Intelligent MP Series

Up to 1500 Watts

Total Power: Up to 1500 Watts
Input Voltage: 85 - 264 Vac
120-300 Vdc
# of Outputs: Up to 21

Special Features

- **Full Medical EN60601 approval**
- Intelligent I²C control
- Voltage adjustment on all outputs (Manual or I²C)
- Configurable input and output (case and module) OK signals and indicators
- Configurable inhibit/enable
- Configurable output UP/DOWN sequencing
- Configurable current limit (foldback or constant current)
- High power density (8.8 W/cu-in)
- Intelligent fan (speed control/fault status)
- Downloadable GUI from website
- Customer provided air option
- uP controlled PFC input with active inrush protection
- I²C monitor of voltage, current, and temp
- Programmable voltage, current limit, inhibit/enable through I²C
- Optional extended hold-up module (SEMI F47 compliance)
- Increased power density to 50% over standard MP
- External switching frequency sync input
- Optional conformal coating
- Industrial temp range (-40 ºC to 70 ºC)
- No preload required
- Industrial shock/vibration (> 50G's)

Safety

- **UL** UL60950/UL2601**
- **CSA** CSA22.2 No. 234 Level 5
- **VDE** EN60950/EN60601-1**
- **BABT** Compliance to EN60950/EN60601 BS7002
- **CB** Certificate and report
- **CE** Mark to LVD

iMP®



RoHS 2002/95/EC

PMBus

Electrical Specifications

Input	
Input range:	85 - 264 Vac 120 - 350 Vdc (limited to 300 Vdc in medical applications)
Frequency:	47 - 440 Hz
Inrush current:	40 A peak max. (soft start)
Efficiency:	Up to 85% @ full case load
Power Factor:	0.99 typ. meets EN61000-3-2 (n/a @ 440 Hz)
Turn-on time:	AC on 2.0 sec typ., inhibit/enable 150 ms typical Programmable delay; 50 ms internal turn-on delay (Dual Output only)
EMI filter:	CISPR 22/EN55022 Level "B"**
Leakage current:	300 µA max. @ 240 Vac; 47 - 63 Hz
Radiated EMI:	CISPR 22/EN55022 Level "B"**
Holdover storage:	20 ms minimum (independent of input Vac) additional 34ms holdover storage with optional HUP module (SEMI F47 compatible). For iMP4 15 ms (low-line), 10 ms (high-line)
AC OK:	> 5 ms early warning min. before outputs lose regulation Full cycle ride thru (50 Hz) (n/a on iMP4 > 750 W @ 90 Vac)
Harmonic distortion:	Meets EN61000-3-2
Isolation:	Meets EN60950 and EN60601
Global Inhibit/Enable:	TTL, Logic "1" and Logic "0"; configurable
Input fuse (internal):	iMP4: 16 A; iMP8: 20 A; iMP1: 25 A (both lines fused)
Warranty:	2 years

ASTEC

EMERSON Network Power

Output	
Adjustment range:*	± 10% minimum all outputs (manual) (full module adjustment range using I²C)
Factory set point accuracy:	± 1%
I²C output program accuracy:	± 5%
Margining:	± 4 - 6% nominal analog (single output module only)
Overall regulation:	0.4% or 20 mV max. (1500W modules 1% max.) (36 W modules 4% maximum)
Ripple:	RMS: 0.1% or 10mV, whichever is greater Pk-Pk: 1.0% or 50mV, whichever is greater Bandwidth limited to 20 MHz
Dynamic response:	< 2% or 100 mV, with 25% load step
Recovery time:	To within 1% in < 300 µsec
Overcurrent protection:**	Configurable through I²C (calibration required). Single output module and main output of the dual output module 105 - 120% of rated output current. Aux output of dual output module 105 - 140% of rated output current
Short-circuit protection:	Protected for continuous short-circuit Recovery is automatic upon removal of short
Overvoltage protection:*	Configurable through I²C
Single output module:	2 - 5.5 V 122 - 134% ; 6 - 60 V 110 - 120%
Dual output module:	2 - 6 V 122 - 134% ; 8 - 28 V 110 - 120%
Triple output module:	110 - 120% of highest voltage rating

