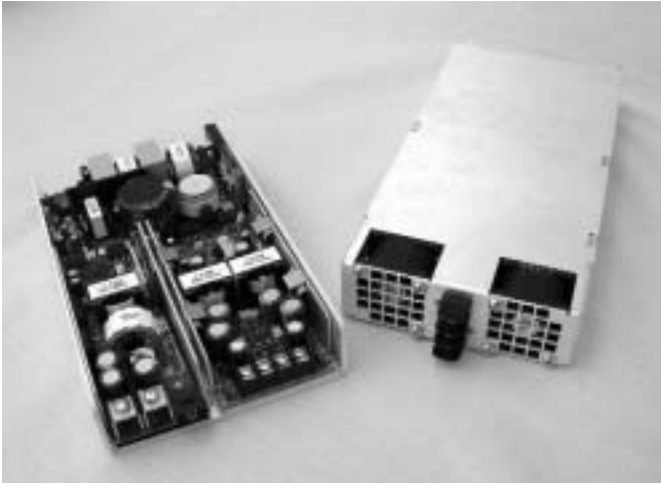


LP & LP-MD Series

150-450W Low Profile Configurable Industrial & Medical

CoolPower
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- Low Profile for 1U Applications
- All Outputs Isolated
- EN60601-1 Approved (M Models)
- Rugged Compact Design
- Wide Voltage Adjustment Range
- AC & DC OK Signals

Specification


Input		General	
Input Voltage	<ul style="list-style-type: none"> • 90-264 VAC 	Efficiency	<ul style="list-style-type: none"> • 75% typical at nominal input
Input Frequency	<ul style="list-style-type: none"> • 47 to 63 Hz 	Inhibit/Power Fail	<ul style="list-style-type: none"> • See Application Notes
Power Factor	<ul style="list-style-type: none"> • Compliant with EN61000-3-2 	Remote Sense	<ul style="list-style-type: none"> • Compensates for up to 0.5 V drop on single (S) output modules & V1 of dual (U) & triple (T) output modules See Application Notes
Inrush Current	<ul style="list-style-type: none"> • 20 A peak max 	Current Sharing	<ul style="list-style-type: none"> • Single wire parallel current share See Application Notes
Output		DC OK	<ul style="list-style-type: none"> • Detects a drop in output voltage See Application Notes
Output Voltage	<ul style="list-style-type: none"> • Dependant on module selected 	Housekeeping	<ul style="list-style-type: none"> • 5 V 50 mA within chassis
Output Voltage Adjustment	<ul style="list-style-type: none"> • Approx $\pm 10\%$ min all modules See Module Table for extended adjustment range 	Environmental	
Hold Up Time	<ul style="list-style-type: none"> • 20 ms min 230 V/50 Hz 	Operating Temperature	<ul style="list-style-type: none"> • 0 °C to +70 °C (for operating above +50 °C derate linearly to 50% at +70 °C) for fan versions. See Airflow Curves for U channel versions
Ripple and noise	<ul style="list-style-type: none"> • 50 mV or 1% pk-pk, whichever is greater, 20 Mhz bandwidth 	Operating Altitude	<ul style="list-style-type: none"> • -350 to +7500 ft with no derating
Line Regulation	<ul style="list-style-type: none"> • Typically 0.1%, maximum 0.3% 	Storage Temperature	<ul style="list-style-type: none"> • -40 °C to +85 °C
Load Regulation	<ul style="list-style-type: none"> • Single output modules & output 1 of dual & triple output modules = 1% max Output 2 & 3 of dual & triple output modules = 2% max A 10% load must be applied to output 1 of the high current dual module (U) & triple module (T) to achieve this figure 	EMC & Safety	
Overvoltage Protection	<ul style="list-style-type: none"> • 120-130% of nominal output for all single & main outputs of high current dual (U) & triple (T) output modules 	EMC	<ul style="list-style-type: none"> • Industrial, P2-P5 = EN55022 Class B Medical, M2 = EN55022 Class B M3, M4 & M5 = EN55022 Class A with FE(x) cover & Class B with ME(x) All models EN61000-4-2, -3, -4, -5 & -6 Level 3 for immunity
Overload Protection	<ul style="list-style-type: none"> • 140% max of nominal rating 	Safety Approvals	<ul style="list-style-type: none"> • Industrial - Approved to EN60950, UL1950, CSA22.2-No.950, CE Marked LVD Medical - Approved to UL2601-1, EN60601-1, CSA22.2-601, CE Marked LVD
Temperature Coefficient	<ul style="list-style-type: none"> • 0.03%/°C 		

LP & LP-MD Series

150-450W Low Profile Configurable Industrial & Medical

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Model Configuration



STEP 1
In order to configure a model number for your LP (industrial) or LP-MD (medical) Series power supply, first select the appropriate chassis dependant on your applications continuous, maximum output power requirements, & 'P' for industrial or 'M' for medical.


STEP 2
Next, from the ratings below, select the output modules that suit your output voltage and current requirements. Modules can be positioned as denoted by the and sequence shown below.

STEP 3
Form the model number as shown on the next page, making sure you have selected a cooling method.

