




DRF120 Series Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Pay attention to all warnings and cautions before using the unit. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

- **Warning Symbols**

CAUTION	
• DO NOT MODIFY OR DISASSEMBLE THE POWER SUPPLY.	
• READ INSTRUCTION MANUAL BEFORE CONNECTING TO MAINS.	
• ELECTRIC SHOCK HAZARDOUS ON THE CONNECTOR SECTION.	

NOTICE:

(1) Installing/Storage Environment

1. Store the product with ambient temperature -40 to $+85$ °C, and relative humidity 5 to 95% (No Dewdrop).
2. Never operate the unit under over current or shorted conditions and out of Input Voltage Range in specification which could result in damage.
3. Confirm connections to input/output terminals are correct as indicated in the instruction manual.
4. Use the product where the relative humidity is 5 to 95% (No Dewdrop).
5. Avoid places where the product is subjected to direct sun light.
6. Avoid places where the product is subjected to penetration of liquid, foreign substance or corrosive gas.
7. Avoid places subject to shock or vibration.
A device such as a contact breaker may be a vibration source. Set the Power Supply as far as possible from possible sources of shock or vibration.
8. If the Power Supply is used in an area with excessive electronic noise, be sure to separate the Power Supply as far as possible from the noise sources.
9. Don't use the product in the environment with strong electromagnetic field, corrosive gas and conductive substance.
10. Model/type reference: DRF120-24-1-xyz , DRF120-24-1/HL-xyz (where xyz is optional and can be alphanumeric characters or blank and it is not a safety related information - product ratings unchanged)

Precautions in Using the product:

When the product is used under the circumstance or environment below, ensure adherence to limitations of the ratings and functions.

Also take countermeasures for safety precautions such as fail-safe installations.

1. Under the circumstances or environment which are not described in the instruction manual.
2. For nuclear power control, railway, aircraft, vehicle, incinerator, medical equipment, entertainment equipment, safety device etc...
3. For applications where death or serious property damage is possible and extensive safety precautions are required.
4. Not to be used with a high inductive power source, as it may cause unstable operation of the power supply.

Note: CE MARKING

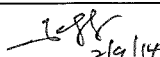

CE Marking, when applied to a product covered by this handbook indicates compliance with the following:

Low voltage directive (2006/95/EC) in that it is complies with EN60950-1.

EMC Directive 2004/108/EC

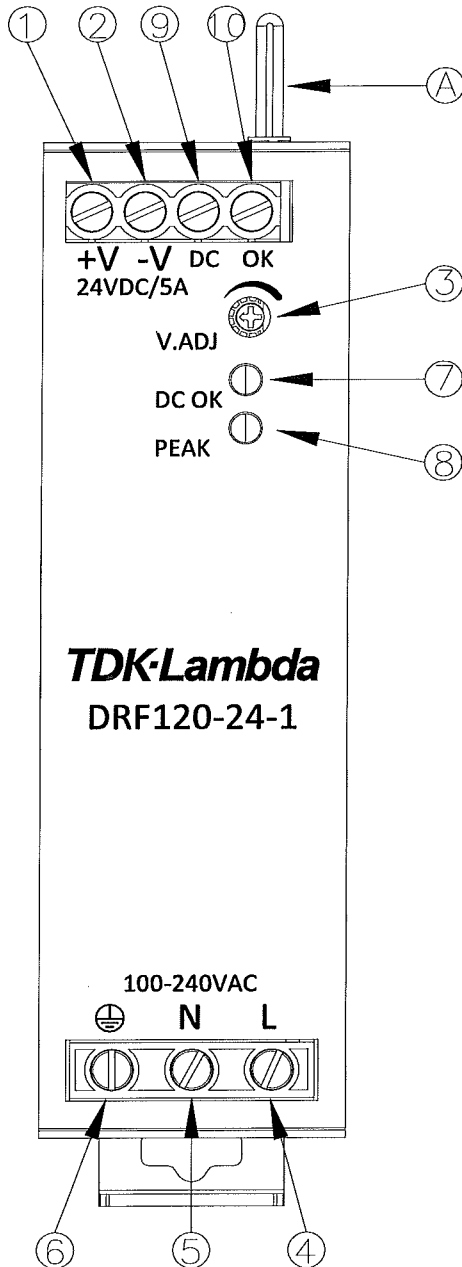
Restriction of the use of certain Hazardous Substances Directive 2011/65EU

