum output current is derated by parallel operation units as shown in Table 11-1.

Note that usage of power module at out-of-rated condition might result in power module temperature abnormal rise or damage.

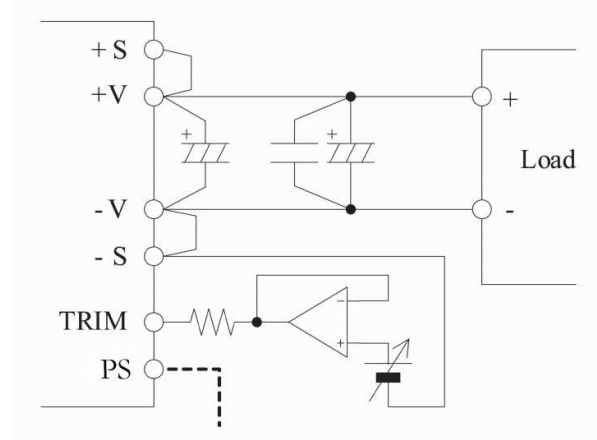
Parallel units	Maximum output current
~3 units	90% of nominal output current
4~6 units	85% of nominal output current

**Table 11-1 Condition for Parallel Operation**

Set the accuracy of the output voltage within +/-1% when adjust the output voltage for parallel operation.

When adjusting the output voltage by applying external voltage at the TRIM terminal, insert approximately a 10k ohm resistor between TRIM terminal and external source.

Moreover, external circuits are necessary for TRIM terminal at each individual module.



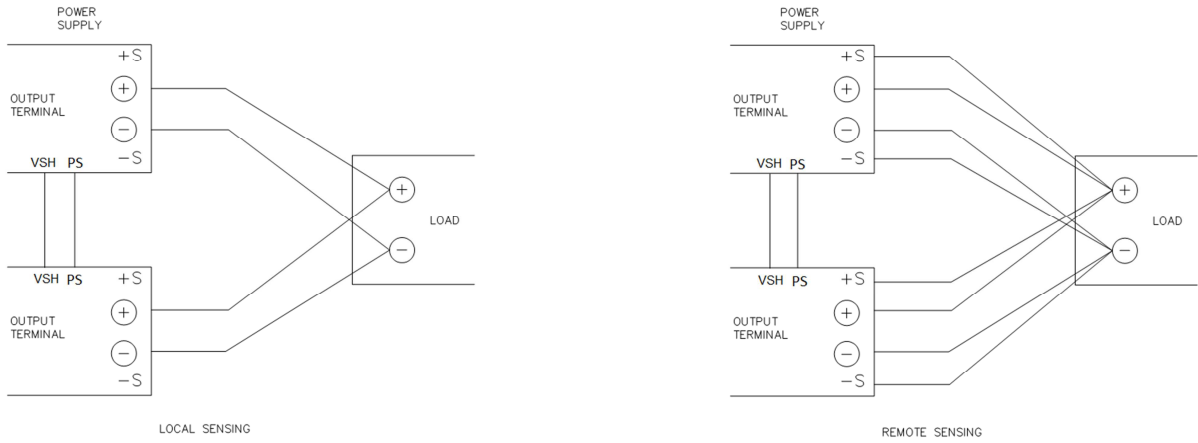
**Fig. 11-1 Output Voltage Adjustment by applying external voltage  
(For parallel operation)**

### Limitations of power supplies in parallel operation:

- If the power supplies are not connected for redundant operation (no oring diodes), the green LED indicator on all power supplies can be lit whenever the output common bus voltage is present and the output voltage read by the I<sup>2</sup>C bus is the voltage of the output common bus; not of the individual power supply.
- The output current reading by the I<sup>2</sup>C bus is the average value of all currents from the power supplies connected in parallel.
- Remote sense cannot compensate for the voltage drop across the oring diodes. To maximize the compensation during redundant operation, attach the oring diodes as close as possible to the point of load and attach +S to the anode of the associated oring diode (See Fig. 11-3).
- When recovering from a fault condition, the output recovery may be delayed for up to 20 seconds to allow for proper start-up.

### 11a. Parallel for Non-Redundant Operation

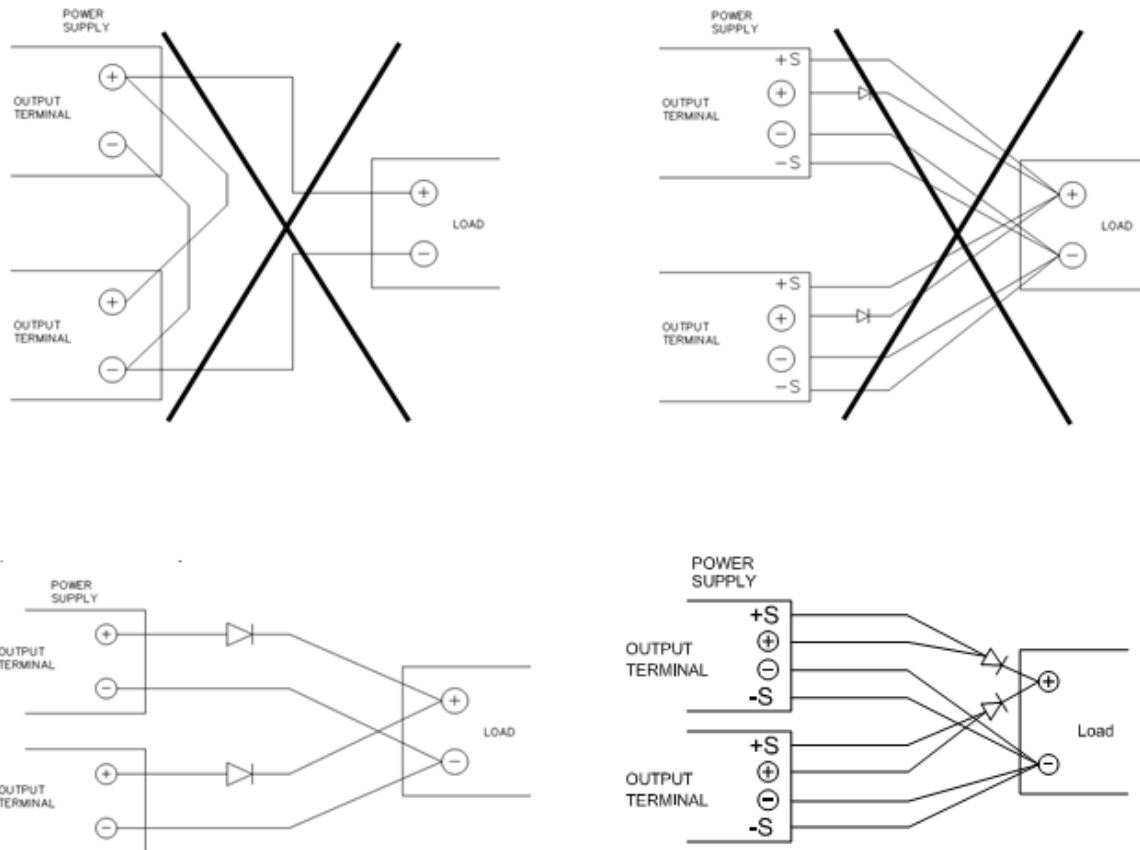
The VSH terminal of each CPFE1000FIXX should be connected together during parallel operation.



**Fig. 11-2 Parallel Operation**

## 11b. Parallel for Redundant Operation:

In cases where an end product or system cannot tolerate any downtime, a redundant power supply or system configuration should be considered. There are a number of ways to construct redundant or fault-tolerant power system. The most common method is to have at least one supply with sufficient output power to fully satisfy the system's power requirements. Then a second power supply of the exact same rating is provided as a back-up in the event one of the two supplies fails. This forms a basic N+1 redundant and fault tolerant power system. "N" equals the number of supplies required to fully power the system and "+1" equals one back-up or redundant supply that will take over for a failed supply. Parallel for redundant operation can be achieved by isolating the outputs using oring diodes. With this method the output load must not exceed the maximum load current of "N" supplies and remote sensing around these diodes is not allowed.