P2 & M2 (150 W) Model

Module Position

1




P3 & M3 (250 W) Model

Module Position

1 2

None

None




P4 & M4 (350 W) Model

Module Position

1 2

None

None




P5 & M5 (450 W) Model

Module Position

1 2

None

None



OUTPUT VOLTAGE (VOLTAGE ADJUSTMENT) & CURRENT RATINGS				LP & LP-MD	
SINGLE OUTPUT MODULES					
Output 1	Output 2	Output 3	Module Code	Module Size	
1.8 V (1.65-1.95 V) @ 50 A			SZ	<input type="checkbox"/>	
2.5 V (2.25-2.75 V) @ 50 A			S1	<input type="checkbox"/>	
3.3 V (3.25-3.50 V) @ 50 A			S2	<input type="checkbox"/>	
5.0 V (4.50-5.50 V) @ 50 A			S3	<input type="checkbox"/>	
8.0 V (7.20-8.80 V) @ 31 A			SF	<input type="checkbox"/>	
10.0 V (9.00-11.00 V) @ 25 A			SG	<input type="checkbox"/>	
12.0 V (11.00-13.00 V) @ 20 A			S4	<input type="checkbox"/>	
15.0 V (14.00-16.00 V) @ 17 A			S5	<input type="checkbox"/>	
24.0 V (21.00-26.00 V) @ 10 A			S6	<input type="checkbox"/>	
28.0 V (25.00-31.00 V) @ 9 A			S7	<input type="checkbox"/>	
36.0 V (32.00-40.00 V) @ 7 A			S8	<input type="checkbox"/>	
48.0 V (43.00-53.00 V) @ 5 A			S9	<input type="checkbox"/>	
DUAL OUTPUT MODULES					
3.3 V (3.25-3.50 V) @ 40 A	5.0 V (4.8-16.0 V) @ 4.0 A		U5	<input type="checkbox"/>	
3.3 V (3.25-3.50 V) @ 40 A	12.0 V (4.8-16.0 V) @ 4.0 A		U6	<input type="checkbox"/>	
3.3 V (3.25-3.50 V) @ 40 A	15.0 V (4.8-16.0 V) @ 4.0 A		U7	<input type="checkbox"/>	
3.3 V (3.25-3.50 V) @ 40 A	24.0 V (19.0-28.0 V) @ 2.5 A		U8	<input type="checkbox"/>	
5.0 V (4.80-5.20 V) @ 40 A	5.0 V (4.8-16.0 V) @ 4.0 A		U1	<input type="checkbox"/>	
5.0 V (4.80-5.20 V) @ 40 A	12.0 V (4.8-16.0 V) @ 4.0 A		U2	<input type="checkbox"/>	
5.0 V (4.80-5.20 V) @ 40 A	15.0 V (4.8-16.0 V) @ 4.0 A		U3	<input type="checkbox"/>	
5.0 V (4.80-5.20 V) @ 40 A	24.0 V (19.0-28.0 V) @ 2.5 A		U4	<input type="checkbox"/>	
5.0 V (4.80-5.20 V) @ 8 A	12.0 V (11.5-12.5 V) @ 6.0 A		R6	<input type="checkbox"/>	<input type="checkbox"/>
5.0 V (4.80-5.20 V) @ 8 A	24.0 V (22.0-26.0 V) @ 3.0 A		R4	<input type="checkbox"/>	<input type="checkbox"/>
12.0 V (11.50-12.50 V) @ 6 A	12.0 V (11.5-12.5 V) @ 6.0 A		R1	<input type="checkbox"/>	<input type="checkbox"/>
12.0 V (11.50-12.50 V) @ 6 A	24.0 V (22.0-26.0 V) @ 3.0 A		R5	<input type="checkbox"/>	<input type="checkbox"/>
15.0 V (14.00-16.00 V) @ 5 A	15.0 V (14.0-16.0 V) @ 5.0 A		R2	<input type="checkbox"/>	<input type="checkbox"/>
TRIPLE OUTPUT MODULES					
3.3 V (3.25-3.50 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	12.0 V (4.8-16.0 V) @ 4 A	T3	<input type="checkbox"/>	<input type="checkbox"/>
3.3 V (3.25-3.50 V) @ 20 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T4	<input type="checkbox"/>	<input type="checkbox"/>
5.0 V (4.80-5.20 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	12.0 V (4.8-16.0 V) @ 4 A	T1	<input type="checkbox"/>	<input type="checkbox"/>
5.0 V (4.80-5.20 V) @ 20 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T2	<input type="checkbox"/>	<input type="checkbox"/>
5.0 V (4.80-5.20 V) @ 20 A	12.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T8	<input type="checkbox"/>	<input type="checkbox"/>
12.0 V (11.50-12.50 V) @ 10 A	12.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T6	<input type="checkbox"/>	<input type="checkbox"/>
12.0 V (11.50-12.50 V) @ 10 A	12.0 V (4.8-16.0 V) @ 4.0 A	15.0 V (4.8-16.0 V) @ 3 A	T10	<input type="checkbox"/>	<input type="checkbox"/>
24.0 V (22.00-26.00 V) @ 4 A	5.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T11	<input type="checkbox"/>	<input type="checkbox"/>
24.0 V (22.00-26.00 V) @ 4 A	15.0 V (4.8-16.0 V) @ 4.0 A	5.0 V (4.8-16.0 V) @ 4 A	T9	<input type="checkbox"/>	<input type="checkbox"/>
24.0 V (22.00-26.00 V) @ 4 A	15.0 V (4.8-16.0 V) @ 3.0 A	15.0 V (4.8-16.0 V) @ 3 A	T7	<input type="checkbox"/>	<input type="checkbox"/>

Notes

- 1. R modules do not have signals or control facilities.

