

**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)

# ***PF/PF-A Series***

## ***Application Notes***

**Before Using The Power Supply**

Pay attention to all warnings and cautions before using the unit. Incorrect usage could lead to an electrical shock, damage to unit, or a fire hazard. Be sure read below *warning* and *caution* before using the power module.

**Warning**

- Do not touch heatsink and case which may be hot.
- Do not open the case and touch the internal components. They may have high temperature or high voltage which may get you in electrical shock or burned.
- When the unit is operating, keep your hands and face away from the unit. You may get injured by an accidents.

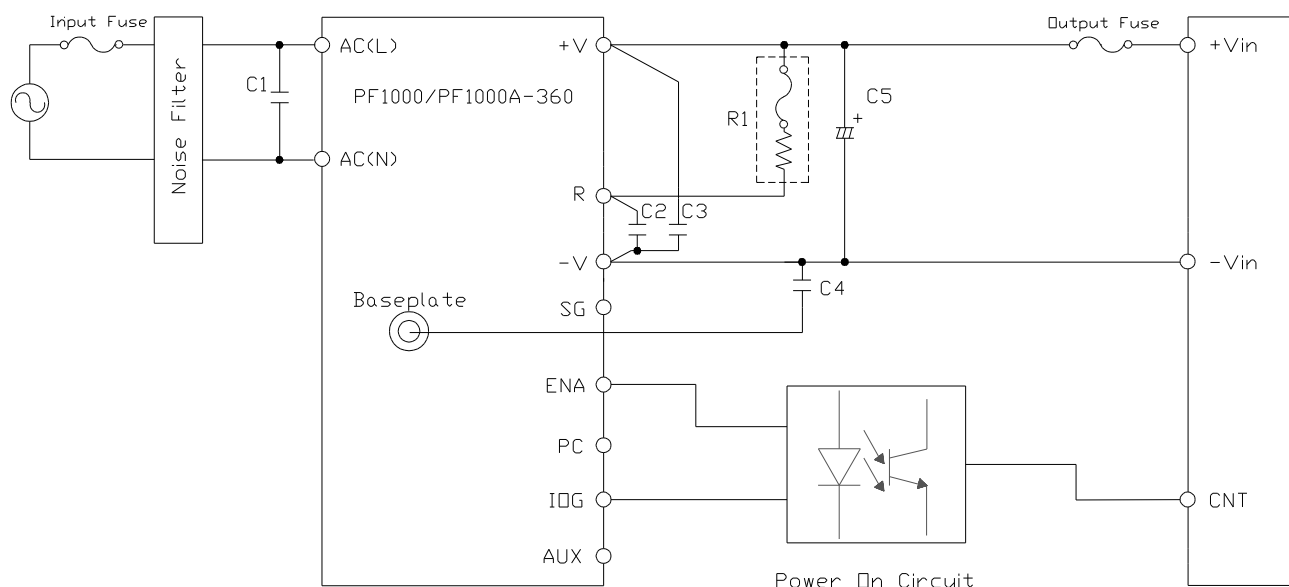
**Caution**

- Confirm that connections to input/output terminals and signal terminals are correct as indicated in the instruction manual.
- Attach a fast blow type external fuse to each module to ensure safety operation and to acquire each safety approval.
- This power supply is designed for professional installation within an end user equipment.
- The output of this power module is 360VDC and is considered a primary power supply. Safe design and Safety Standard requirement should be considered in application design.
- The application circuits and their parameters are for reference only. Be sure to verify effectiveness of application circuits and their parameters before finalizing circuit design.
- The information on this document is subject to change without notice. For actual design-in, please refer to the latest publications of data sheet, etc., for the most up-to-date specifications of this unit.
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of TDK-Lambda.

**CE MARKING :**

CE Marking, when applied to a product covered by this handbook, indicates compliance with the low voltage directive.

■ Basic Connection



1. External Components

- a) **C1: AC250V 1 $\mu$ F**  
 PF500/PF500A-360: 1pcs  
 PF1000/PF1000A-360: 2pcs

Note: Input capacitor C1 should be provided to filter high frequency noise at the input of the module. AC ripple current rating must be rated for more than 3A (RMS) per capacitor. Locate C1 as closely to the terminals as possible. This will reduce unwanted oscillations formed from wiring inductance and parasitic capacitance.

- b) **C2: 630V 0.82 $\mu$ F**  
 PF500/PF500A-360: 1/pcs  
 PF1000/PF1000A-360: 2/pcs

Note: Capacitor C2 is used to snub spike noise emanating from the boost inverter particularly when the main switch turns off. AC ripple current rating must be

rated for more than 3A (RMS) per capacitor. Locate C2 as closely to the terminals as possible.

- c) **C3: 630V 0.47 $\mu$ F**  
 PF500/PF500A-360: 1pcs  
 PF1000/PF1000A-360: 2pcs

Note: Same as C2.

- d) **C4: AC400V1000~4700pF**

Note: This capacitor is provided to reduce common mode circulating current. This capacitor is determined by the Overall common mode circulating current in the system and by the leakage current requirement of the system.

- e) **C5:**  
 Please refer to “● Selection of External Output Capacitor” below. The possible external nominal capacitance is as follows.

- PF500/PF500A-360: 120~1200 $\mu$ F  
 PF1000/PF1000A-360: 240~2000 $\mu$ F

If a value above these values is used, damage to the module could occur.

**f) R1:**

Please refer to “11. Input Surge Current”.

**g) Power On Circuit:**

Please refer to “16. Power On Signal”.

**h) Input Fuse:**

Please refer to “11. Input Surge Current”.

**i) Output Fuse:**

In order to protect the load from damage, please use an external fuse ( Fast Blow Type).

Recommended Output Fuse Nominal Current.

PF500/PF500A-360: 3A

PF1000/PF1000A-360: 6A

● **Selection of External Output Capacitor**

The external output capacitor value is determined by the following factors:

- Peak to Peak Output Ripple Voltage
- Required Holdup Time
- Peak to Peak Ripple Current
- Expected Lifetime of the Capacitor

**A. Peak to Peak Output Ripple Voltage**

The peak to peak output ripple voltage should be minimized to less than 15Vpk-pk. This will ensure that the DC voltage bus is fairly constant for line and load changes. The following formula determines the required output capacitance needed for a peak to peak ripple voltage of less than 15Vpk-pk.

**Equation 1**

$$C_o \geq \frac{P_{out}}{(2\pi f \times V_{pk-pk} \times V_o \times \eta)} [F]$$

Co = Output Smoothing Capacitance

Pout = Pin of PH module

(Pin = Po(of PH module)/ η )

f = Input frequency

Vpk-pk = Output ripple voltage

(less than 15Vpk-pk)

Vo = PF/PF-A rated output voltage

(worst case = 98% of rated output voltage)

η = Efficiency of PF/PF-A module

**Example**

-using two PH modules (PH300F280-5 at full load current)

-Input frequency 60Hz

-Input voltage is 360VDC

Total Pout of PF/PF-A module required

$$P_o = \frac{600W}{0.83} = 723W$$

$$V_o = 0.98 \times 360 = 353V$$

The PF1000/PF1000A-360 would be required to support the total system input power of 723 Watts.



$$C_o \geq \frac{728 \times 10^{-6}}{(2\pi)(60)(15)(353)(0.94)} [F]$$

$$C_o \geq 388 \mu F$$

### B. Capacitance Selection for Desired Holdup Time

The total output capacitance must also be calculated based on the required holdup time of the AC/DC power supply. The following equation relates the output capacitance to the required holdup time.