**Fig. 11-3 Parallel for Redundant Operation**

### Limitations of power supplies in parallel operation for Redundant Operation:

- Where it is imperative that a single unit fault does not cause any downtime, it is advised that the parallel sense (PS) and Vshare (VSH) be left disconnected between units. To ensure proper startup in this mode, it is advised to power on the units before applying the load.

## 12. Series Operation

The output of several units can be connected in series for increased output voltage. It is recommended that diodes be connected in parallel with each unit output to prevent reverse voltage during start-up sequence or in case one of the units shuts down. Each diode should be rated to at least the power supply rated output voltage and output current. Refer to Fig. 12-1 and 12-2 for series operation with local and remote sensing.

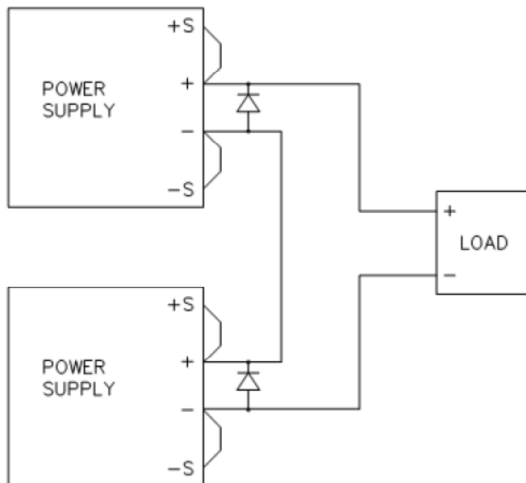


Fig. 12-1: SERIES CONNECTION, LOCAL SENSING

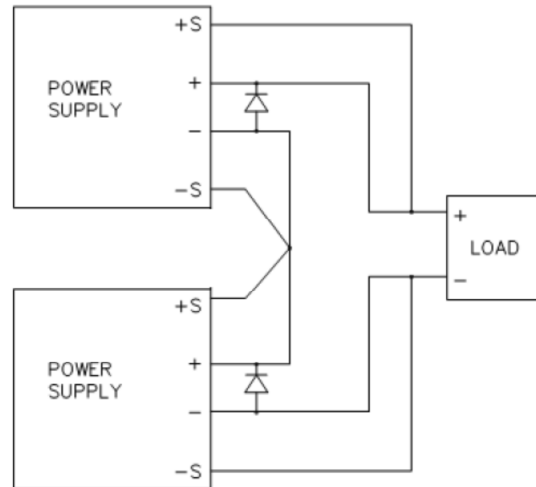


Fig. 12-2: SERIES CONNECTION, REMOTE SENSING

### Limitations of power supplies in series operation:

- If the total voltage of outputs connected in series exceeds the 60Vdc SELV limit then all outputs must be considered Non-SELV.
- Non-SELV outputs are hazardous and must not be made user accessible. They must be guarded to avoid a service engineer making inadvertent contact with the output studs or dropping a metal tool onto them.
- Without galvanic isolation, the I<sup>2</sup>C can't be used with series operation because the GND pin of the I<sup>2</sup>C signal is internally connected to -V of the unit. Consult factory for operation in this mode.
- Without galvanic isolation, the signals (AUX, TRIM, OTW, PWR\_OK, AC\_OK & ENA) cannot be used with series operation because the COM pin is internally connected to -V of the unit. Consult factory for operation in this mode.



## 13. Power ON Signal (ENA terminal)

This signal is located at the secondary side (output side) and it is an open collector output. (Maximum sink current is 100mA and maximum applied voltage is 50V.)

Return line for ENA terminal is the COM terminal. When output voltage goes over a specified voltage level at start up, Power ON signal is LOW.

Output voltage threshold level above which the Power ON signal is LOW:

**CPFE1000FI-12 : 8V (TYP)**

**CPFE1000FI-28 : 19V (TYP)**

**CPFE1000FI-48 : 33V (TYP)**

Output voltage threshold level below which the Power ON signal is HIGH :

**CPFE1000FI-12 : 6V (TYP)**

**CPFE1000FI-28 : 15V (TYP)**

**CPFE1000FI-48 : 28V (TYP)**

## 14. Power OK Signal (PWR\_OK terminal)

This signal is located at the secondary side (output side) and it is an open collector output. (Maximum sink current is 100mA and maximum applied voltage is 50V.)

Return line for PWR\_OK terminal is the COM terminal. When output voltage goes over a specified voltage level at start up, Power OK signal is LOW.

Output voltage threshold level above which the Power OK signal is LOW:

**CPFE1000FI-12 : 8V (TYP)**

**CPFE1000FI-28 : 19V (TYP)**

**CPFE1000FI-48 : 33V (TYP)**

Output voltage threshold level below which the Power OK signal is HIGH :

**CPFE1000FI-12 : 6V (TYP)**

**CPFE1000FI-28 : 15V (TYP)**

**CPFE1000FI-48 : 28V (TYP)**

## 15. AC Good Signal (AC\_OK terminal)

This signal is located at the secondary side (output side) and it is an open collector output. (Maximum sink current is 100mA and maximum applied voltage is 50V.)

Return line for AC\_OK terminal is the COM terminal. When sufficient AC voltage is present on the input to enable the unit to function the AC\_OK signal is LOW.

## 16. Voltage Share Signal (VSH terminal)

The VSH terminal is used during parallel operation to prevent any single unit from going into current limit during start-up while under load. For proper operation, the VSH terminals from each unit should be connected together.

Entering any fault condition or removing the AC input voltage will result in the VSH signal changing.

When recovering from any condition that triggers a change in the VSH signal, the output recovery may be delayed for up to 20 seconds to allow for proper restart.

## 17. Over temperature Warning Signal (OTW terminal)

This signal is located at the secondary side (output side) and it is an open collector output. (Maximum sink current is 100mA and maximum applied voltage is 50V.)

Return line for OTW terminal is the COM terminal.

When the temperature of the unit increases to within approximately 20°C of the OTP limit, the OTW signal goes HIGH.

When the temperature of the unit is less than approximately 20°C below the OTP limit, the OTW signal goes LOW.

The OTW signal must go LOW before the unit will attempt to recover from an OTP condition.

If any output fault (OVP, OCP, OTP or Short Circuit) occurs while the OTW signal is HIGH, the unit will not try to recover until after the OTW signal goes LOW.

## 18. Auxiliary Power Supply

### For external circuits (AUX terminal)

The auxiliary output voltage is within the range of 10~14VDC and has a maximum output current of 20mA. The Ground for the auxiliary output is the COM terminal. Avoid shorting the AUX terminal with any other terminal as this will damage the unit.

## 19. Operating Temperature Range

The CPFE1000FIxx can be mounted in any direction; however, careful consideration should be given to avoid heat accumulation around the module. Verify baseplate temperature at worst case operating condition at the measurement point as shown on page 34. The baseplate temperature must be maintained at or below 85°C on all models.

Due to the temperature limit of other components in the power supply that are not directly installed on the base plate, the ambient temperature must also be maintained at or below the maximum limits. Figure 19- 1 shows the orientation of the power supply that corresponds to the orientation listed in the derating tables. The tables below show the de-rated output power at different ambient temperatures and orientations.