LP & LP-MD Series

150-450W Low Profile Configurable Industrial & Medical




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PRECONFIGURED MODELS					LP & LP-MD	
Output V1	Output V2	Output V3	Output V4	Maximum Output Power	Industrial Version Model Number	Medical Version Model Number ⁽¹⁾
12.0 V @ 6 A	12.0 V @ 6 A			150 W	P2R1FE2	M2R1FE2
15.0 V @ 5 A	15.0 V @ 5 A			150 W	P2R2FE2	M2R2FE2
5.0 V @ 30 A	12.0 V @ 4 A			150 W	P2U2FE2	M2U2FE2
5.0 V @ 20 A	12.0 V @ 4 A	12.0 V @ 4 A		150 W	P2T1FE2	M2T1FE2
5.0 V @ 50 A				250 W	P3S3FE3	M3S3ME3
12.0 V @ 20 A				250 W	P3S4FE3	M3S4ME3
24.0 V @ 10 A				250 W	P3S6FE3	M3S6ME3
48.0 V @ 5 A				250 W	P3S9FE3	M3S9ME3
5.0 V @ 50 A	5.0 V @ 50 A			350 W	P4S3S3FE4	M4S3S3ME4
12.0 V @ 20 A	12.0 V @ 20 A			350 W	P4S4S4FE4	M4S4S4ME4
5.0 V @ 50 A	3.3 V @ 40 A	12.0 V @ 4 A		350 W	P4S3U6FE4	M4S3U6ME4
5.0 V @ 50 A	12.0 V @ 10 A	12.0 V @ 4 A	5.0 V @ 4.0 A	350 W	P4S3T6FE4	M4S3T6ME4
12.0 V @ 20 A	12.0 V @ 20 A			450 W	P5S4S4FE5	M5S4S4ME5
5.0 V @ 50 A	3.3 V @ 40 A	12.0 V @ 4 A		450 W	P5S3U6FE5	M5S3U6ME5
5.0 V @ 50 A	12.0 V @ 10 A	12.0 V @ 4 A	5.0 V @ 4.0 A	450 W	P5S3T1FE5	M5S3T1ME5
3.3 V @ 40 A	5.0 V @ 40 A	12.0 V @ 4 A	24.0 V @ 2.5 A	450 W	P5U4U6FE5	M5U4U6ME5

Notes

1. Medical versions shown include EMC Class B fan assembly.

Model Number Example - Industrial 'P' Versions

Chassis Power	Module Position 1	Module Position 2	Fan Assembly Style
P3	S3	T1	FE3
<p>Add the chassis code first.</p> <p>P2 = 150 W Chassis P3 = 250 W Chassis P4 = 350 W Chassis P5 = 450 W Chassis</p>	<p>Add any ▲ or ■ size module</p> <p>S3 = Single 5 V</p> <p>P2 Model</p> <p>Module Position 1</p> <p>■ ▲</p> 	<p>Add any ▲ or ■ size module</p> <p>T1 = Triple 5 V/12 V/12 V</p> <p>P3,P4, P5 Model</p> <p>Module Position 1 2</p> <p>■ None ▲ ■ ▲ ■ ▲</p> 	<p>Leave blank for open U channel or select a fan cover.</p>  <p>FE(x)</p> <p>End Fan Screw Terminal AC Connections (Except P2 which has Molex Header)</p>

NOTE:

Model number format and module position may change dependant on module configuration chosen.
Connector kits available - Order part number 'LP CONN KIT'.

Fan Assemblies

Alternate fan assemblies available - consult sales for details.







Top Fan
Molex Header AC Connections



End Fan
IEC Inlet AC Connections

Model Number Example - Medical 'M' Versions


Chassis Power	Module Position 1	Module Position 2	Fan Assembly Style
M 3	S 3	T 1	M E 3
<p>Add the chassis code first.</p> <p>M2 = 150 W Chassis M3 = 250 W Chassis M4 = 350 W Chassis M5 = 450 W Chassis</p>	<p>Add any ▲ or ■ size module S3 = Single 5 V</p> <p>M2 Model Module Position 1</p>  <p style="text-align: right;">■ ▲</p>	<p>Add any ▲ or ■ size module T1 = Triple 5 V/12 V/12 V</p> <p>M3, M4, M5 Model Module Position 1 2</p>  <p style="text-align: right;">■ None ▲ ■ ■ ▲</p>	<p>Leave blank for open U channel or select a fan cover from below.</p>  <p style="text-align: center;">ME(x)</p> <p>End Fan Screw Terminal AC Connections Class B</p>  <p style="text-align: center;">FE(x)</p> <p>End Fan Screw Terminal AC Connections Class A (Except M2 which has Molex Header AC Connections & is Class B)</p>

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NOTE:
Model number format and module position may change dependant on module configuration chosen.
Connector kits available - Order part number 'LP CONN KIT'.

Fan Assemblies


Alternate fan assemblies available - consult sales for details.



End Fan
IEC Dual Fused
& Switched AC Connections
Class B



End Fan
IEC Inlet AC Connections
Class A



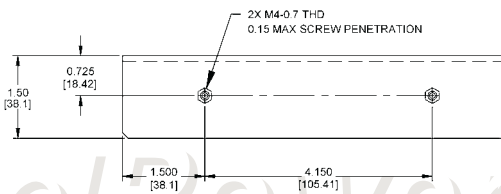
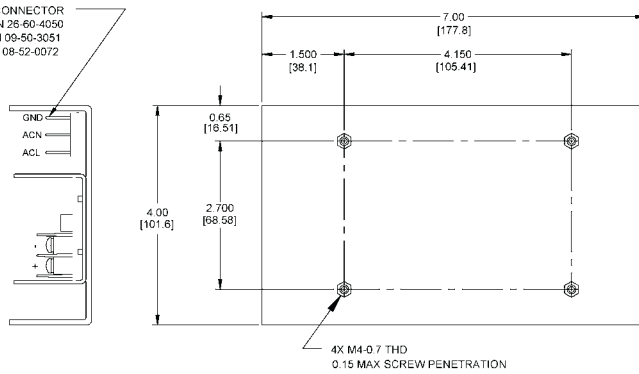
Top Fan
Molex Header AC Connections