#### Equation 2

$$C_o \geq \frac{2 \times (P_o / \eta) \times Th}{(V_o - V_{pk-pk} / 2)^2 - (V_{min})^2} [F]$$

Co = Output Smoothing Capacitance

Po = Pin of PH module

(Pin = Po(of PH module)/ η )

η = Efficiency of PH module

Th = Required holdup time of AC/DC power supply

Vo = PF/PF-A rated output voltage

(worst case = 98% of rated output voltage)

Vpk-pk = Output ripple voltage

(less than 15Vpk-pk)

Vmin = Minimum Input Voltage of PH Module

#### Example

- using two PH modules (PH300F280-5) at full load current

- desired holdup: 1 line cycle at 60Hz

- η of PH module = 83%

- Vmin = 180VDC

- Vpk-pk = 15V

- Vo = 360 × 0.98 = 353VDC

$$P_o = \frac{600W}{0.83} = 723W$$

The capacitance is calculated as follows:

$$C_o \geq \frac{2 \times (723)(16.6mS) \times 10^{-6}}{\left[ (353 - 15/2)^2 - (200)^2 \right]} [F]$$

$$C_o \geq 302 \mu F$$

Determine the capacitance from the results of Equations 1 and 2. The larger value should be used to obtain the desired holdup and peak to peak ripple voltage requirements.

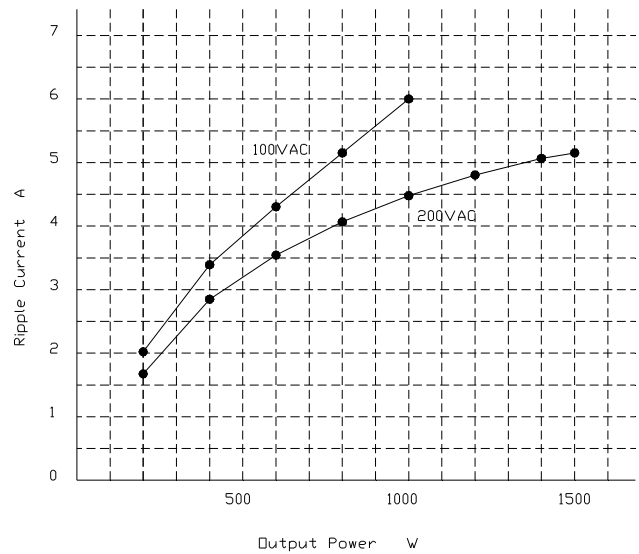
Note: Electrolytic capacitors of low ESR type should be used.

### C. Peak to Peak Capacitor Ripple Current

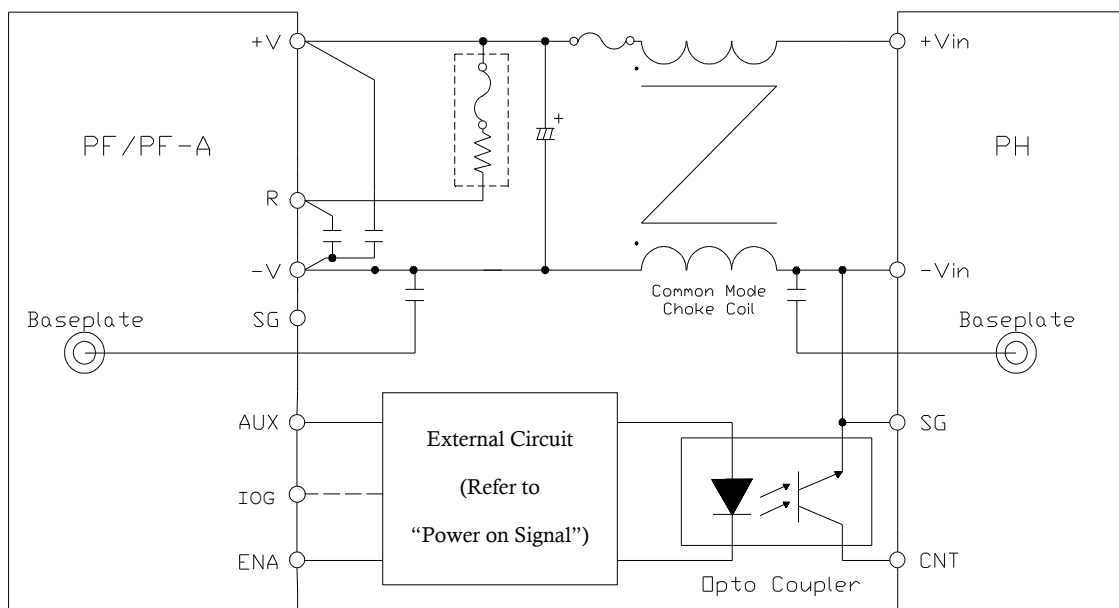
The peak to peak ripple current is comprised of both line frequency and switching frequency components. In a power factor corrected system, the AC peak to peak capacitor current is greatly reduced. This is due to the regulated DC bus of 360VDC that the capacitor sees even over wide input variations. This allows for a smaller capacitor that can consistently store more energy than in the conventional system at low line.

All of this results in a charging current waveform that has a peak to peak value of only twice the DC input current. That means that the RMS capacitor current is equal to  $0.707 \times IDC$ . This increases the reliability of the overall front end which extends itself to a better system design.

The maximum allowable ripple current of the capacitor must be greater than the actual ripple current value. The figure below shows actual ripple current versus output power. This can be used as an estimation for actual peak to peak ripple current. However, measurement of the actual current should be made to confirm system reliability.



● PH Series Connection



- Place a common mode choke coil across the input section of the PH series (for each module).

- Place a 4700pF capacitor on the input side of the PH series between the -V terminal and baseplate (FG).

Common Mode Choke Coil Inductance

Value: 2mH

(attach to each module)

- Place a 4700pF capacitor on the output side of the PF/PF-A series between the  $-V$  terminal and baseplate (FG).  
(attach to each module)
- Please use (for each PH module) an opto-coupler for the ON/OFF control circuit between the PF/PF-A series and the PH series. Further, please use a opto-coupler with the transistor output having no base terminal. Also place the transistor as close to the PH series CNT and SG (or  $-V$ ) terminals as possible.
- Short the SG terminal to the  $-V_{in}$  on the PH series and to the  $-V_{out}$  on the PF/PF-A series. Do not connect them directly together.
- Attach the PH series input fuse to the +V side, do not place it on the  $-V$  side.

## 2. Input Voltage Range

Input Voltage that takes into consideration each country's standard input voltage and tolerance range.

In order to meet each safety standard, the standard input voltage must be provided. The PF/PF-A modules input voltage rating is from 85~265VAC, at a frequency range of 47~63Hz. The input current is comprised of both low frequency (60Hz) and high frequency components (PF: 190kHz, PF/A: 140kHz).

## 3. PFHC Operation Input Voltage Range

PFHC operation will not occur with input voltage above 255VAC. The output voltage will be the full rectification of the input voltage.

## 4. Input Current

This is the effective value of the current supplied to the module. The value in the specifications is the value under standard input and output.

## 5. Nominal Output Voltage

The nominal output of the PF/PF-A360 series is 360VDC. However, this is the value when the input is under 255VAC.

## 6. Maximum Output Current

This is the maximum output current the module can supply to the load continuously.