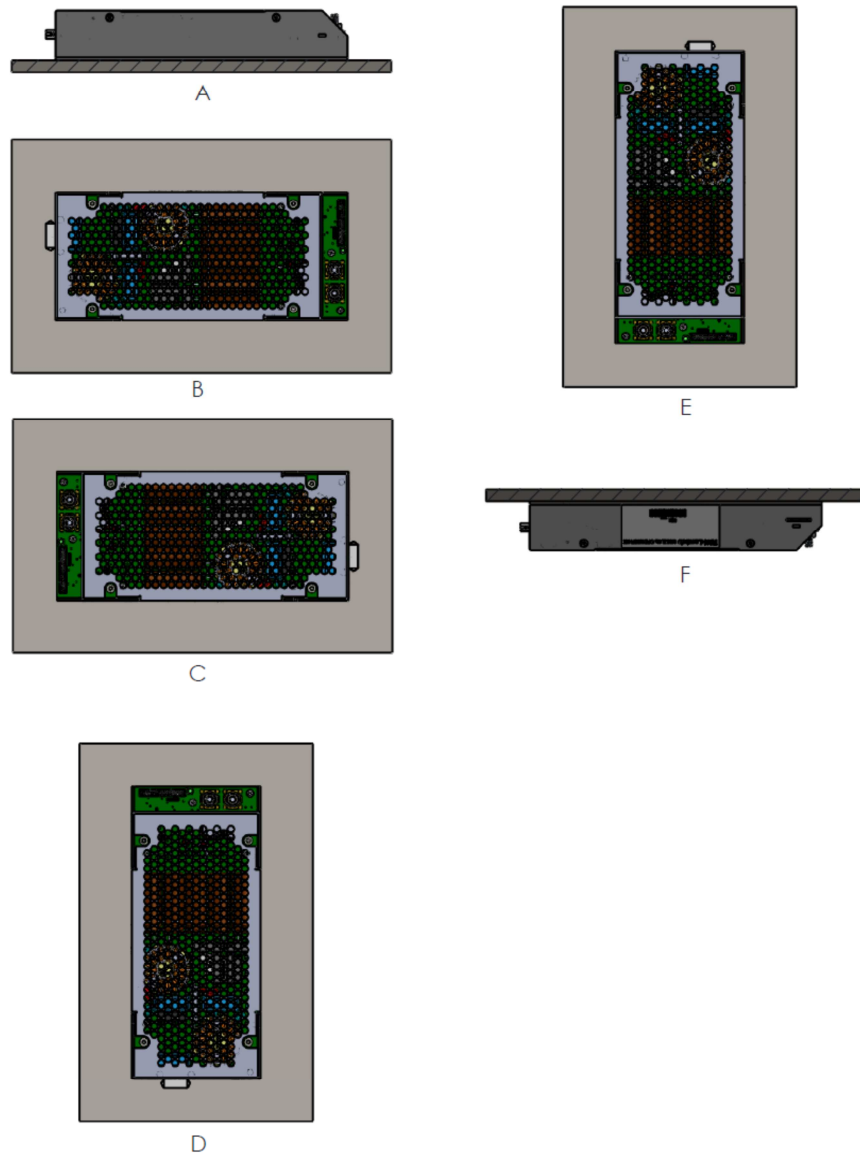


Figure 19- 1: Test Orientations of Power Supply

### OUTPUT RATINGS TABLES

For Model CPFE1000FI-48 (also represents CPFE1000FI-48/P, CPFE1000FI-48/PH and CPFE1000FI-48/H)

Orientation	Output Rating (DC)				
	Voltage (V)	Current (A) @ 90-135 V ac	Power Max (W)	Current (A) @ 170-265 V ac	Power Max (W)
A	48 (38.4– 57.6)	21 @ 50°C 20 @ 60°C 18 @ 70°C	1008 @ 50°C 960 @ 60°C 864 @ 70°C	21 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
B		21 @ 45°C 20 @ 50°C 18 @ 60°C 16 @ 70°C	1008 @ 45°C 960 @ 50°C 864 @ 60°C 768 @ 70°C	21 @ 45°C, 50°C, 60°C & 70°C	1008 @ 45°C, 50°C, 60°C & 70°C
C		21 @ 50°C 20 @ 60°C 18 @ 70°C	1008 @ 50°C 960 @ 60°C 864 @ 70°C	21 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
D		21 @ 50°C 20 @ 60°C 18 @ 70°C	1008 @ 50°C 960 @ 60°C 864 @ 70°C	21 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
E		21 @ 50°C 20 @ 60°C 18 @ 70°C	1008 @ 50°C 960 @ 60°C 864 @ 70°C	21 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
F		21 @ 45°C 20 @ 50°C 19 @ 60°C 17.5 @ 70°C	1008 @ 45°C 960 @ 50°C 912 @ 60°C 840 @ 70°C	21 @ 45°C, 50°C, 60°C & 70°C	1008 @ 45°C, 50°C, 60°C & 70°C

Test orientations are as follows:

- A – Horizontal – components pointed toward the top
- B – Sideways – input connector on the left and output connector on the right
- C – Sideways – input connector on the right and output connector on the left
- D – Vertical – input connector pointed towards the bottom and output connector pointed towards the top
- E – Vertical – input connector pointed towards the top and output connector pointed towards the bottom
- F – Horizontal – components pointed toward the bottom

Note: Baseplate temperature not to exceed **85°C** on all orientation.

For Model CPFE1000FI-48/C (also represents CPFE1000FI-48/CH)

Orientation	Output Rating (DC)				
	Voltage (V)	Current (A) @ 90-135 V ac	Power Max (W)	Current (A) @ 170-265 V ac	Power Max (W)
A	48 (38.4– 57.6)	21 @ 30°C 20 @ 40°C 19 @ 50°C 18 @ 60°C 17 @ 70°C	1008 @ 30°C 960 @ 40°C 912 @ 50°C 864 @ 60°C 816 @ 70°C	21 @ 30°C, 40°C, 50°C, 60°C & 70°C	1008 @ 30°C, 40°C, 50°C, 60°C & 70°C
B		21 @ 30°C 20 @ 40°C 19 @ 50°C 18 @ 60°C 17 @ 70°C	1008 @ 30°C 960 @ 40°C 912 @ 50°C 864 @ 60°C 816 @ 70°C	21 @ 30°C, 40°C, 50°C, 60°C & 70°C	1008 @ 30°C, 40°C, 50°C, 60°C & 70°C
C		21 @ 40°C 20 @ 50°C 19 @ 60°C 18 @ 70°C	1008 @ 40°C 960 @ 50°C 912 @ 60°C 864 @ 70°C	21 @ 40°C, 50°C, 60°C & 70°C	1008 @ 40°C, 50°C, 60°C & 70°C
D		21 @ 40°C 20 @ 50°C 19 @ 60°C 18 @ 70°C	1008 @ 40°C 960 @ 50°C 912 @ 60°C 864 @ 70°C	21 @ 40°C, 50°C, 60°C & 70°C	1008 @ 40°C, 50°C, 60°C & 70°C
E		21 @ 40°C 20 @ 50°C 19 @ 60°C 18 @ 70°C	1008 @ 40°C 960 @ 50°C 912 @ 60°C 864 @ 70°C	21 @ 40°C, 50°C, 60°C & 70°C	1008 @ 40°C, 50°C, 60°C & 70°C
F		19 @ 25°C 18 @ 40°C 17 @ 50°C 16 @ 60°C 15 @ 70°C	912 @ 25°C 864 @ 40°C 816 @ 50°C 768 @ 60°C 720 @ 70°C	21 @ 25°C, 40°C, 50°C, 60°C & 70°C	1008 @ 25°C, 40°C, 50°C, 60°C & 70°C

Test orientations are as follows:

- A – Horizontal – components pointed toward the top
- B – Sideways – input connector on the left and output connector on the right
- C – Sideways – input connector on the right and output connector on the left
- D – Vertical – input connector pointed towards the bottom and output connector pointed towards the top
- E – Vertical – input connector pointed towards the top and output connector pointed towards the bottom
- F – Horizontal – components pointed toward the bottom

Note: Baseplate temperature not to exceed **85°C** on all orientation.