ATEX Directive 94/9/EC (applicable products only identified by the ATEX Ex mark)

DWG NO. : PA618-04-02A		
APPD	CHK	DWG
		JOHN

2. Terminal Explanation

2-1. DRF120



- ① +V: +Output terminal
- ② - V: - Output terminal
- ③ V.ADJ: Output voltage adjust trimmer
The output voltage rises when trimmer is turned clockwise.
- ④ L: AC Input terminal
Live line (fuse in line)
- ⑤ N: AC Input terminal
Neutral line
- ⑥ \oplus : Protective Earth
Connect to safety ground of apparatus or equipment.
- ⑦ DC OK : Green LED lights when Output Voltage on and within specification
- ⑧ PEAK : Red LED lights when Output Current peaks
- ⑨ DC OK: Relay contact
- ⑩ DC OK : Relay contact
- Ⓐ Signal Connector – see section 12

WIRING

CONNECTOR	Recommended Wire	Max. Torque
INPUT (L, N, \oplus)	10~24 AWG	10.3 kgf.cm (9 lbf.in)
OUTPUT (+V, -V)	10~24 AWG	10.3 kgf.cm (9 lbf.in)
OUTPUT (DC OK)	10~24 AWG	10.3 kgf.cm (9 lbf.in)

Note: According to EN/UL60950-1 multi-strand flexible cables connected to the input require ferrule

3. Terminal Connecting Method

Pay attention to the input wiring. If it is connected to wrong terminal, the power supply will be damaged.

- Input must be off when making connections.
- Connect \oplus (Protective Earth) terminal of input connector to ground terminal of the equipment.
- The output load line and input line shall be separated and twisted to reduce noise sensitivity.

When connecting or removing input and output wire, do not apply stress to PCB.

4. Explanation of Functions and Precautions

4-1. Input Voltage Range

Input voltage range is single phase 85 ~ 264VAC (47~63Hz) can withstand 300VAC surge for 5 seconds during operation. Input voltage which is out of specification may cause unit damage. For cases where conformance to various safety specs (UL, CSA, EN) are required, input voltage range will be 100 ~ 240VAC (50/60Hz).

4-2. Output Voltage Range

Output voltage is set to the rated value at shipment. V.ADJ trimmer on the front panel side can be used to adjust the output voltage within the range specified (refer to specifications for adjustable range).

To turn the trimmer clockwise, the output voltage will be increased. Take note when the output voltage is increased excessively, over voltage protection (OVP) function may trigger and output voltage will be shut down. Furthermore, when increasing the output voltage, reduce the output current so as not to exceed the maximum output power.

4-3. Over Voltage Protection (OVP)

The OVP function will shut down the output. To reset the OVP, disconnect the input voltage from the power supply for a minute and then re-apply. Alternatively, use CNT reset (Remote ON/OFF: OFF to ON). The OVP point is fixed and cannot be adjusted externally.

4-4. Over Current Protection (OCP)

Constant current limit with auto recovery. If the output current is >105% for more than 4 seconds the power supply will shut down, continuous operation in overload or short condition may result in damage to the power supply.

4-5. Peak output current

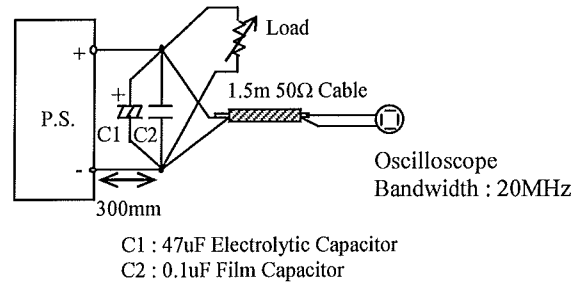
The DRF120 can deliver 150% peak current for 4 seconds aiding the startup of capacitive loads and operation of downstream circuit breakers.