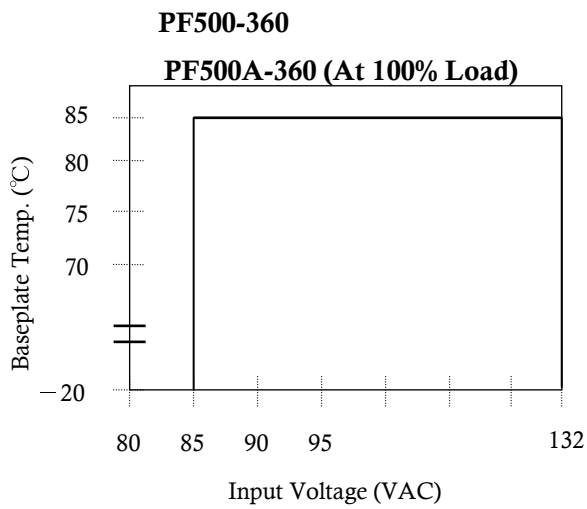
## 7. Maximum Output Power

This is the maximum output power the module can supply to the load continuously.

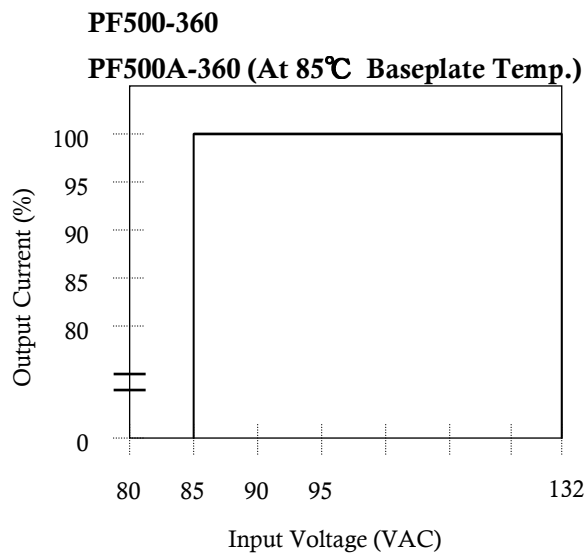
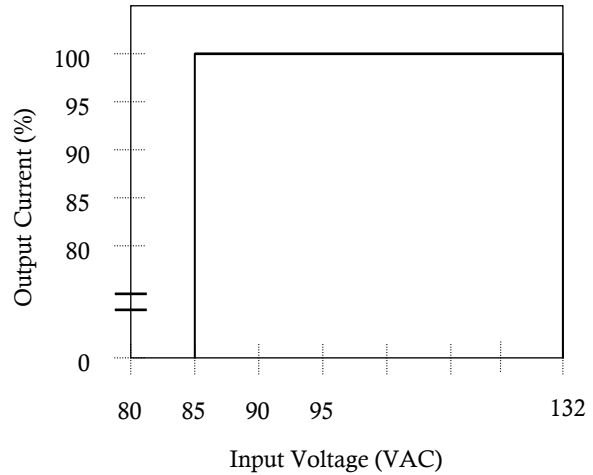
The PF1000/PF1000A-360 has the capability of supplying 1000W in the 100VAC input mode and 1500W in the 200VAC input mode. The PF500/PF500A-360 can supply 500W in the 100VAC input mode and 750W in the 200VAC input mode.

The increased wattage capability at 200VAC input is primarily due to the higher efficiency (94%) achieved as compared to (90%) when operating in the 100VAC mode.

PF&PF-A Series derating must be taken as follows.



**PF1000-360**  
**PF1000A-360 (At 85°C Baseplate Temp.)**

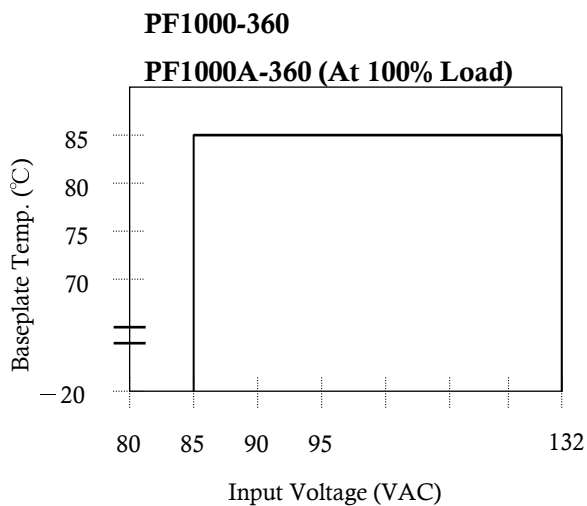


## 8. Efficiency

This is the ratio of the output power to the effective input power. The value in the specifications is the efficiency under standard input and output. Due to the fact that the efficiency will change with input voltage and output power, please take caution when constructing thermal design.

## 9. Power Factor

The percentage of effective input power vs. the apparent input power is called power factor.



## 10. Output Voltage Accuracy

Within the PFHC operating input voltage range, the output voltage accuracy is 360VDC ± 2%.

## 11. Inrush Current

Inrush current is defined as the initial peak input current drawn by the input capacitors during turn-on. This current can be very large depending on the source impedance, and can cause such problems as external fuse brown-out, melting of the contacts of a relay or tripping of a circuit breaker.

The inrush current at turn-on can be limited by connecting an external resistor between the R and +V terminals on the PF/PF-A module. This allows flexibility for the user to reduce the inrush current to meet his or her design conditions.

Note: The PF/PF-A module must be operated with an external inrush limiting resistor.

### ● Selection of an External Inrush Limiting Resistor

#### A. Determine Resistor Value

##### Equation 4

$$R = \frac{V_{inpk}}{I_{(inrush)}} [\Omega]$$

R = External Resistor Value (Ω)

V<sub>in</sub> = AC RMS Input Voltage (VAC)

V<sub>inpk</sub> = V<sub>in</sub> × √2

I<sub>(inrush)</sub> = Inrush Current (A<sub>pk</sub>)

#### B. I<sup>2</sup>t Rating of Inrush Limiting Resistor

When selecting an inrush limiting resistor value,

its I<sup>2</sup>t rating must be limited to less than the manufacturer's rating. The I<sup>2</sup>t value can be computed as follows:

##### Equation 5

$$I^2t = \frac{C_o \times (V_{inpk})^2}{2 \times R} [A^2s]$$

I<sup>2</sup>t = Product of the current squared and time

C<sub>o</sub> = Output Smoothing Capacitance

V<sub>inpk</sub> = V<sub>in</sub> × √2

R = External Inrush Limiting Resistor

It is recommended to use a thermally fused inrush limiting resistor or a resistor with a thermal fuse in series for safety protection.

### ● Selection of an External Input Fuse

The power module does not provide an input fuse. For safety precautions and to meet each safety approval standard, an external fuse should be connected (to each module).

#### A. Voltage Rating of the External Fuse

<u>Rating</u>	<u>Input Voltage</u>
125VAC	100VAC Input
250VAC	200VAC Input

#### B. Current Rating of the External Fuse

The standard current is determined from the maximum input current with the following formula shown below.

**Equation 6**

$$I_{in(max)} = \frac{P_{out}}{V_{in(min)} \times \eta \times PF} [A_{rms}]$$

$I_{in(max)}$  = Maximum Input Current

$P_{out}$  = Maximum Output Power of PF/PF-A Module

$\eta$  = Efficiency  $\frac{\text{actual power}}{\text{apparent power}}$

PF = Power Factor

$V_{in(min)}$  = Minimum AC Input Voltage

External fuse input current ratings for the PF/PF-A modules are the following.

PF500/PF500A-360: 10A

PF1000/PF1000A-360: 20A

The power factor varies depending on line impedance, effective input capacitance, and output power.

**C. Calculating the Required Surge Energy**

The surge energy when the inrush current protection circuit does not function must be considered. If the output is above 180V when the input has been shut down, the inrush current protection circuit will not function. Please refer to Sequence Timing Chart. At this time the inrush current limiter is only the line impedance. The surge energy at this time can be calculated as follows.