Mechanical Details - 150 Watt P2 & M2 Models

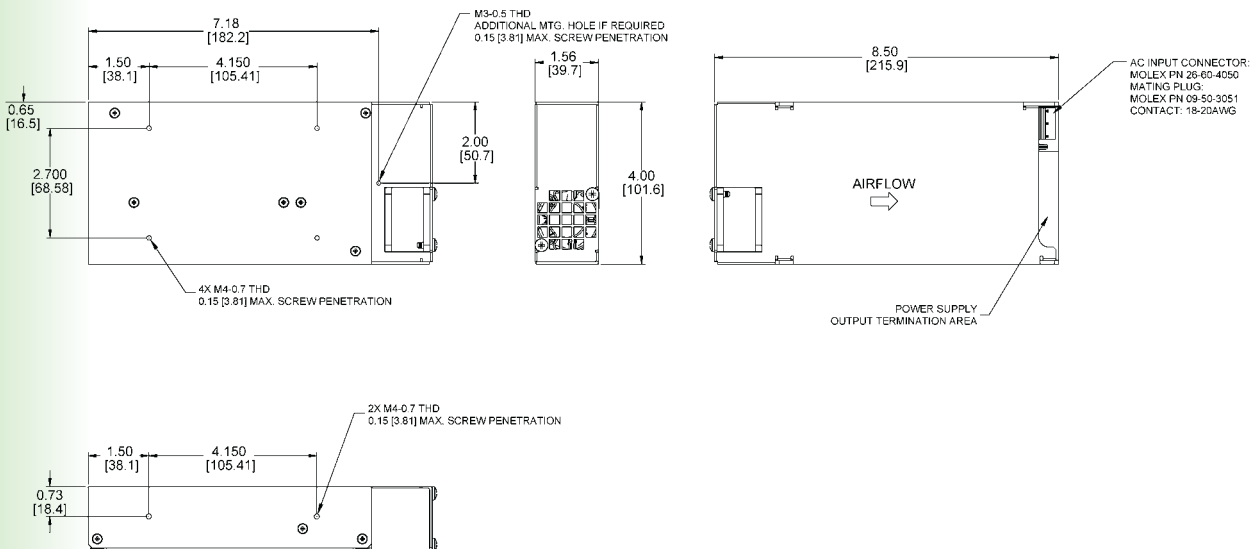
I U Channel

See Airflow Curves

AC INPUT CONNECTOR
MOLEX PN 26-60-4050
MATING PLUG: MOLEX PN 09-50-3051
CONTACT: 18-28AWG, MOLEX PN 08-52-0072



FE2 Fan Assembly

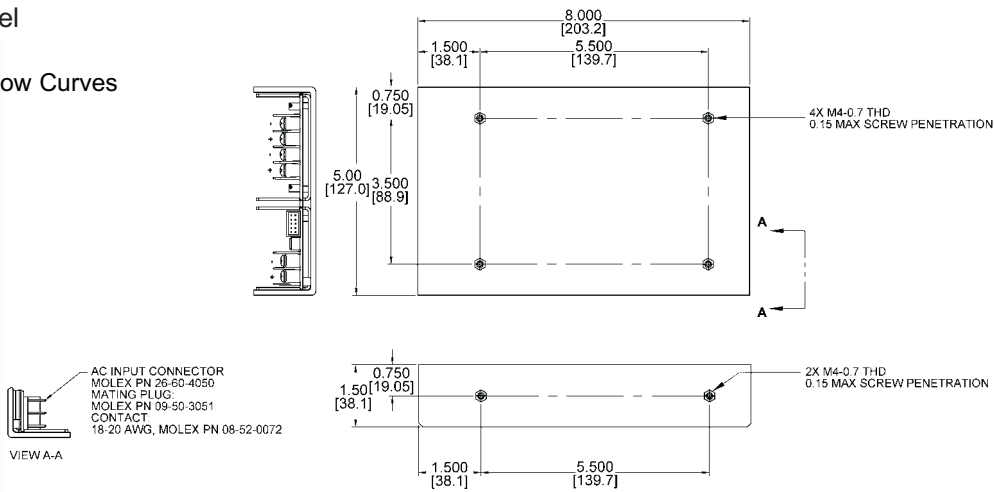


NOTES:
Mating Connector Kit, order part number 'LP CONN KIT'.
Dimensions in Inches (mm).

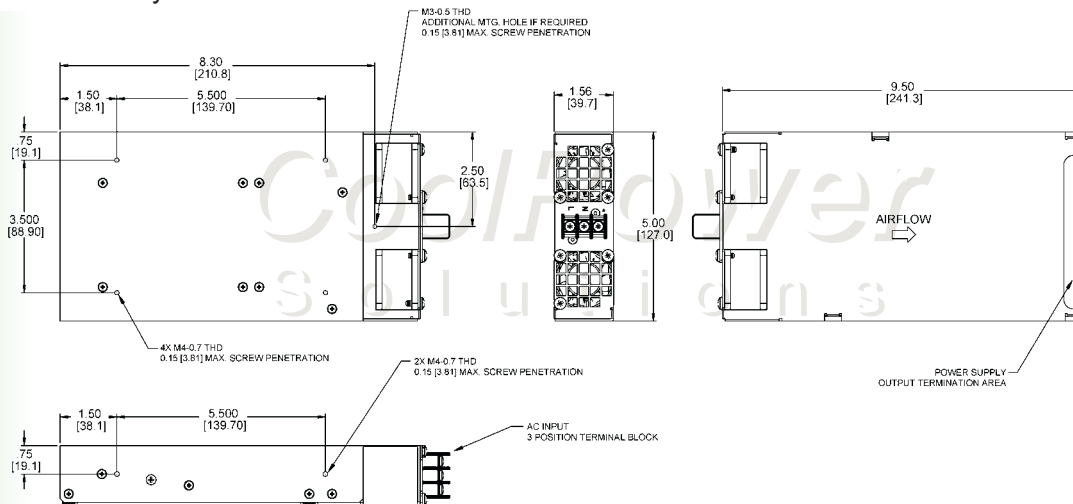
Mechanical Details - 250 Watt P3 & M3 Models