Duty cycle (D) of peak current delivery is:

$$D < 35\% \text{ and } < \text{rated output power and RMS current}$$

4-6. Output Ripple & Noise

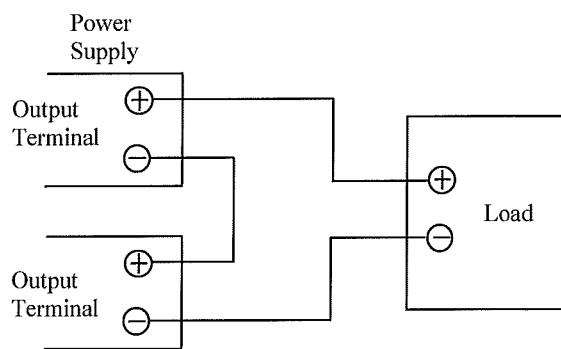
The standard specification for maximum ripple value is measured according to measurement circuit as below. When load lines are longer, ripple becomes larger. In this case, electrolytic capacitor, film capacitor, etc. might be necessary to use across the load terminal. The output ripple cannot be measured accurately if the probe ground lead of oscilloscope is too long.



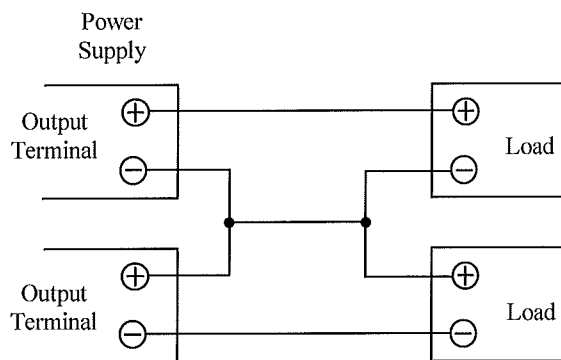
4-7. Series Operation

For series operation, either method (A) or (B) is possible.

Method (A)



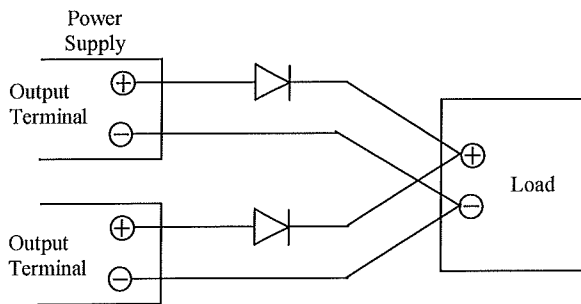
Method (B)



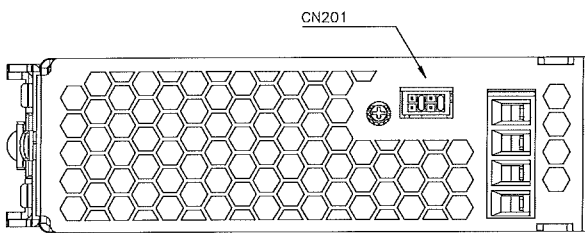
4-8. Parallel Operation

To use as Back-up Power Supply

1. Set power supply output voltage higher by the forward voltage drop(VF) of diode
2. Adjust the output voltage of each power supply to be the same.
3. Use within the specifications for output voltage and output power.



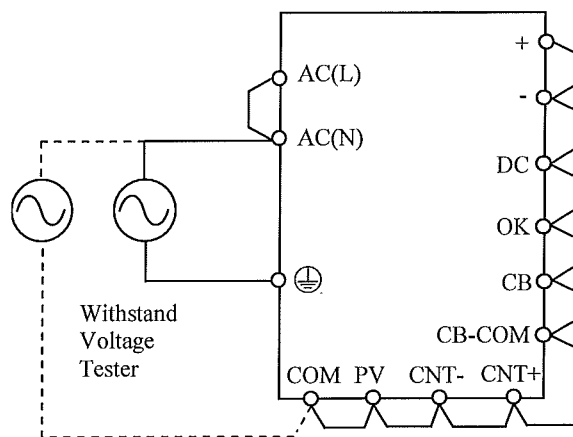
4. When paralleling units cut the link between pins 1 & 2 of signal connector (CN201) located on the top of the unit.



4-10. Withstand Voltage

This series is designed to withstand 4242VDC between input and output, 2121VDC between input and \oplus (Protective Earth) and 500VDC between output and the \oplus (Protective Earth) each for 1 minute. When testing withstand voltage, set current limit of the withstand voltage test equipment to 20mA (Output - \oplus (Protective Earth) : 100mA). The applied voltage must be gradually increased from zero to the testing value and then gradually decreased for shut down. When timer is used, the power supply may be damaged by high impulse voltage at timer switch on and off. Connect input and output as follows.