**For Model CPFE1000FI-28 (also represents CPFE1000FI-28/P, CPFE1000FI-28/PH and CPFE1000FI-28/H):**

Orientation	Output Rating (DC)				
	Voltage (V)	Current (A) @ 90-135 V ac	Power Max (W)	Current (A) @ 170-265 V ac	Power Max (W)
A	28 (22.4– 33.6)	36 @ 50°C 34 @ 60°C 32 @ 70°C	1008 @ 50°C 952 @ 60°C 896 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
B		36 @ 50°C 34 @ 60°C 32 @ 70°C	1008 @ 50°C 952 @ 60°C 896 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
C		36 @ 50°C 34 @ 60°C 32 @ 70°C	1008 @ 50°C 952 @ 60°C 896 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
D		36 @ 50°C & 60°C 34 @ 70°C	1008 @ 50°C & 60°C 952 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
E		36 @ 50°C 34 @ 60°C 31 @ 70°C	1008 @ 50°C 952 @ 60°C 868 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
F		36 @ 40°C 34 @ 50°C 32 @ 60°C 30 @ 70°C	1008 @ 40°C 952 @ 50°C 896 @ 60°C 840 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C

Test orientations are as follows:

- A – Horizontal – components pointed toward the top
- B – Sideways – input connector on the left and output connector on the right
- C – Sideways – input connector on the right and output connector on the left
- D – Vertical – input connector pointed towards the bottom and output connector pointed towards the top
- E – Vertical – input connector pointed towards the top and output connector pointed towards the bottom
- F – Horizontal – components pointed toward the bottom

Note: Baseplate temperature not to exceed **85°C** on all orientation.

For Model CPFE1000FI-28/C (also represents CPFE1000FI-28/CH):

Orientation	Output Rating (DC)				
	Voltage (V)	Current (A) @ 90-135 V ac	Power Max (W)	Current (A) @ 170-265 V ac	Power Max (W)
A	28 (22.4– 33.6)	36 @ 30°C 34 @ 40°C 32 @ 50°C 30 @ 60°C 28 @ 70°C	1008 @ 30°C 952 @ 40°C 896 @ 50°C 840 @ 60°C 784 @ 70°C	36 @ 30°C, 40°C, 50°C, 60°C & 70°C	1008 @ 30°C, 40°C, 50°C, 60°C & 70°C
B		36 @ 40°C 34 @ 50°C 32 @ 60°C 30 @ 70°C	1008 @ 40°C 952 @ 50°C 896 @ 60°C 840 @ 70°C	36 @ 40°C, 50°C, 60°C & 70°C	1008 @ 40°C, 50°C, 60°C & 70°C
C		36 @ 45°C 35 @ 50°C 33 @ 60°C 31 @ 70°C	1008 @ 45°C 980 @ 50°C 924 @ 60°C 868 @ 70°C	36 @ 45°C, 50°C, 60°C & 70°C	1008 @ 45°C, 50°C, 60°C & 70°C
D		36 @ 50°C 34 @ 60°C 32 @ 70°C	1008 @ 50°C 952 @ 60°C 896 @ 70°C	36 @ 50°C, 60°C & 70°C	1008 @ 50°C, 60°C & 70°C
E		36 @ 45°C 35 @ 50°C 33 @ 60°C 30 @ 70°C	1008 @ 50°C 980 @ 60°C 924 @ 60°C 840 @ 70°C	36 @ 45°C, 50°C, 60°C & 70°C	1008 @ 45°C, 50°C, 60°C & 70°C
F		33 @ 25°C 31 @ 40°C 30 @ 50°C 28 @ 60°C 26 @ 70°C	924 @ 25°C 868 @ 40°C 840 @ 50°C 784 @ 60°C 728 @ 70°C	36 @ 25°C, 40°C, 50°C, 60°C & 70°C	1008 @ 25°C, 40°C, 50°C, 60°C & 70°C

Test orientations are as follows:

- A – Horizontal – components pointed toward the top
- B – Sideways – input connector on the left and output connector on the right
- C – Sideways – input connector on the right and output connector on the left
- D – Vertical – input connector pointed towards the bottom and output connector pointed towards the top
- E – Vertical – input connector pointed towards the top and output connector pointed towards the bottom
- F – Horizontal – components pointed toward the bottom

Note: Baseplate temperature not to exceed **85°C** on all orientation.

**For Model CPFE1000FI-12 (also represents CPFE1000FI-12/P, CPFE1000FI-12/PH, CPFE1000FI-12/H, CPFE1000FI-12C and CPFE1000FI-12/CH):**

Orientation	Output Rating (DC)				
	Voltage (V)	Current (A) @ 90-135 V ac	Power Max (W)	Current (A) @ 170-265 V ac	Power Max (W)
A	12 (9.6–14.4)	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C
B		60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C
C		60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C
D		60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C
E		60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C
F		60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C	60 @ 50°C, 60°C & 70°C	720 @ 50°C, 60°C & 70°C

Test orientations are as follows:

- A – Horizontal – components pointed toward the top
- B – Sideways – input connector on the left and output connector on the right
- C – Sideways – input connector on the right and output connector on the left
- D – Vertical – input connector pointed towards the bottom and output connector pointed towards the top
- E – Vertical – input connector pointed towards the top and output connector pointed towards the bottom
- F – Horizontal – components pointed toward the bottom



## 20. Withstand Voltage

This unit is safety certified to meet a withstand voltage of 4242VDC between input to output, 2500VDC between input and baseplate, and 500VDC from output to baseplate. During production the unit is tested, in accordance with safety requirements, to verify withstand voltage performance.

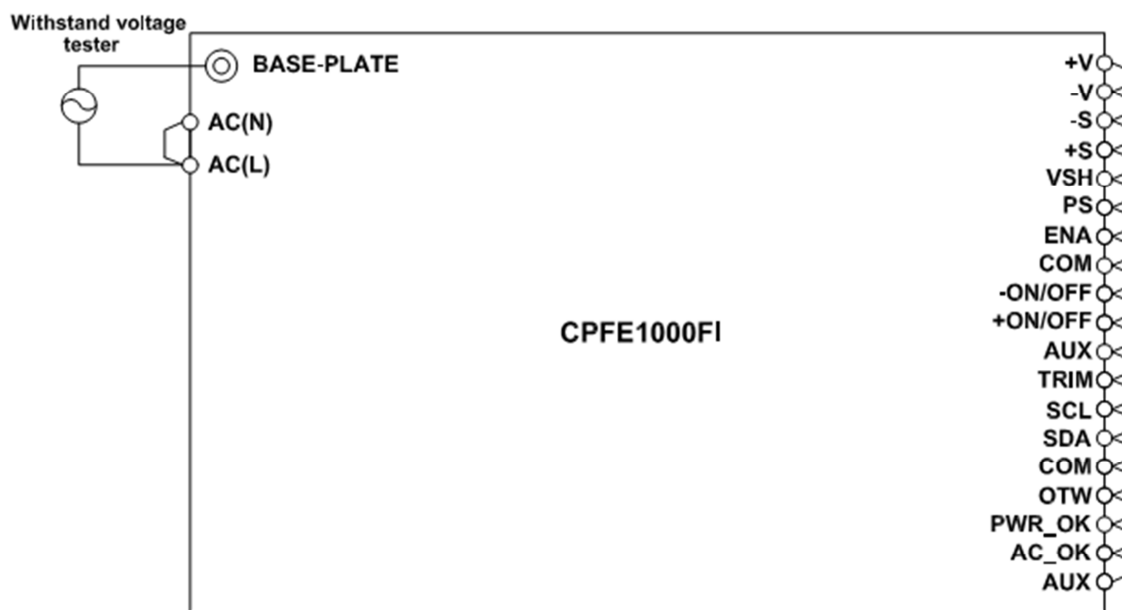
If additional withstand voltage testing in end equipment is required, limit the applied withstand voltage to 2500VDC between input to output (short output to baseplate) and 2500VDC between input and baseplate for a maximum dwell of 1 minute. Failure to reduce the voltage to these levels could result in components being damaged.

When performing this test, set the current limit of test equipment to 20mA.