U Channel

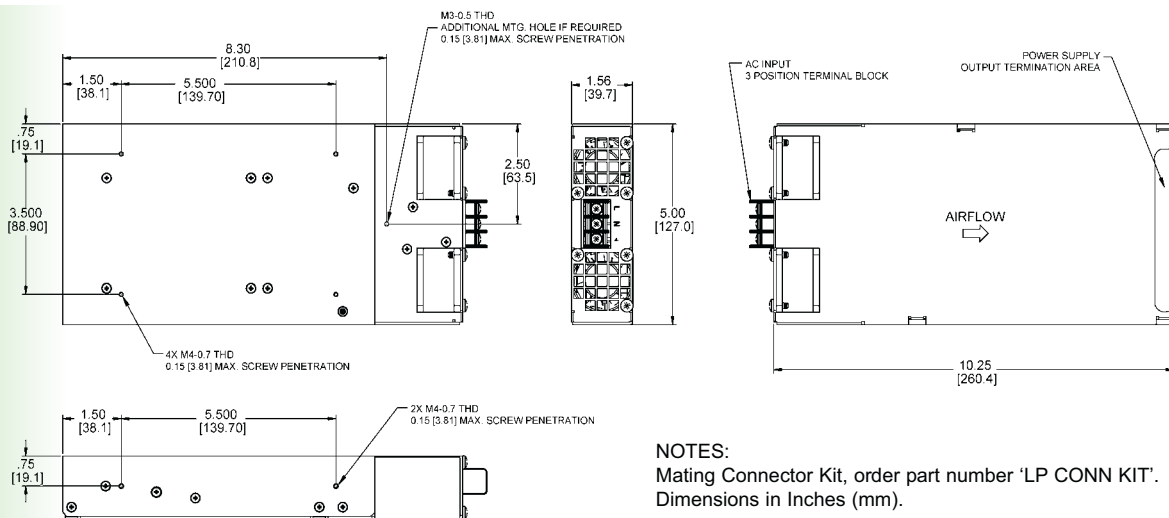
See Airflow Curves



FE3 Fan Assembly



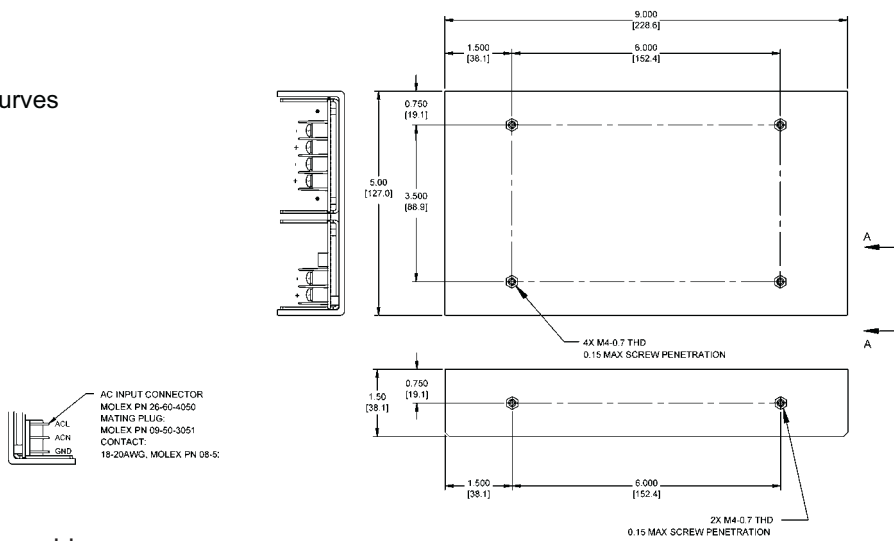
ME3 Fan Assembly (M Models Only)



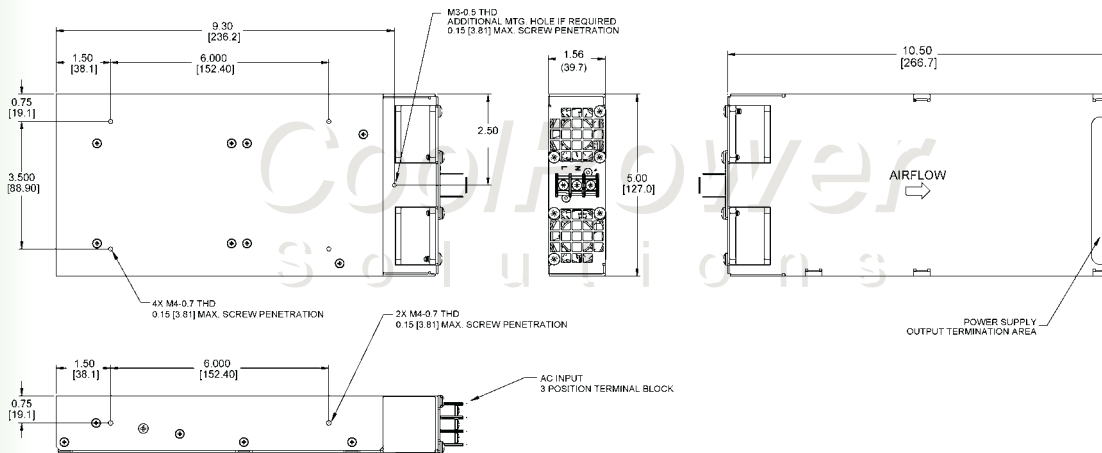
Mechanical Details - 350 Watt P4 & M4 Models