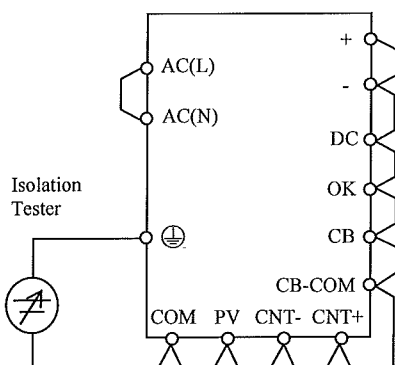
- Input ~ Output (dotted line)
 4242VDC 1min. (20mA)
- Input ~ \oplus (Protective Earth) (solid line)
 2121VDC 1min. (20mA)



4-9. Isolation Test

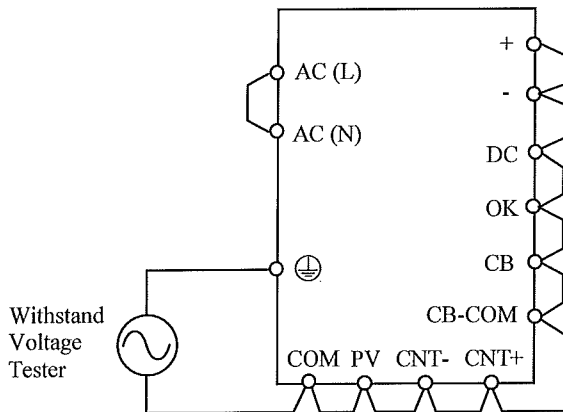
Isolation resistance between output and \oplus (Protective Earth) shall be more than 100MΩ at 500VDC. For safety operation, voltage setting of DC isolation tester must be done before the test. Ensure that the unit is fully discharged after the test.

Output ~ \oplus (Protective Earth) : 500VDC 100MΩ or more



(4.10 Continued)

Output ~ ⊕ (Protective Earth)
 500VDC 1min. (100mA)



5. DC OK relay

In normal operation the DC Good relay is closed when the output voltage is greater than 80% of nominal output voltage. When the output is less than 80% of nominal output voltage the relay is open

6. Programming voltage

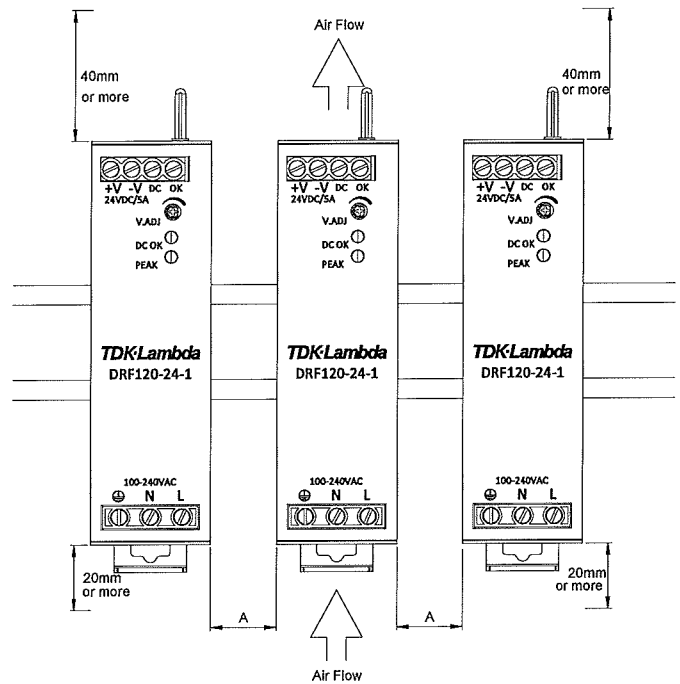
The output voltage may be adjusted, between 24 – 28V, by the application of an external programming voltage, in the range 5-6V, to pins 7 and 8 of the signal connector (see section 12)

7. Control ON/OFF

The power supply can be remotely switched ON by removing the link between pins 5 and 6 of the signal connector and taking the CNT+ (pin 5) to TTL low or by switching pin 5 to pin 6 via a remote switch or relay. If the link is removed and no TTL signal is applied the unit remains OFF

8. Mounting Directions

Recommended standard mounting method is vertical with the output connector uppermost. Do not exceed the load deratings. See section 9. Leave enough space surround the units to ventilate heat efficiently.