When applying the 500VDC withstand voltage between output and baseplate, limit the applied dwell to 1 minute. When performing this test, be sure to apply DC voltage only. Avoid applying AC voltage during this test because this will damage the module.

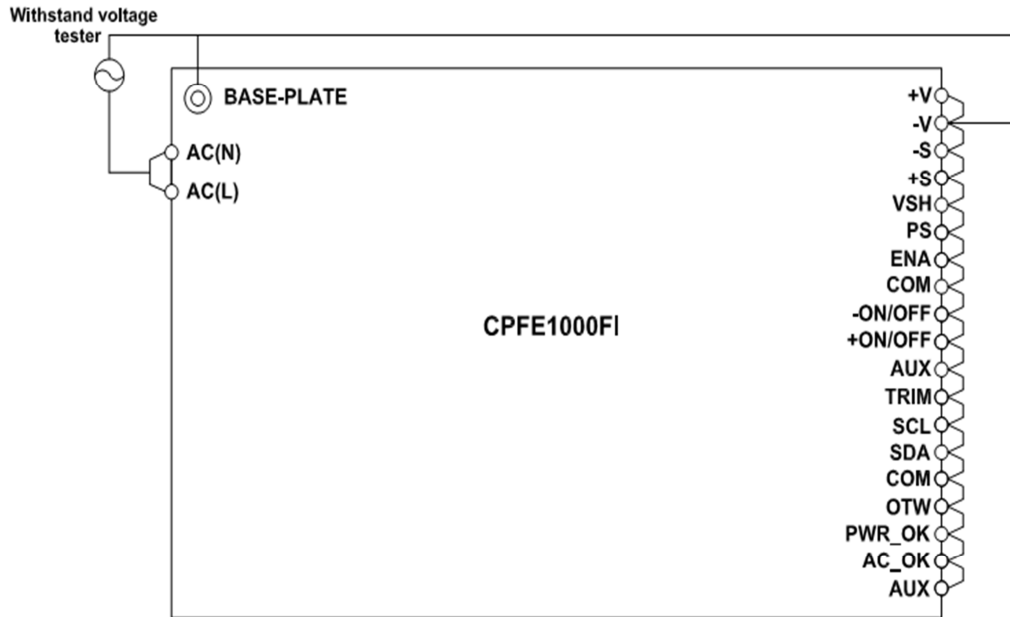
Refrain from injecting a high test voltage suddenly. Be sure to gradually increase the applied voltage during testing and gradually reduce the voltage after the test.

Caution- when using a timer switch on the test equipment, an impulse voltage which is higher than the applied set voltage, can be generated when the timer switch is cut off. This causes damage to the power module. Connect each terminal according to the circuit diagrams shown below.

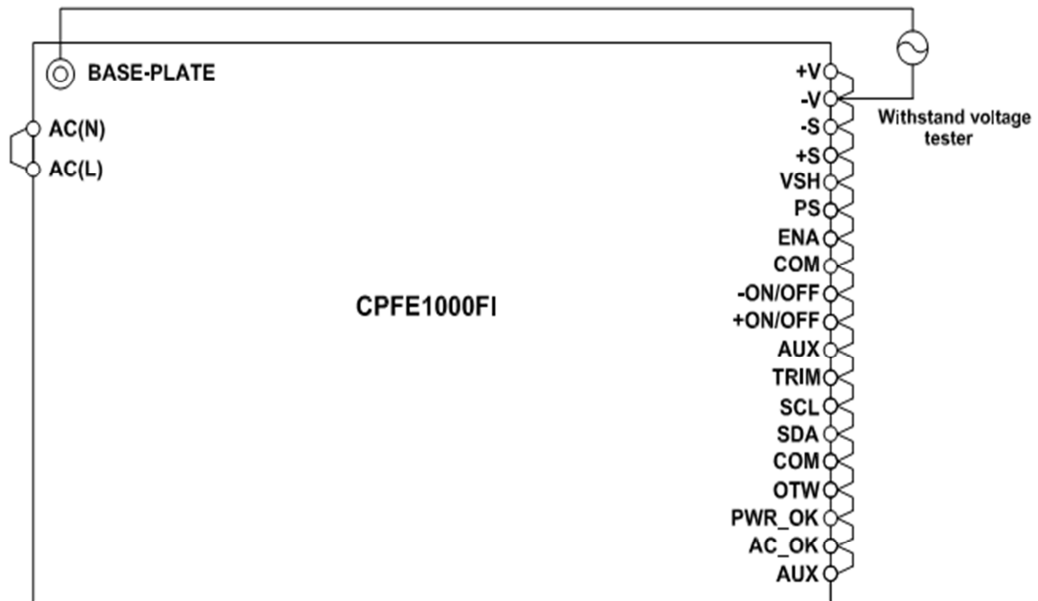


**2.5kVDC 1 minute (20mA)**

**Fig. 20-1 Input to Baseplate Withstand Voltage Test Method**



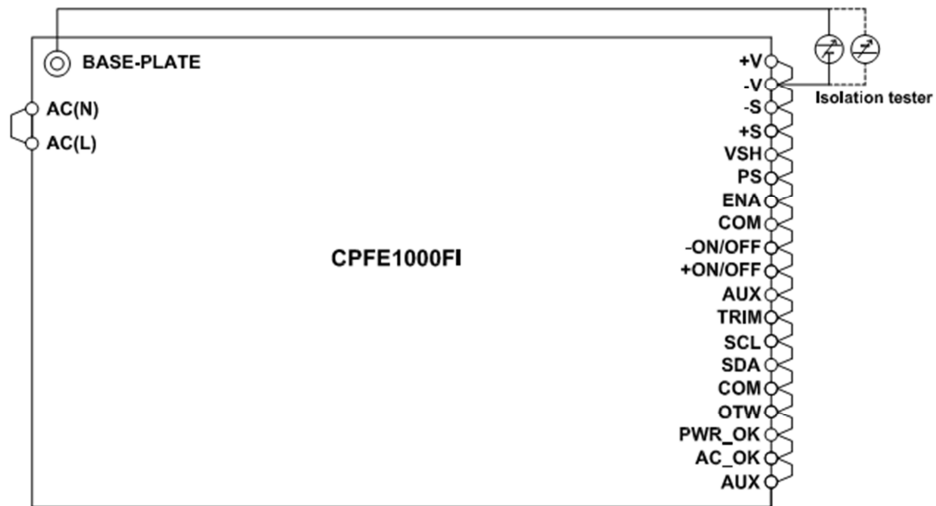
**2.5kVDC 1 minute (20mA) (Short Output to Baseplate)**  
**Fig. 20-2 Input to Output Withstand Voltage Test Method**



**500VDC 1 minute (20mA)**  
**Fig.20-3 Output to Baseplate Withstand Voltage Test Method**

## 21. Insulation Resistance

Use DC Insulation Resistance test equipment (MAX.500V) between output and baseplate.  
Insulation Resistance must be 100Mohm or more at 500VDC. Take caution that some types of test equipment generate high pulse voltage when switching applied voltage. After test, discharge this module using resistor, etc.



**100Mohm or more at 500VDC**  
**Fig. 21-1 Insulation Resistance Test Method**

## 22. Connection Details

### Input Connection

Mains input connection by 3way AMP 'Mate-n-lock' connector

Mating 3-way housing: AMP 350766-1.

Mating crimp terminals: AMP 926893-1 (14~20AWG), 926895-1 (18~24AWG)

Pin 3 : Live

Pin 2 : Earth

Pin 1 : Neutral

Internal Fuse Type: 20A 250VAC Time Lag

### Output Power Connection

DC output +V & -V connection by two M6x20 studs, max torque 10Nm.

Use appropriate ring terminals and wire for the load and short circuit current.

### Output Signals

Signal connections available on one 20 pos. 2mm header connector (ref J2) and on one 14 pos. 2mm header connector (ref J3)

Mating 20-way housing : Molex 51110-2051.

Mating crimp terminals : Molex 50394 type

Mating 14-way housing : Molex 51110-1451.