**Equation 7**

$$I^2t = \frac{C_o \times (V_{inpk} - 180)^2}{2 \times r} [A^2s]$$

$I^2t$  = Product of the current squared and time  $C_o$  = Output Smoothing Capacitance

$V_{inpk} = \max V_{in} \times \sqrt{2}$

$r$  = Input Line Impedance

Line impedance will vary depending on conditions of use. However, when using calculations, please make this value 0.5  $\Omega$ .

The  $I^2t$  value of the manufacturers rating must be greater than the calculated value from Equation 7. The fuse must also be able to support the AC RMS input current as well as the AC RMS input voltage.

**12. Overvoltage Protection**

The PF/PF-A series is equipped with an overvoltage protection circuit. During an overvoltage condition, the power factor correction function is disabled. The DC bus, however, is still maintained as a rectified AC input voltage. Power factor correction is restored once the AC input voltage has been manually recycled and reapplied to the PF/PF-A module. The overvoltage protection trip point is factory set and cannot be changed. When the OVP triggers, please shut down load as follows :

- a.) For PF-module : through IOG and ENA
- b.) For PF-A module : through IOG or ENA

Note: When recycling the AC input line voltage, enough time should be allowed to pass so that the DC output falls below 20VDC before the AC is reapplied.

### 13. Thermal Protection

The PF/PF-A modules are thermally protected in the event that their base plate temperature should rise above the trip point (85°C~115°C). Once an overtemperature condition is detected, power factor correction is inhibited and only a rectified AC input voltage is provided as an output from the PF/PF-A module. Power factor correction is restored once the baseplate temperature has fallen to within operating limits and AC line voltage is reapplied. When the thermal protection triggers, please shut down the load through the IOG and ENA.

### 14. Parallel Operation

The PF/PF-A modules can be configured for current sharing N+1 parallel redundancy. N+1 parallel redundancy enhances system design reliability and provides the user with an option of achieving increased output power.

The PF/PF-A modules can be paralleled by connecting the “PC” pin from one module to another. This will allow equal current sharing of up to a maximum of five units in parallel (same power level). By connecting the PC terminals together, each module will sense and monitor its own output current via an analog voltage signal that is in proportion to the output current. The internal circuits of both modules will mutually monitor and compare the voltage of one another, so that balancing is achieved

for both modules.

When operating in parallel, the maximum load current drawn from each unit is up to 90% of the maximum output current that appears on the modules specification sheet.

#### Example

- using two PF1000/PF1000A-360 in parallel at  $V_{in} = 200VAC$
- The total output current is 8.4A
- The maximum load current capability per module is given by:

$$I_{load} = 0.9 \times 8.4$$

$$I_{load} = 7.56A$$

#### ● Application Note on Parallel Operation

Parallel operation is possible within the PFHC operation range (85~255VAC). When operating in parallel, connect the PC pins together and there will be current sharing between the models.

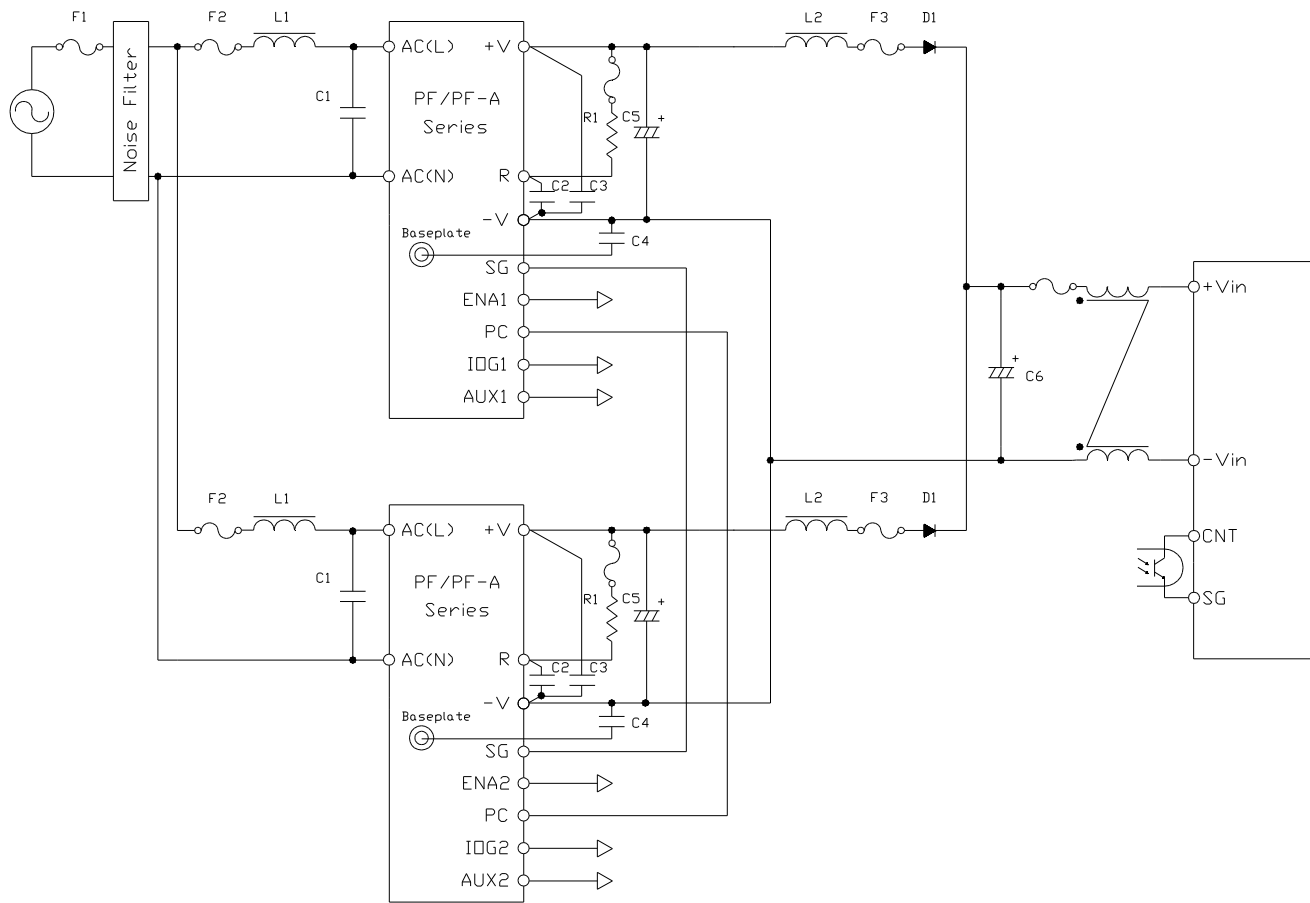
There are two methods of parallel operation.

- (1) Parallel Operation
- (2) N+1 parallel redundant operation.

#### A. Basic Connection

Parallel operation is used when there is not enough current to supply the load being used with one model, or when improving the reliability of the power supply by reducing the output power. However, if one model goes down, the output will be shut down. The basic connection is shown below.