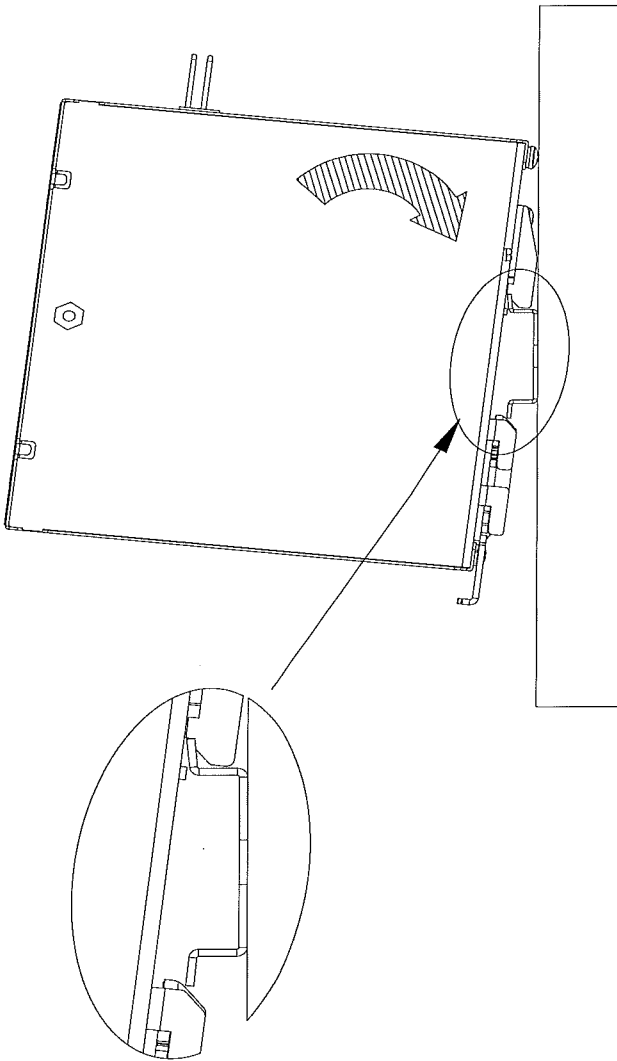


Minimum Installation clearances:
 40mm on top, 20mm on the bottom, A=5mm which is recommended on the left and right side when products are permanently loaded with full 120W. In case the adjacent device is a heat source, A=15mm clearance is recommended"

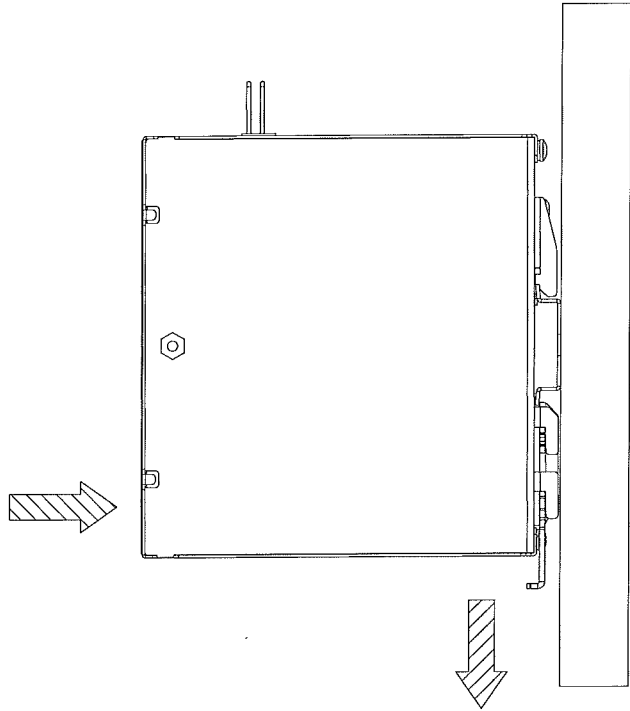
8.1. Power supply mounting on DIN RAIL (TS35 or equivalent)

Make sure input and output wire disconnected when mount power supply onto rail

- (1) Tilt the unit slightly rearwards, fit the unit over top hat rail.