Mating crimp terminals : Molex 50394 type

J2 Pin	Function
1	VSH
2	VSH
3	PS
4	PS
5	ENA
6	ENA
7	COM
8	COM
9	-ON/OFF
10	-ON/OFF
11	+ON/OFF
12	+ON/OFF
13	AUX
14	AUX
15	TRIM
16	TRIM
17	-S
18	-S
19	+S
20	+S

J3 Pin	Function
1	SCL
2	SCL
3	SDA
4	SDA
5	COM
6	COM
7	OTW
8	OTW
9	PWR_OK
10	PWR_OK
11	AC_OK
12	AC_OK
13	AUX
14	AUX

**Table 22-1 Pin Assignments**

### 23. Safety Approvals

UL/CSA 60950-1, IEC/EN60950-1

Intended for installation in a non-operator access environment

Intended for installation in an external electrical/mechanical/fire enclosure

### 24. EMC & Immunity

Conducted Emissions - EN55022 Class B

Radiated Emissions - EN55022 Class A

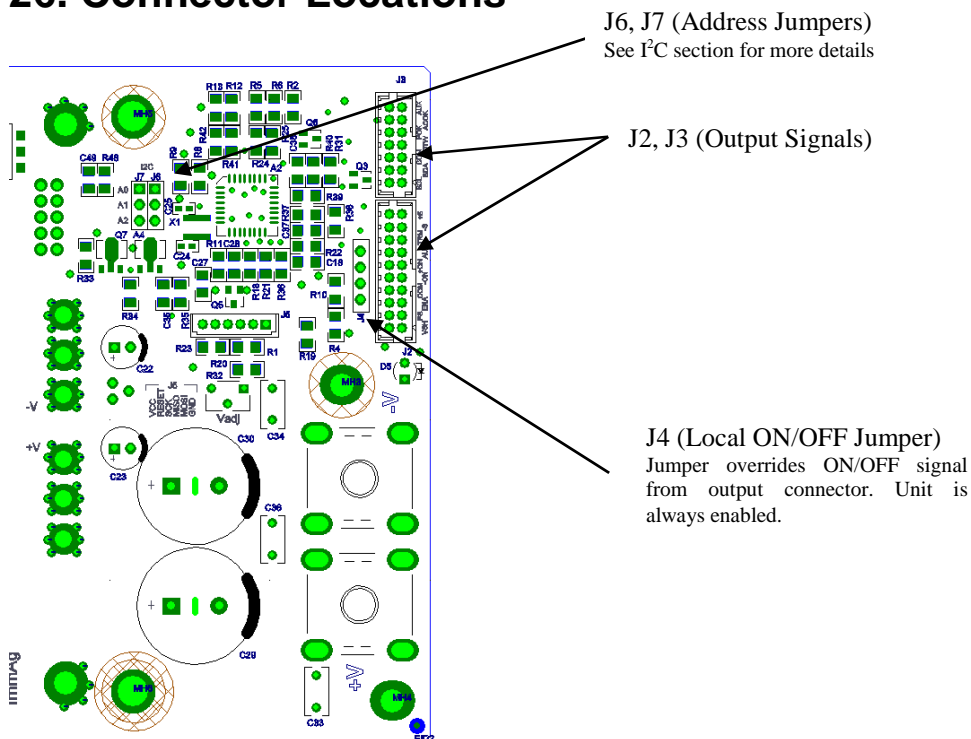
Immunity - EN61000-4-2, -3, -4, -5, -6, -8, -11, -12, -14

### 25. Fault Finding

If the unit shuts down, cycle the AC power to the supply. The over voltage or over temperature protection circuit may have been activated thus shutting down the output. In the event of an over temperature condition, ensure the unit has cooled down before re-applying the AC input.

When recovering from a fault, the output recovery may be delayed for up to 20 seconds to allow for proper start-up. If the unit still fails to power up, return to TDK-Lambda Americas for evaluation and repair.

### 26. Connector Locations



## 27. I2C Bus Interface

### 1.- Introduction

The I<sup>2</sup>C interface option includes facilities to monitor operating parameters of the Power Supply (PS). The parameters are then transferred to the host PC if demanded, over a standard I<sup>2</sup>C bus.

The following data can be monitored for the individual units connected to the I<sup>2</sup>C bus:

- 1.- Status of the unit
- 2.- Actual Output voltage, output current and internal temperature of the unit.
- 3.- Manufacturing related data (model, serial number, manufacturing date, etc.....)

At startup there is an approximate 2 second lockout before the I<sup>2</sup>C function is available.

During operation, activity on the bus can cause delays, so it is not recommended to trigger protection mechanisms from the data being monitored on the I<sup>2</sup>C bus. For triggering protection mechanisms, it is recommended to use the analog signals at connectors J2 and J3 (See Section 22 for pin-out details)

### 2. - Addressing (A0, A1, A2)

Three address lines allow up to 8 units to be addressed on a single I2C bus. The address lines are internally pulled-up to +5V by resistors. Addressing of a unit is achieved by hard wiring an address line to the –sense to set to “0” or leaving the address line open to set it to “1”.

A0, A1, A2 are in the PS (J6,J7) for Customer configuration of the I<sup>2</sup>C address. Addresses are on Hex format 0x00

A2	A1	A0	Address
0	0	0	A0
0	0	1	A2
0	1	0	A4
0	1	1	A6
1	0	0	A8
1	0	1	AA
1	1	0	AC
1	1	1	AE

**Jumper = “0”**

**Open = “1”**

### 3.- Serial Clock

This line is clocked by the processor which controls the I<sup>2</sup>C bus. It is internally connected to +5V via a pull-up resistor. The I2C interface is designed to run with a serial clock speed of 100KHz

### 4.- Serial Data

This line is a bidirectional data line. It is internally connected to +5V via a pull-up resistor.

## 5.- Operation and Functions

### 5.1 Digital status

Digital status functions are provided by a status byte register. This is an 8-bit word when read by the I<sup>2</sup>C controller.

**Status Byte:**

Address: 07

Bytes: 1

Example for CPFE1000Fi12 model:

Get the Hexadecimal number: 27

Convert the Hexadecimal number to Binary number: 00100111

Binary number is read from right to left, so for our example:

Function	Bit	Description
On_Off status	1	Unit is OFF
Enable	1	Vout < 6 volts
IOG	1	Main Inverter stops working
OTW	0	Base plate temperature <90C
OTG	0	Base plate temperature <100C, not OTP
VoutOK	1	Vout is not present
IOK	0	Unit is not in OCP condition
AC_OK	0	AC Input Voltage Present

Bit	Function	Description	
0	On_Off status	0 = Unit On , 1 = Unit Off	ON/OFF status on the I2C command.
1	Enable	0 = Good , 1 = Bad	See Section 13 for Output voltage threshold level above which the Power ON signal is LOW (Good) and level below which the signal is HIGH (Bad).
2	IOG	0 = Good , 1 = Bad	Good if main Inverter is working OK, Bad is main inverter stops working or it's working abnormally
3	OTW	0 = Good , 1 = Warning	Good if base plate temperature is < ~80C, Warning if base plate temperature is > ~80C, unit is ON
4	OTG	0 = Good , 1 = Bad	Good if base plate temperature is < ~100C, Bad if base plate temperature is >~100C, unit in OTP status
5	VoutOK	0 = Good , 1 = Bad	Good if Vout is present, Bad if not Vout is present
6	IOK	0 = Good , 1 = Bad	Good if Iout is below or nom current, Bad if Iout is in over current condition
7	AC_OK	0 = Good , 1 = Bad	Good if AC is present, Bad if AC is Lost

## 5.2 EEPROM Data

A 512 bytes EEPROM is included on the I2C option. The EEPROM is programmed at the factory with the data shown on the following table:

**Serial Number:** Address: 01  
Bytes: 20

Example:

43	4C	57	2D	33	31	35	53	31	30	2D	30	31	36	30	2D	53	35	32	31
C	L	W	-	3	1	5	S	1	0	-	0	1	6	0	-	S	5	2	1

Each number represents an ASCII character in hexadecimal numbering system.