■ Basic Parallel Operation



**B. Parallel Redundant Operation**

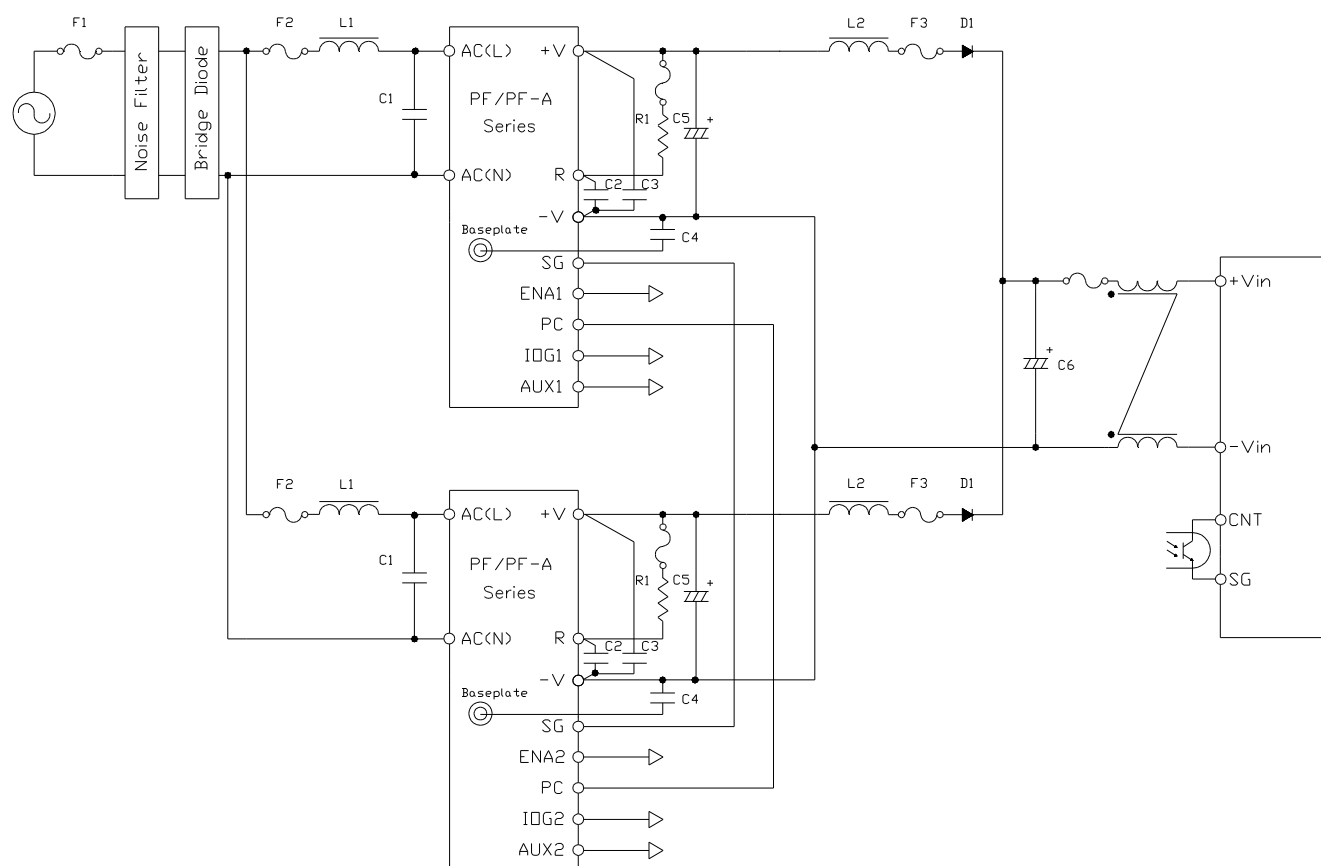
In power supply systems demanding high reliability, N+1 modules can be used for the N module power supply, increasing the reliability of the system. In normal operation, the output power of each module will be lower, also raising the reliability of the system.

If one module goes down within the N+1

modules, the remaining N modules can still supply the load current and protection from the system going down is accomplished. However, a bridge diode and input fuse (standard DC) is required. When selecting the bridge diode as well as input fuse, please consider not only the time in standard operation, but also the inrush withstand current. The basic connection is shown below.



■ N+1 Parallel Redundant Operation



C. In Order to Operate in Parallel

In order to operate in parallel, the following basic caution points should be considered.

- Input Voltage Range: 85~255VAC  
If this range is exceeded, there will be no current sharing and damage to the module could occur.
- Maximum Possible Modules in Parallel:  
5 units Models must be of similar type.  
PF500/PF500A and PF1000/PF1000A cannot be operated in parallel.
- Connection for Each Signal:

(ENA) and IOG signal (IOG) are used.

Only when both of these signals are LOW, the operation is normal, and possible output is displayed. If one of the signals is abnormal (HIGH), the module is thought to be abnormal. Please make the output in “OFF” condition.

- SG Terminal Connection

The SG terminal is connected inside the module to the -V terminal. However, to make the module’s operation more steady, discriminate from the output line (power line). To make the ground level even between each SG

Make sure that the power on signal

terminal, short each  $-V$  terminal to the SG terminal.

#### - Output Derating: Under 90%

When operating in parallel, derating is needed to achieve the current sharing accuracy. Please use at 90% or below of each module's maximum power rating. Further, take note that depending on the input voltage, the standard output will change.

#### - Output Smoothing Capacitor:

When operating in parallel, a situation will be produced where the output capacitance exceeds each PF/PF-A series upper limit. The inrush current due to the output capacitor can damage the module. Therefore, in order to fulfill each module's maximum external output capacitance (inrush current capacitance), be sure to attach an output diode.

#### - Insertion of Normal Mode Choke Coil

To avoid malfunction due to noise from the input and output lines, please insert an input and output normal mode choke coil.

#### - Parallel Redundant Operation

When operating in parallel redundant mode, please be sure to full wave rectify by place a bridge diode on the input. If a bridge diode is not inserted, when one module fails there is the possibility of all of the input fuses blowing and the system's output dropping out.

Further, when operating in redundant mode as a power supply system, there is a redundant operation method for each

system (PH, or PT etc. used as the secondary).

#### - Input Fuse

For safety reasons, please place a input fuse on the input of each module.

Further, we recommend placing an apparatus input fuse on the input section.

#### - Wiring

The standard is to wire short and thick. Especially, wire the output  $-V$  terminals short and thick.

### ● Determining the Recommended External Component Values

#### a) F1: AC Input Fuse

Please select a component that meets the following recommended conditions.

##### ○ Standard Voltage

100VAC Input Series: 125VAC

200VAC Input Series: 250VAC

##### ○ Standard Current

Please choose a component above  $N$  (paralleled units)  $\times$  the calculated input current of each PF/PF-A module.

Further, for the standard current, please select the components so that  $F1 > F2$ .

##### ○ Withstand Surge Current

Please calculate the withstand surge current with the following formula.

**Equation 8**

$$I^2t = N^2 \times A \left[ A^2s \right]$$

I<sup>2</sup>t: Withstand Surge Current needed for

F1

N: Parallel Operation Units

A: Withstand Surge Current needed for F2  
(refer to Equation 9)

Further, when calculating with the above conditions, the value will be on the large side compared to the actual measured value. Therefore, base your selection on the measured value for the withstand surge current.

**b) F2: PF/PF-A Input Fuse**

When the line from the PF/PF-A series output to the PH/PT series is long, an input electrolytic capacitor is needed to stabilize the PH/PT series input voltage. Therefore, when inserting an input electrolytic capacitor, a surge current will be added to F2. Please consider the sum of the PF/PF-A series output smoothing capacitors C5 and C6 with the following equation.

Further, C6 must be considered with all PF/PF-A series modules in parallel operation.

**Equation 9**

$$A = \frac{(C5 + C6) \times V_a^2}{2 \times r} \left[ A^2s \right]$$

A: Withstand Surge Current needed for F2

C5: Output Smoothing Capacitor

C6: Secondary Input Electrolytic Capacitor

(consider the tolerance)

V<sub>a</sub>: Input 200V Series Vin – 180

Input 100V Series Vin

However, Vin is the maximum input voltage DC conversion value.

r: Input Line Impedance

**c) R1: Input Surge Current Protective Resistor**

For the input surge current protective resistor, the output smoothing capacitance must be considered in the same way as for the PF/PF-A input fuse.