- (3) Press against the bottom front side for locking. Shake the unit slightly to check the locking action.

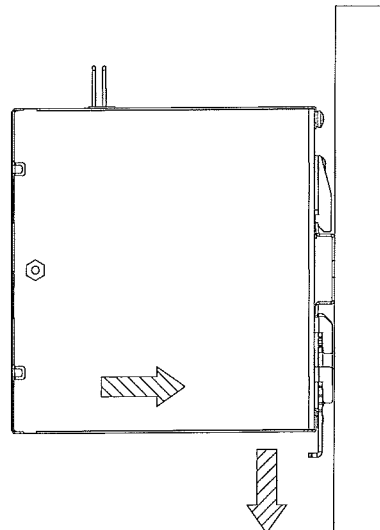


- (4) In order to tighten the unit mounting, the Din rail stopper attached on both sides of the unit is recommended.

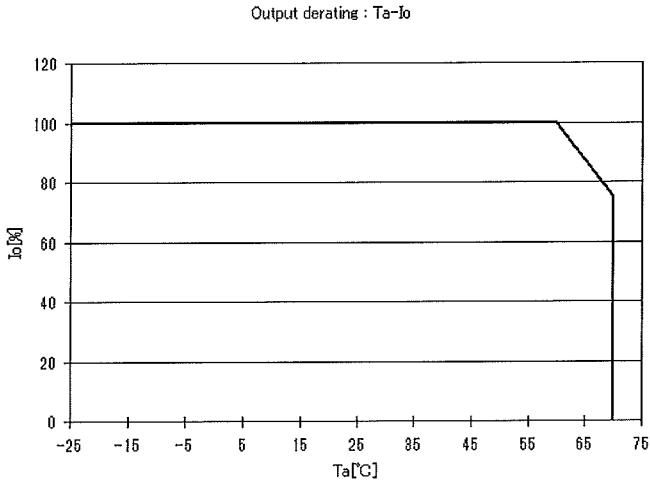
8.2. Power supply removal from DIN RAIL

- (1) Switch main power off and disconnect your system from the supply network. Pull the Latch on the rear lower edge of the unit downwards and gently lift lower front edge of the unit (tipping upwards) and remove it.

- (2) Slide it downward until it hits the stop.



9. Output Derating – DRF120 series



10. Wiring Method

The output load line and input line shall be separated and twisted to improve noise sensitivity. Use all lines as thick and short as possible to make lower impedance. Noise can be eliminated by attaching a capacitor to the load terminals. EMI reduction performance by winding the cable around the toroidal ferrite core several times. Use any appropriate commercially available ferrite core from local vendor. For safety and EMI considerations, connect ⊕ (Protective Earth) terminal of input connector to ground terminal of equipment.

10.1 EMC

The DRF120 complies with the provisions of the EMC directive and meets the following standards:

Emissions: EN55022 Class B

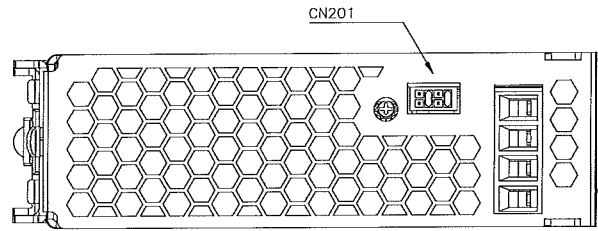
Immunity: EN61000-4-2, -3, -4, -5, -6, -8, 11

SEMI F47 0706, GL EMC2

11. External Fuse Rating

If required a 250Vac/5A rated fuse rating should be fitted external on input line. Surge current flows when line turns on. Use slow-blow fuse or time-lag type fuse. Do not use fast-blow fuse. Fuse rating is specified by in-rush current value at line turn-on. Do not select the fuse according to input current (RMS.) values under the actual load condition

12. Connections



Signal Connector Information

Signal connector used (CN201)

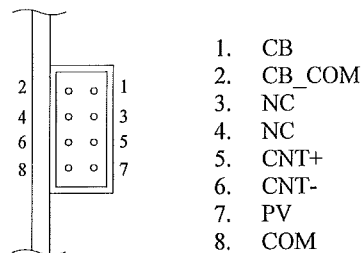
Part Description	Part Name	Manufact.
Pin Header	S8B-PHDSS(LF)(SN)	JST