**Firmware Revision:** Address: 02  
Bytes: 4

Example:

56	31	2E	30
V	1	.	0

**Product Revision:** Address: 03  
Bytes: 4

Example:

58	31	2E	30
X	1	.	0

**Unit Part Number:** Address: 08  
Bytes: 12

Example:

43	50	46	45	31	30	30	30	46	49	31	32
C	P	F	E	1	0	0	0	F	I	1	2

Each number represents an ASCII character in hexadecimal numbering system.

**Unit Manufacturing Date:** Address: 09  
Bytes: 8

Each number represents an ASCII character in hexadecimal numbering system.

**Unit Manufacturing Location:** Address: 10  
Bytes: 3

Each number represents an ASCII character in hexadecimal numbering system.



### 5.3 Analog Functions

Analog functions are provided by a 8-channel 10-bit resolution Analog-Digital Converter (ADC). When this device is read by the I2C bus controller it provides a 2 bytes word information.

Address	Bytes	Data
04	2	Output Voltage Readback
05	2	Output Current Readback
06	2	Baseplate Temperature Readback

The ADC has to be scaled to obtain a correct value for the voltage, current and temperature readings. The following scaling factor (SF) should be employed:

CPFE1000FI12	Range	SF	Accuracy
Voltage	0 – 15V	0.01668	+/-2%
Current	0-60A	0.0815	+/-5%
Temperature	0-100°C	Note 1	+/-3%

CPFE1000FI28	Range	SF	Accuracy
Voltage	0 – 34V	0.03973	+/-2%
Current	0-36A	0.0488	+/-5%
Temperature	0-100°C	Note 1	+/-3%

CPFE1000FI48	Range	SF	Accuracy
Voltage	0 - 58V	0.06772	+/-2%
Current	0-21A	0.0282	+/-5%
Temperature	0-100°C	Note 1	+/-3%

**Note 1:** At ambient temperatures below -20C, a period of warm-up may be required before the current readback meets these accuracy levels. The current readback accuracy may also be affected during fault (OTP, OVP, OCP) condition.

**Note 2:** Use the following formula for calculating temperature.

$$T_{base} (C) = (DEC \text{ number} - 610) / 2.048 + 25$$

Where DEC Number is the decimal conversion of the HEX number read on address 6 (temp reading)

Example:

For 12 volts output @ 30C baseplate temperature

02	6D
----	----

Get the HEX number: 26D

Convert the HEX to DEC number: 621

Apply formula: Temp = (DEC number – 610)/2.048 + 25

$$(621 - 610) / 2.048 + 25 = 30.4C$$

Temp = ~ 30.4C

**Output Voltage:**

Address: 04

Bytes: 2

Example:

For 12 

02	C4
----	----

 volts output

Get the HEX number: 2C4

Convert the HEX to DEC number: 708

Multiply the DEC number by Scaling Factor (SF): 0.01668

$V_{out} = 708 * 0.016687 = 11.814$  Volts

Same method is used for current readings.

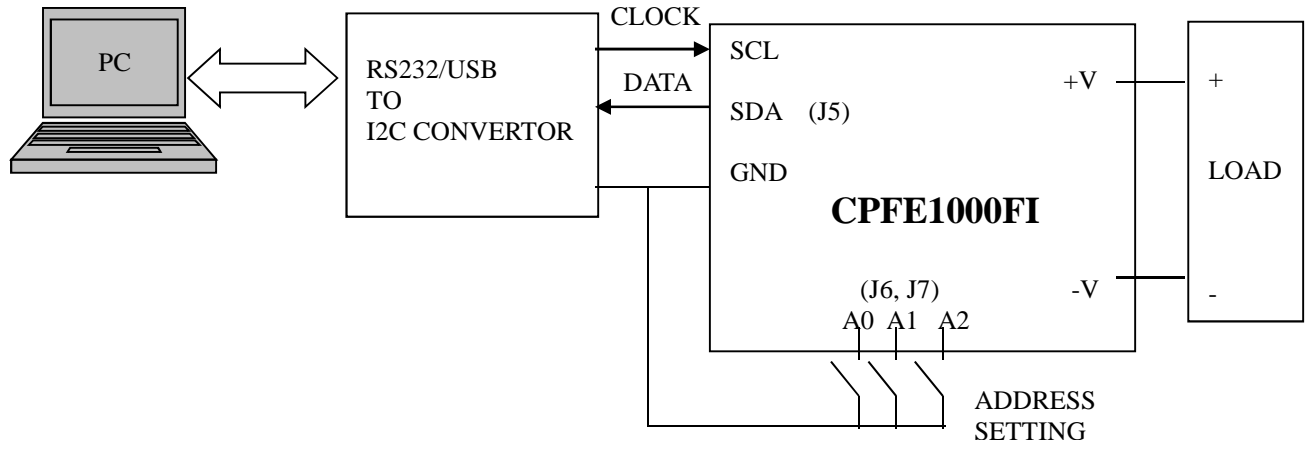
**5.4 Remote ON/OFF thru I<sup>2</sup>C.**

Unit can be remotely turned OFF by the OFF command on address 0A. Once address 0A is called out, the unit will stay OFF until the ON command is called out thru address 1A or the Input Line is removed for about 30 seconds.

Address	Function
1A	Turn output On
0A	Turn output Off

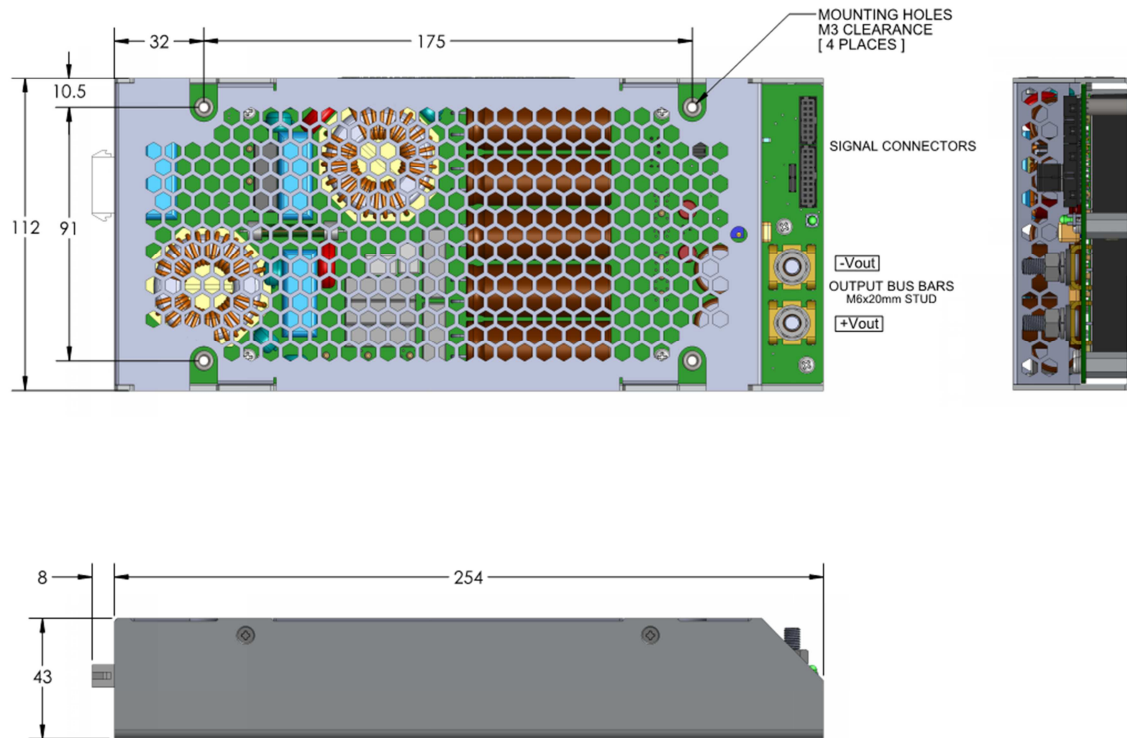
For the remote ON/OFF to function, the unit must be enabled via the ON/OFF Control (See Section 10) or the local ON/OFF jumper (J4 connector).