U Channel

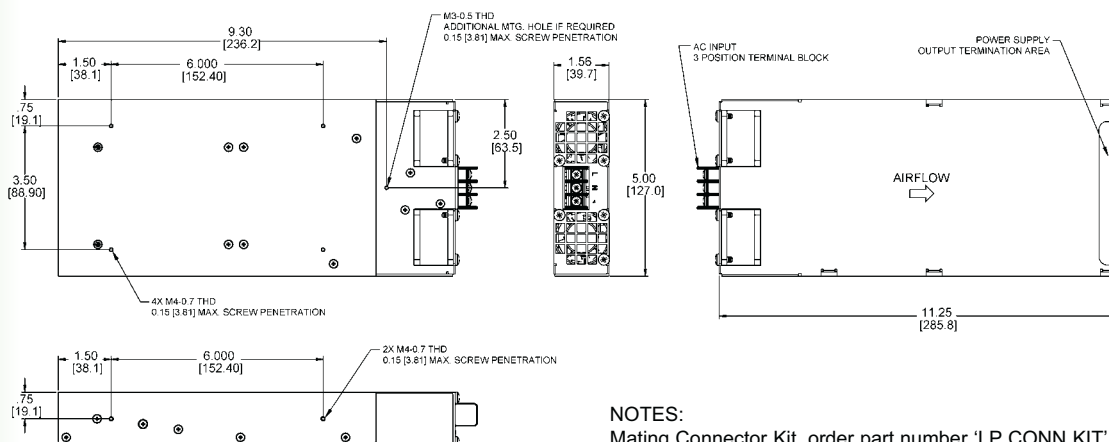
See Airflow Curves



FE4 Fan Assembly



ME4 Fan Assembly (M Models Only)

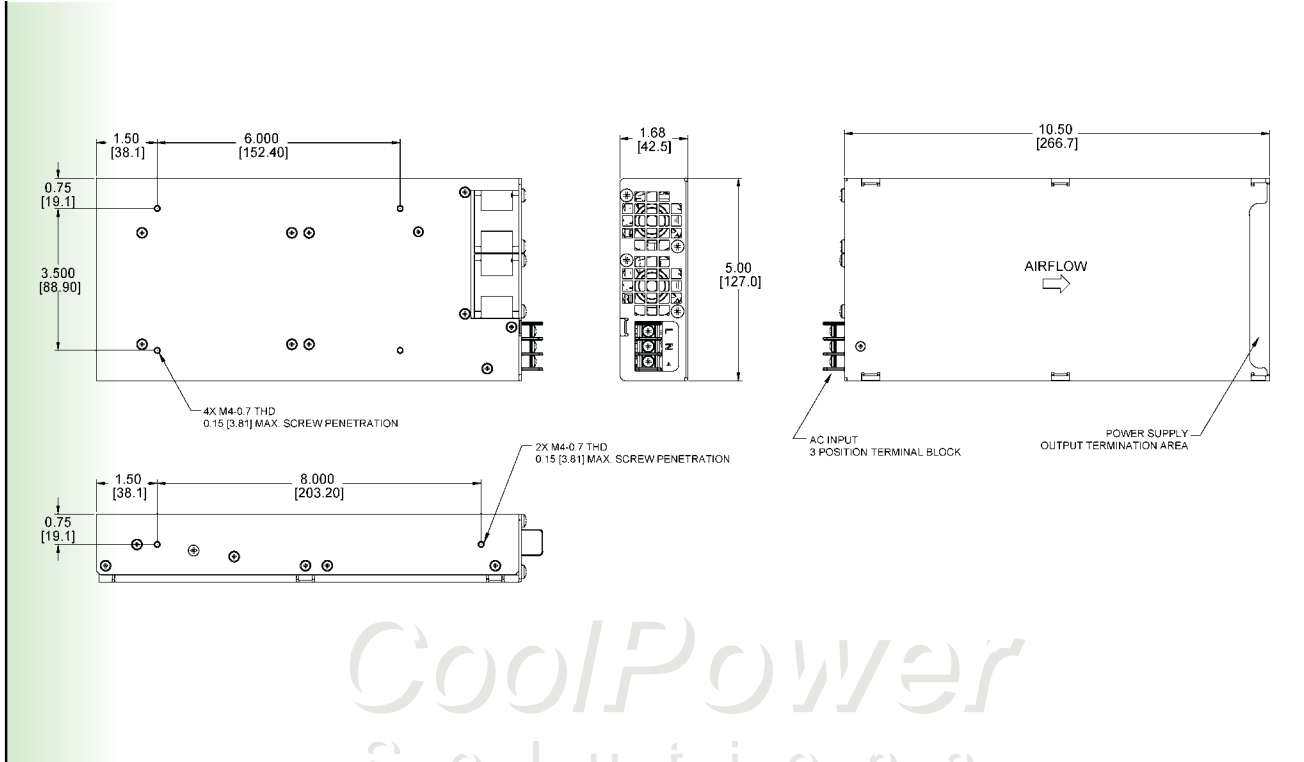


NOTES:
Mating Connector Kit, order part number 'LP CONN KIT'.
Dimensions in Inches (mm).