Matching Housings, Pin & Tool

Part Description	Part Name	Manufact.
Socket Housing	PHDR-8VS	JST
Terminal Pins	SPHD-002T-P0.5	JST
	SPHD-001T-P0.5	
Hand Crimping Tool	YRS-620(SPHD-002T-P0.5)	JST
	YC-610R(SPHD-001T-P0.5)	

Signal Connector Pin Assign

S8B-PHDSS(LF)(SN) (JST)



13. DRF120 series UL508 Listed Condition

WIRING

Connector	Recommended Wire	Max. Torque
Input (L, N, \oplus)	10~24 AWG	10.3 kgf.cm (9 lbf.in)
Output (+V, -V)	10~24 AWG	10.3 kgf.cm (9 lbf.in)
Output (DC OK)	10~24 AWG	10.3 kgf.cm (9 lbf.in)

- 1) Wire requirements, use minimum 75°C wire, use copper conductor only
- 2) For use in a Pollution degree 2 environments only
- 3) These products are considered for use where maximum surrounding air temperature does not exceed 70°C. When installing these products please refer to section 9. for deratings.
- 4) Indoor use only

14. DRF120 series ATEX/IEC Ex Conditions (Model DRF120-24-1/HL-xyz only)

II3G Ex nA nC IIC T4 Gc

The **DRF 120-24-1/HL** is a sub model of the DRF120 series. It has the same functionality as the standard DRF120 and benefits from a conformal coating. It is suitable for applications in Zone 2 provided it is installed in an appropriate IP54 enclosure according EN60079-15. When fitted in an IP54 enclosure, mounting method (section 8), ambient temperature requirement and deratings (section 9) must be complied with. Do not adjust any trimmers when explosive atmosphere could be present.

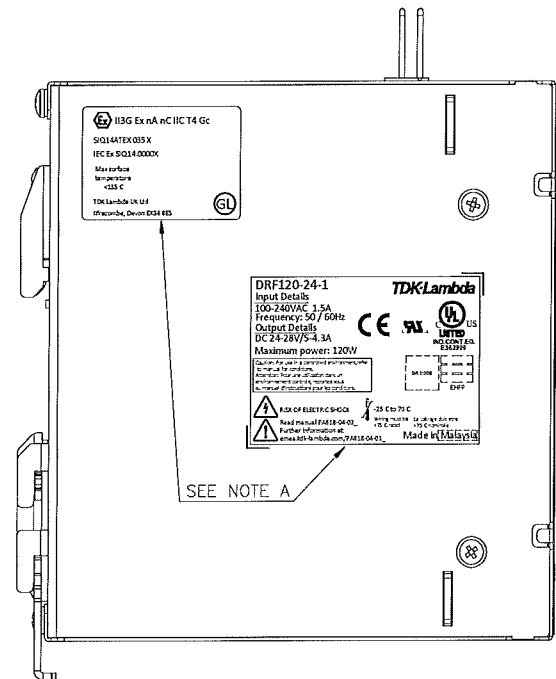
The DRF120-24-1/HL is approved to IEC/EN60079-0 and IEC/EN60079-15 Protection type nA and nC.

The product is suitable for IIA, IIB and IIC gas atmospheres. Temperature class T4 (maximum surface temp $\leq 135^{\circ}\text{C}$).

Product marking:

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



Note A: Model name, input voltage range, nominal input voltage, maximum output current, country of manufacture, ATEX/IEC, additional approval markings and CE mark are shown in accordance with the product specification.

Certification No.: (example for approval reference only)

SIQ14ATEX 035 X
IEC Ex SIQ14.0000X

15. Before concluding that the unit is at fault...

Before concluding that the unit is at fault, make the following checks.

Check if the rated input voltage is connected.

Check if the wiring of input and output is correct.

Check if the wire material is not too thin.

Check if the output voltage control (V.ADJ) is properly adjusted.

Check if the output current and output wattage do not over specification.

Audible noise can be heard during Dynamic-Load operation.

Audible noise can be heard when input voltage waveform is not sinusoidal wave.

Audible noise can be heard during no/light load where the unit is in bursts mode condition.

16. Returns

Please contact your local sales office or visit our website to arrange return of any faulty product.