**d) L1: Normal Mode Choke Coil**

Please select an input interference protective normal mode choke coil that meets the following conditions.

**○ Recommended Inductance Value**

10μH: 5~30 μH

Please select a similar component for the output interference protective normal mode choke coil L2.

**e) D1: Output Diode**

Please select an output diode that meets the following conditions.

**○ Reverse Withstand Voltage**

600V or above.

**○ Standard Current**

Allow a good margin vs. the output current of the PF/PF-A that is being used and select the appropriate standard current output diode.

○ **Withstand Inrush Surge Current**

The C6 charging current will flow to the output diode. On this occasion the withstand current will be as shown in the following equation.

$$I^2 t = \frac{C6^2 \times Va^2}{2 \times r(C5 + C6)} [A^2 s]$$

I<sup>2</sup>t: Withstand Surge Current needed for D1

C5: Output Smoothing Capacitor

C6: Secondary Input Electrolytic Capacitor (please consider the tolerance)

Va: Input 200V Series Vin – 180  
Input 100V Series Vin

However, Vin is the maximum input voltage DC conversion value.

r: Input Line Impedance

**f) F3: Output Fuse**

F3 is the abbreviation in the case that an input fuse is connected to all the DC-DC converters.

**g) C6: PH/PT Input Electrolytic Capacitor**

When the wiring from the PF/PF-A series to the PH/PT series is long and there is a large voltage drop and regulation, please place this capacitor to the input section of the PH/PT series.

Please select the capacitor so that the sum of C5 and C6 does not exceed the PF/PF-A series maximum external output capacitance.

Further, ripple current will flow through this capacitor. Please check and select a component that satisfies the ripple current.

○ **Standard Voltage**

400WV or above

**h) Bridge Diode**

Please select a bridge diode that satisfies the conditions below.

○ **Withstand Voltage**

100VAC Input Series: 400VAC

200VAC Input Series: 600VAC

○ **Standard Current**

Please choose a component above N (paralleled units) × the calculated input current of each PF/PF-A module.

○ **Withstand Inrush Surge Current**

Select a value similar to the F1 withstand inrush surge current.

Further, when attaching a bridge diode to each module unlike in the redundant operation basic connection, please select a standard current and withstand inrush surge current similar to F2.

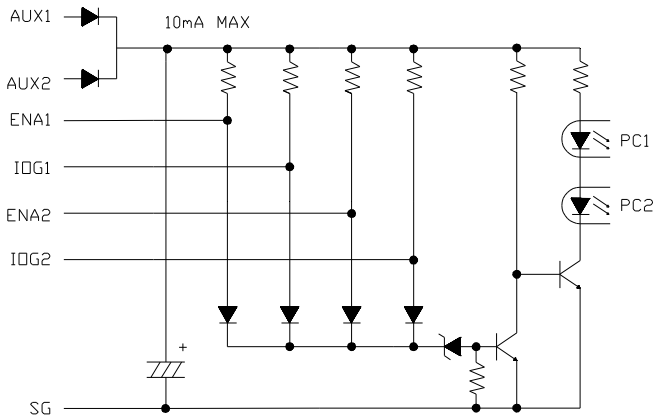
Also, please take note of the heat generated by the bridge diode.

● **Signal Connection for Parallel Operation.**

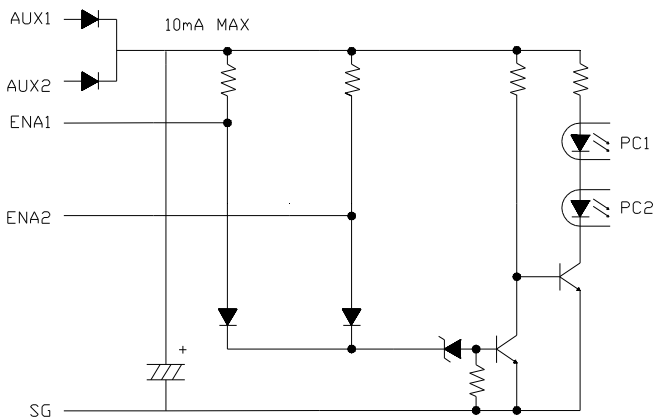
The parallel and redundant operation signal connection for the PF/PF-A series to the secondary PH/PT series is recommended as follows.

**Parallel Operation Signal Connection.**

**(PF Connection)**

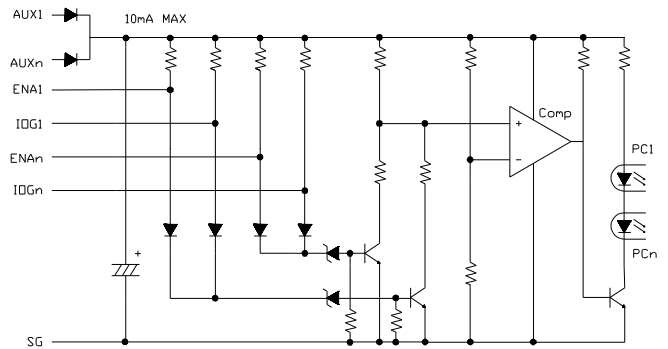


**(PF-A Connection)**

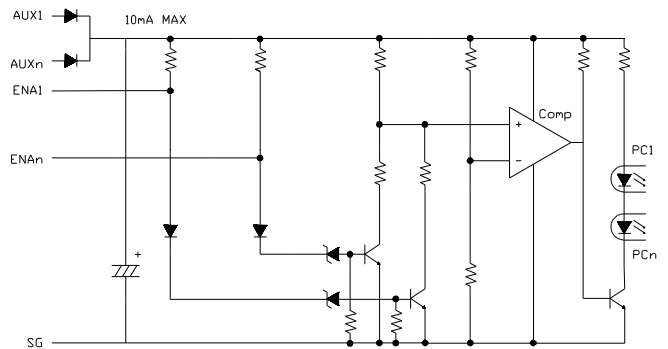


**N+1 Parallel Redundant Operation Signal Connection**

**(PF Connection)**



**(PF-A Connection)**



Please select a electrolytic capacitor or 100 $\mu$ F or below for the capacitor connected to the AUX terminal.

Further, 0.1 $\mu$ F capacitors have a good effect in removing noise between the ENA, IOG terminals and SG terminal.

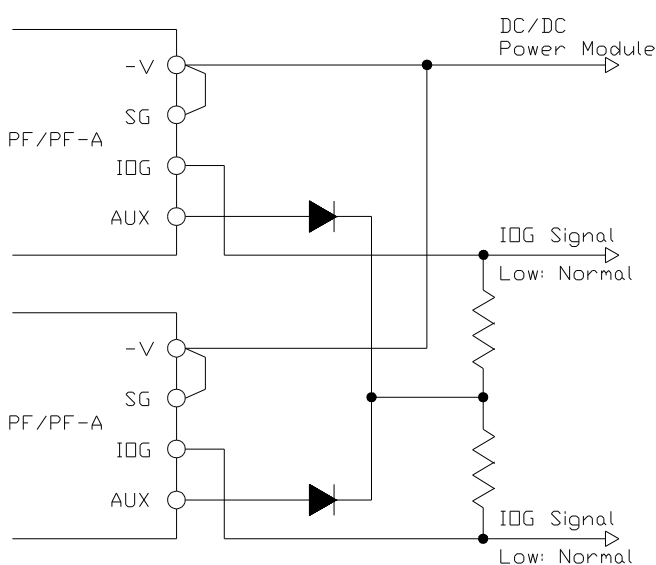
Upon module power supply development, depending on the PCB to be loaded on and the construction, applications not mentioned above may be needed. Please confirm with the actual equipment being used.