Mechanical Details - 450 Watt P5 & M5 Models

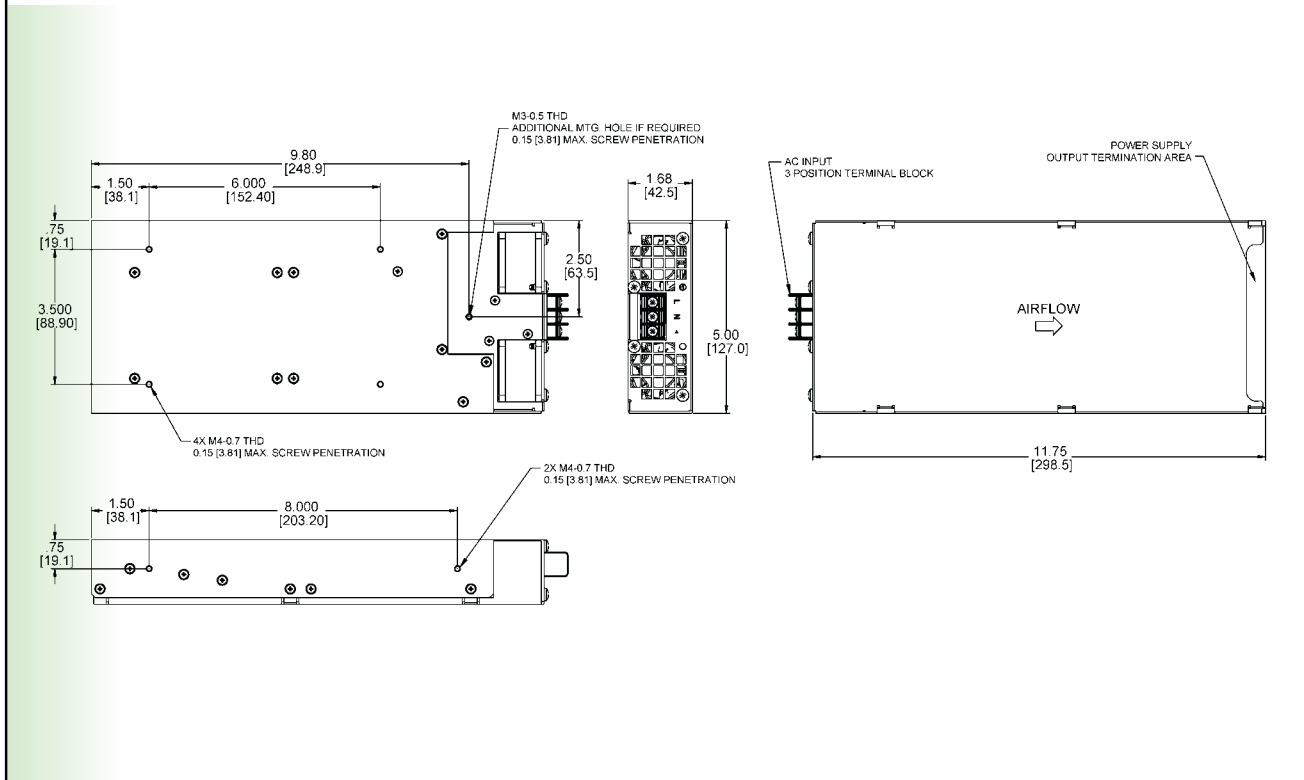
450 W - P5 & M5 are always shipped with a fan cover to ensure adequate cooling.

FE5 Fan Assembly



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ME5 Fan Assembly (M Models Only)



Airflow Curves - U Channel Models

- ✕ 300 LFM
- ▲ 225 LFM
- 150 LFM

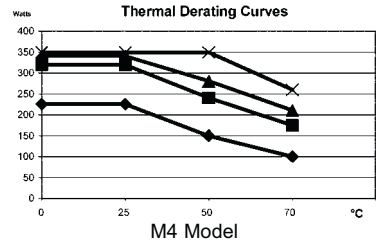
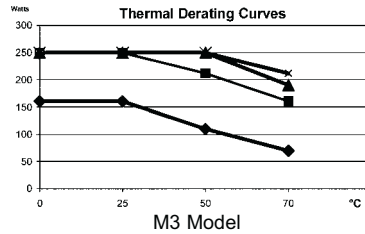
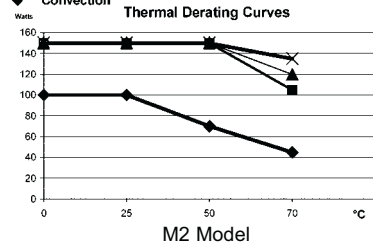
Formula for converting CFM to LFM:

$$LFM = \frac{CFM \times 144}{(\text{total cross section of airflow path (Inches}^2\text{)})}$$

Formula for converting LFM to CFM:

$$CFM = \frac{LFM \times (\text{total cross section of airflow path (Inches}^2\text{)})}{144}$$

◆ Convection

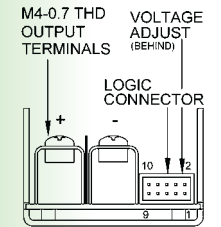


The curves denotes chassis derating, output modules must be derated by the same proportion.

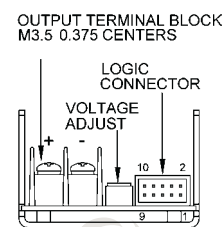
Output Connection Details

Single Output (S)

Low Voltage (1.8 V - 15.0 V)

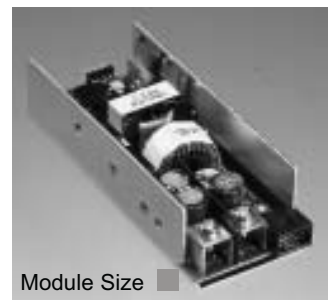


High Voltage (24.0 V - 48.0 V)

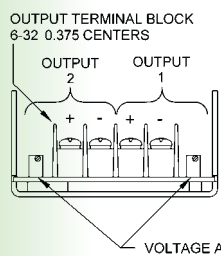


LOGIC CONNECTOR	
Pin	Function
1	+ Sense
2	- Sense
3	+ Sense
4	Current Share
5	
6	Inhibit
7	- Sense
8	DC OK
9	
10	Power Fail

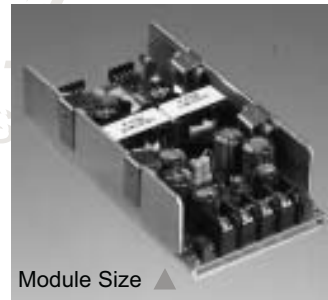
AMP 87631-5



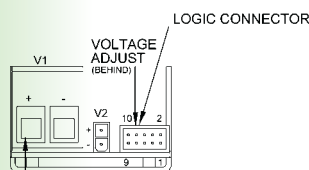
Dual Output (R)