### 6.- Typical application diagram

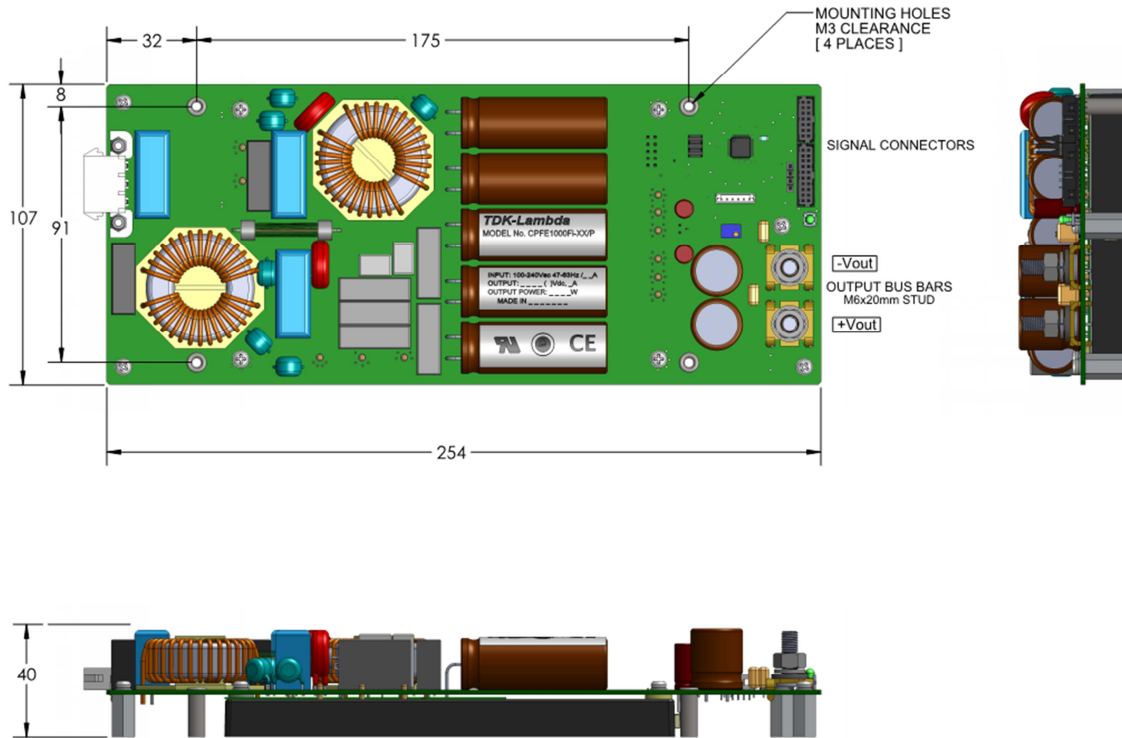


### 28. Mechanical Drawing

The CPFE1000Fi series of units are available in the following three chassis configurations: 1) The standard configuration is installed in a U-channel chassis, without a top cover, 2) The /C option is installed in the U-channel chassis with a ventilated top cover (shown in Fig 28-1), and 3) The /P option which has neither the top cover nor the U-channel chassis (shown in Fig 28-2). Overall dimensions for the standard model and the /C option are shown in Fig 28-1. Overall dimensions for the /P option is shown in Fig 28-2.

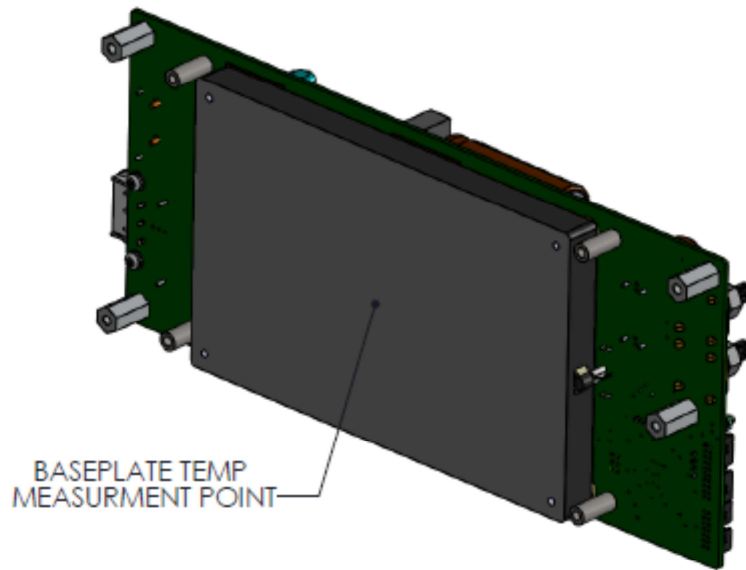


**Fig 28-1: Dimensions for Standard and /C chassis configurations**

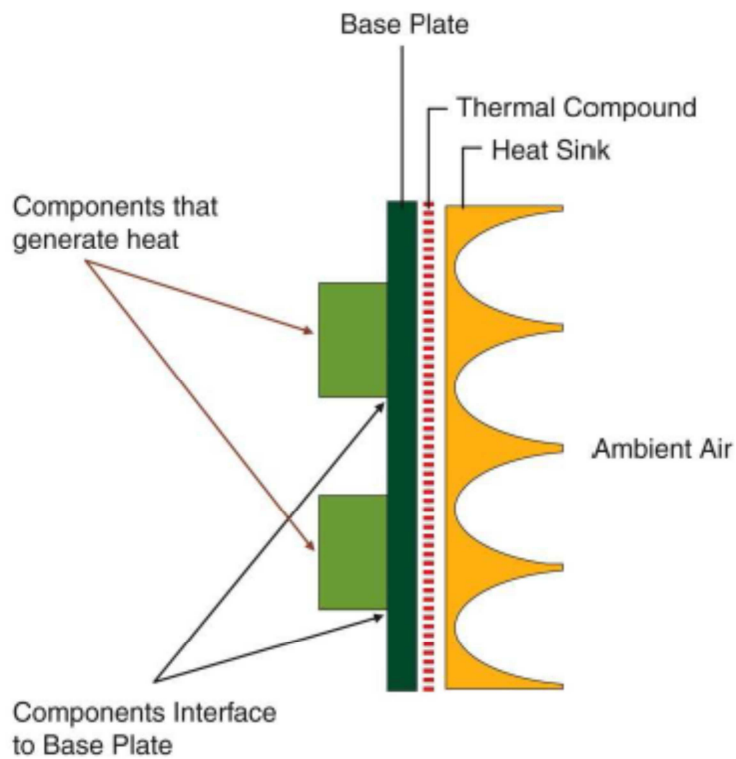


**Fig 28-2: Dimensions for /P chassis configuration.**

## 29. Baseplate Temperature Measurement Point



## 30. Heat Sink Selection



PD = Power Dissipation

$$\frac{P_{out}}{eff} - P_{out} = \frac{1000}{.85} - 1000 = 176 \text{ Watts}$$

$\theta$  = Thermal Resistance, degrees C per Watt, °C/W

Tb = Temperature of Base Plate

Ta = Temperature of Ambient Air

$\theta_{sa}$  = Thermal resistance between Heat Sink and Ambient Air

$\theta_{ba}$  = Thermal resistance between Base Plate and Heat Sink

Example:        Ambient 25°C  
                  Base Plate 100°C

$$\theta = \frac{Tb - Ta}{PD} = \frac{75^\circ C}{176} = .43^\circ C/W$$