### 15. Inverter Output Good Signal (IOG Terminal)

In a system that is using N+1 redundancy, hot plugability must be an option to the user. By allowing a module to be replaced (such as a defective or damaged module), without shutting down the AC input power, system reliability can be increased and “down time” minimized. The PF/PF-A module has an IOG pin that allows the user access to monitor each module’s operation status. The IOG pin monitors the module’s inverter operation by providing an open collector output signal.

Normal operation is indicated as a low (maximum sink current: 5mA, maximum applied voltage: 35V). When monitoring the IOG terminal, the return should be connected to the SG terminal as in the following diagram (SG is connected internally to the -V terminal).

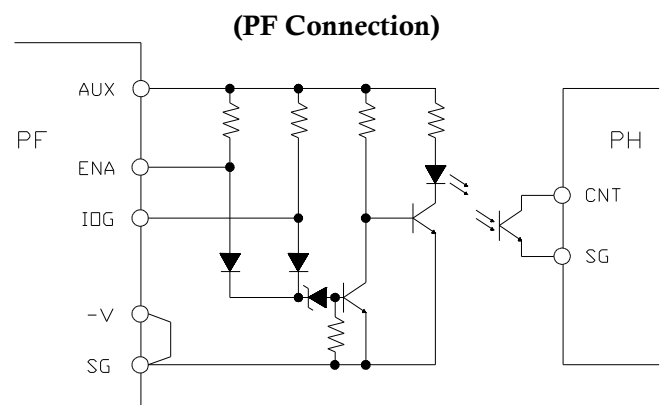
Please take note that the time from when the PFHC goes off until the time the IOG goes high is 500~700mS.

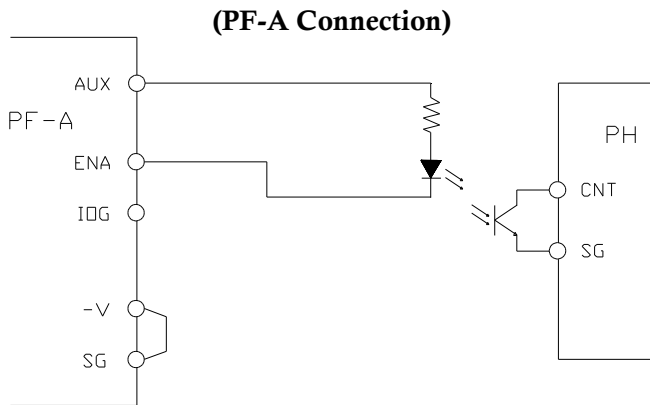


### 16. Power ON Signal (ENA Terminal)

The PF/PF-A series is furnished with a power ON monitoring signal (ENA terminal) that is supplied as an open collector type. This signal monitors the output voltage of the PF/PF-A module and indicates when it is at a high enough voltage to support proper operation. When the output voltage is at its proper level (greater than 350VDC), the power ON signal is in its low state (maximum sink current : 5mA, maximum applied voltage: 35V). Please refer to the Timing Sequence Chart.

The power ON signal functions to ensure that the load of the PF/PF-A module (ie: PH module) remains in the off state until the module reaches its appropriate output voltage. At initial turn on of a power supply, there exists a high peak inrush current that charges up the input capacitors. If a load is drawn from the bulk storage capacitors before the PF/PF-A module reaches its normal operating voltage, the DC bus voltage can drop, causing a possible undervoltage lockout condition. This can prohibit the PF/PF-A module from operating properly. To prevent this from happening, the following circuitry should be added when combining PF/PF-A and PH modules.





The optically isolated circuit shown above uses the auxiliary bias supply of the PF/PF-A module to “hold off” the PF/PF-A module until sufficient voltage at the output of the PF/PF-A module is reached.

Note : This circuit can also be controlled via an external 0~5VTTL signal in place of the auxiliary supply. The return of the ENA pin is the SG terminal.

### 17. Auxiliary Power Supply for External Signal (AUX Terminal)

PF/PF-A modules are equipped with an auxiliary power supply (AUX terminal) to provide power for external system or “housekeeping” circuitry. The output voltage range is from 12~20VDC at an maximum output current of 10mA. When using parallel operation, the AUX terminals should be diode isolated as shown in the diagram for the IOG signal. In this case as well, the maximum output current is 10mA. The return for the AUX signal is the signal ground terminal (SG).

### 18. Operating Temperature

The baseplate temperature must be limited to less than 85°C. For details on the thermal design, please refer to the Application Note “Thermal Design”.

### 19. Operating Humidity

Avoid the buildup of condensation on or in the power module.

### 20. Storage Temperature

Sudden temperature changes can cause condensation buildup and possible power module failure.

### 21. Storage Humidity

High temperature and humidity can cause the terminals on the module to oxidize.

### 22. Cooling Method

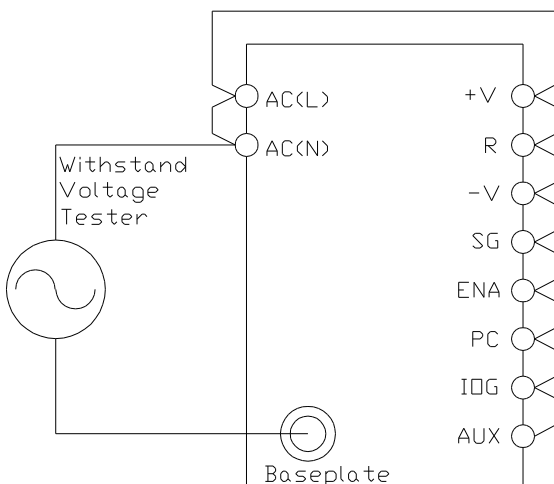
The operating temperature is specified by the baseplate temperature (limited to 85°C). Various heatsink designs are possible. for detailed heatsink design, refer to the Application Note “Thermal Design”.

### 23. Withstand Voltage

The power module is designed to withstand 3kVAC between the input and baseplate, and

between the input and output for 1 minute. In the case that the withstand voltage is tested in the incoming goods test, etc., please set the limit of the withstand voltage test equipment to 20mA. The applied voltage must be increased gradually from zero to the testing value, and then decreased gradually at shut down. Especially stay away from use of a timer, where a pulse of several times the applied voltage can be generated. This could cause damage to the module. Be sure to short the output side as shown below.

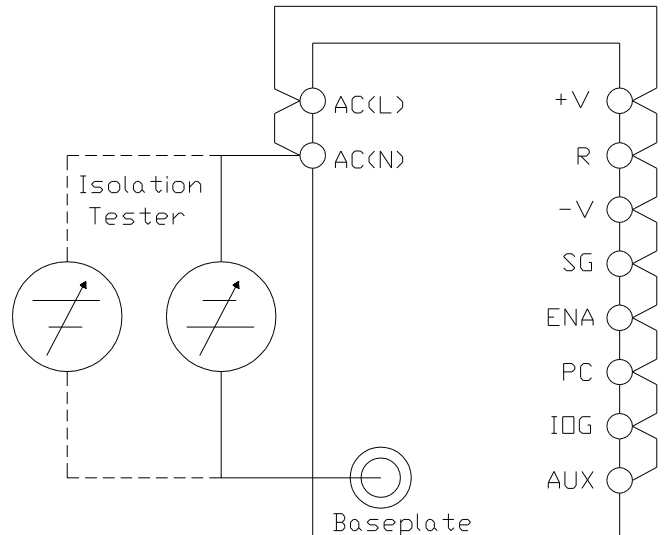
Further, the Withstand Voltage Test is basically a breakdown test. Please limit the number of tests to as few as possible.