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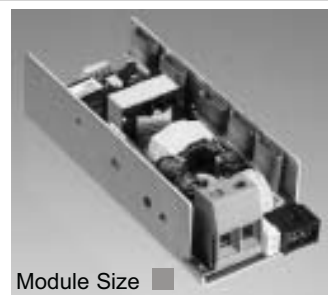
Dual Output (U)



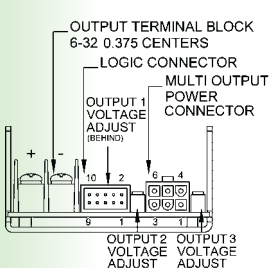
V1 OUTPUT TERMINAL BLOCK (EUROSTYLE 10.16mm)
WIRE RANGE : 6 TO 18 AWG
WIRE STRIP LENGTH : 1/4" OR 6.35mm
TIGHTENING TORQUE : 7 IN.-lbs.

LOGIC CONNECTOR	
Pin	Function
1	+ Sense
2	- Sense
3	+ Sense
4	Current Share
5	-
6	Inhibit
7	- Sense
8	DC OK
9	
10	Power Fail

AMP 87631-5



Triple Output (T)

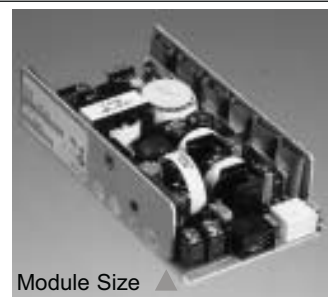


POWER CONNECTOR	
Pin	Function
1	Output 2 Return
2	-
3	Output 3 Return
4	Output 2 +
5	-
6	Output 3 +

Molex 39-01-2080

LOGIC CONNECTOR	
Pin	Function
1	+ Sense
2	- Sense
3	+ Sense
4	Current Share
5	
6	Inhibit
7	- Sense
8	DC OK
9	
10	Power Fail

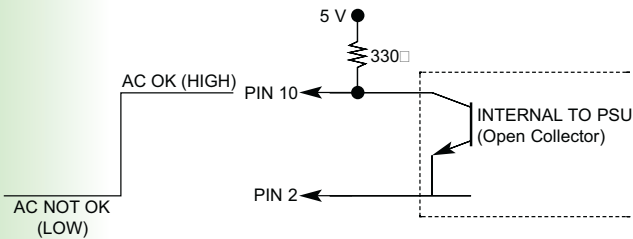
AMP 87631-5



Application Notes

AC OK/Power Fail

When fitted in module position 2 of the chassis, pins 10 and 2 provide a minimum of 5 ms warning of loss of output regulation.



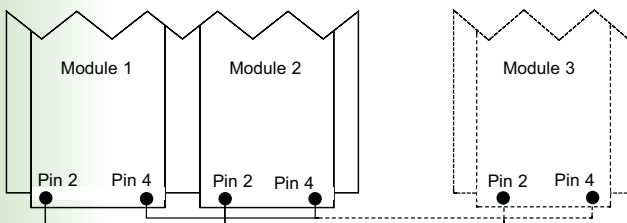
(Reverse logic option available, i.e. high for AC NOT OK).

Modules in Parallel

Single output modules with the same part number and V1 of dual and triple output modules can be paralleled to obtain increased output current. These modules can be either fitted in the same chassis or different chassis with their outputs connected directly together and current share connections made, see below.

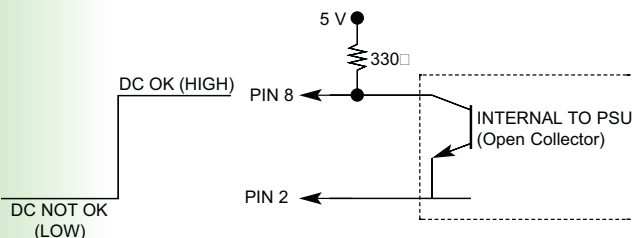
Current Share

Connecting pin 4 & 2 of like part number modules (3 maximum) within the same chassis or separate chassis will force current share the outputs.



DC OK

Pins 8 and 2 provide notification that the output voltage is within regulation via a logic '0'.



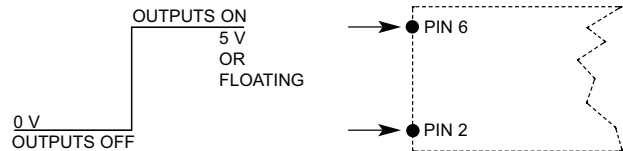
(Reverse logic option available, i.e. high or DC NOT OK).

Global Inhibit

Inhibiting the module fitted in position 2 will inhibit all outputs of other modules. If individual inhibit is required on the module fitted in chassis position 2 alternate configurations are available, please consult our application engineering team.

Inhibit

Pins 6 and 2 (return) provide on/off control of the module. Applying a logic '0' between these pins turns the outputs off.



(Reverse logic option available, i.e. high for outputs off or low for outputs on).

Remote Sense

Pins 1 (+ve) and 2 (-ve) provide compensation for voltage drops in application wiring up to a maximum of 0.5 V. Remote sense is not fitted to (R) modules and V2, V3 of (U) and (T) modules.

Modules in Series

Single output modules can be connected in series to obtain alternate output voltages not available from a single module. For example a 10 V (SG module) can be connected in series with a 12 V (S4 module) to obtain an output voltage of 22V.

Housekeeping

A 5 V standby voltage rated at 50 mA is fitted to each chassis.

(NOTE: R module does not have these signal facilities).