#### 24. Isolation Resistance

The isolation resistance is more than 100MΩ at 500VDC when tested with a DC isolation tester between output and baseplate and input and baseplate. Note when testing, some isolation testers can produce a high pulse when the applied voltage is changed over.

Ensure to discharge the module with a resistor after the test.



#### 25. Vibration

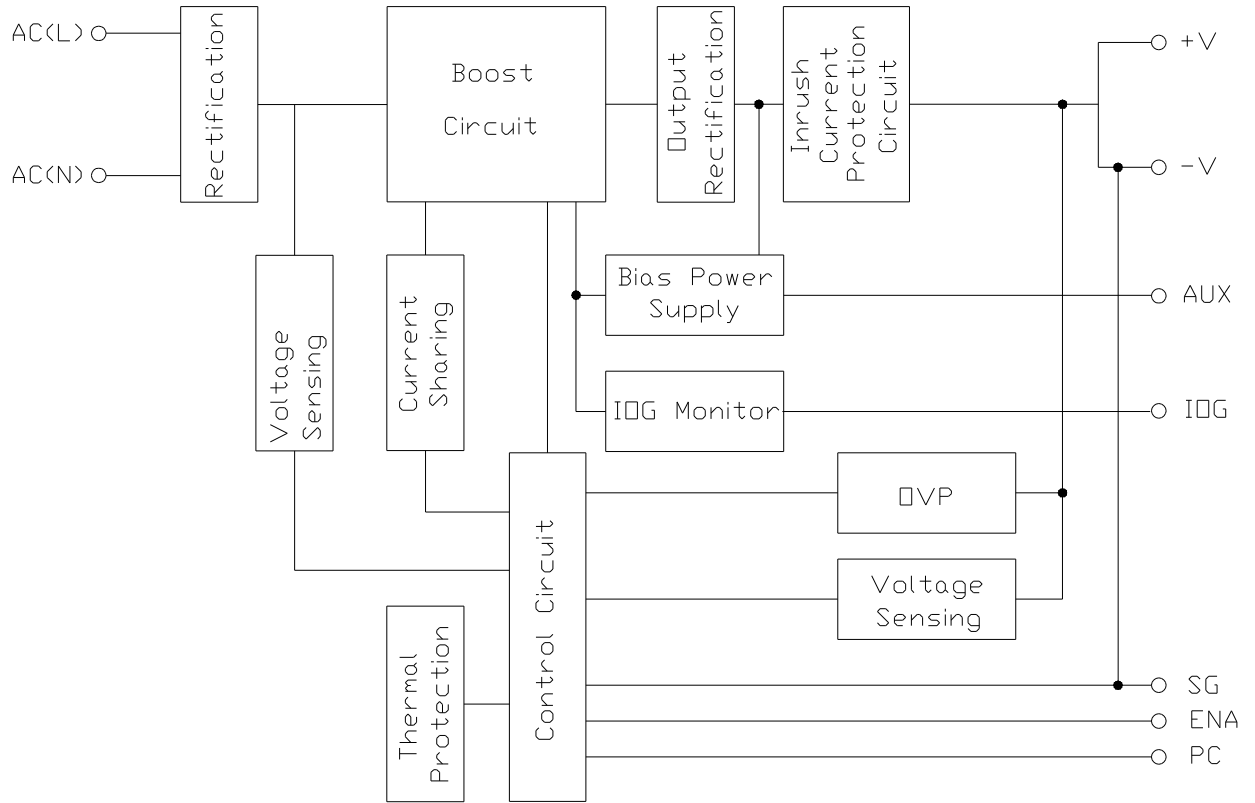
Please refer to the “Installation” application note.

#### 26. Shock

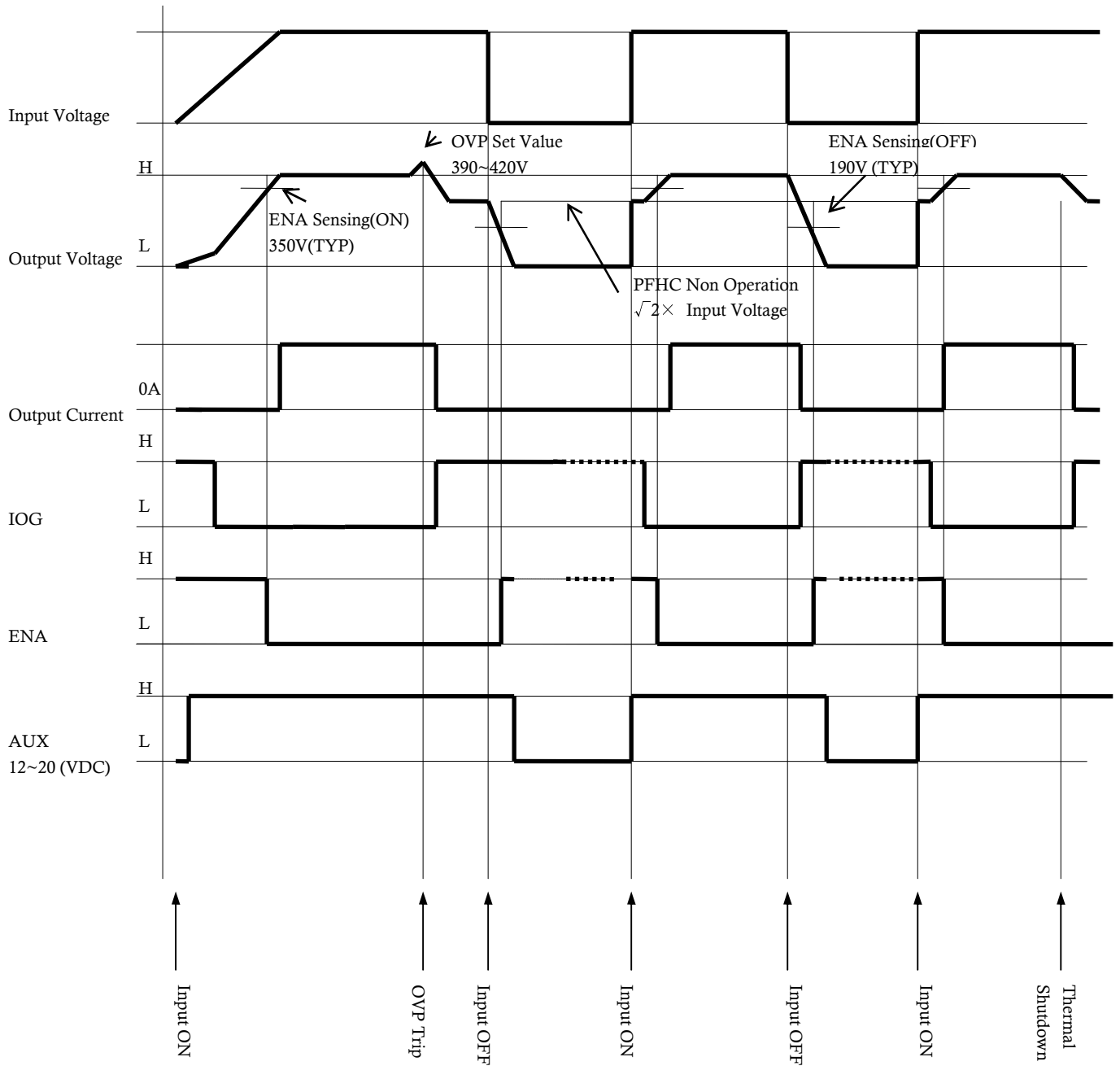
Value for the conditions of our shipping and packaging.



27. Block Diagram • Sequence Chart



PF Sequence Chart



PF-A Sequence Chart