Output Continued	
Reverse voltage protection:	100% of rated output current
Thermal protection:* (OTP and OTW)	Configurable through I²C All outputs disabled when internal temp exceeds safe operating range. > 5 ms warning (AC OK signal) before shutdown
Remote sense:	Up to 0.5 V total drop (not available on triple output module)
Single wire parallel:	Current share to within 2% of total rated current
DC OK:*	± 5% of nominal. Configurable through I²C
Minimum load:	Not required
Housekeeping standby:	5 Vdc @ 1.0 A max. present whenever AC input is applied (Optional 2.0 A available)
Module inhibit:*	Configured and controlled through I²C
Switching frequency:	250k Hz accepts external sync signal
Output/Output isolation:	>1 Megohm, 500 V
External sync:	TTL clock input signal used to adjust switching frequency. Frequency 500 kHz ± 20%; Duty cycle 40 - 55%

* **Can be controlled via I²C**
** **Controlled via I²C but requires load calibration**

Environmental Specifications

Operating temperature:	-40 ° to 70 °C ambient. Derate each output 2.5% per degree from 50 °C to 70 °C. (-20 °C start up)
Storage temperature:	-40 °C to 85 °C
Electromagnetic susceptibility:	Designed to meet EN61000-4; -2, -3, -4, -5, -6, -8, -11 Level 3
Humidity:	Operating; non-condensing 10% to 95% RH
Vibration:	IEC68-2-6 to the levels of IEC721-3-2
MTBF demonstrated	> 550,000 hours at full load, 220 Vac and 25 °C ambient conditions

Output Module Line-up

Module Code	1	2	3	5	4		—
Module Type	Single	Single	Single	Single	Dual		Triple
Max output power	210 W	360 W	750 W	1500 W	144 W		36 W
Max output current	35 A	60 A	150 A	140 A	10 A		2 A
Output voltages available*	2-60 V	2-60 V	2-60 V	6-60 V	8 - 15*, 24 - 28; 8 - 15*, 8 - 15*; 8 - 15*, 2 - 6; 2 - 6, 2 - 6; 24 - 28, 24 - 28; 24 - 28, 2 - 6		8-15, 8-15, 2-6; 8-15, 8-15, 8-15; 8-15, 8-15, 18-28; 8-15, 18-28, 2-6
Standard voltage increments	25	25	25	18	16		18
Remote sense	Yes	Yes	Yes	Yes	Yes	Yes	No
Remote margin	Yes	Yes	Yes	Yes	No	No	No
V-Program - I²C Control	Yes	Yes	Yes	Yes	Yes	Yes	No
Active Current Share	Yes	Yes	Yes	Yes	Yes	No	No
Module Inhibit - I²C Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Module Inhibit - Analog	Yes	Yes	Yes	Yes	Yes	No	No
Overvoltage/Overcurrent protection	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minimum load required	No	No	No	No	No	No	No
Slots occupied in any *i*VS case	1	2	3	4	1		1

* Note: Contact Factory for extended range down to 6 V

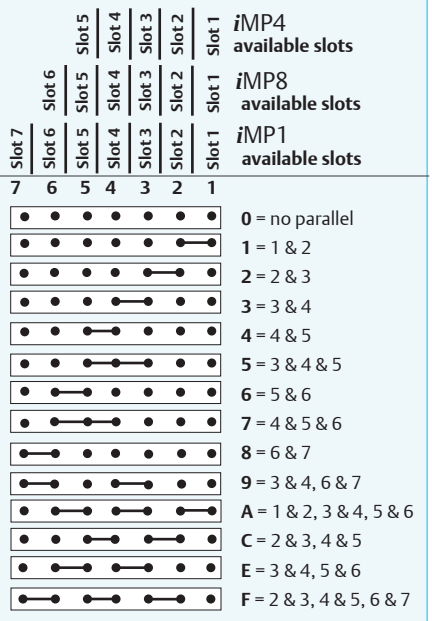
Output Module Voltage/Current

Voltage	Voltage Code	Single Output Module Code				Dual Output***		Triple Output			I²C Adjustment Ranges****
		1	2	3	5+	4	4	-	-	-	
2 V	A	35 A	60 A	150 A	—	10 A	10 A	—	—	2 A	1.8 - 2.2
2.2 V	B	35 A	60 A	150 A	—	10 A	10 A	—	—	2 A	2.0 - 2.4
3 V	C	35 A	60 A	150 A	—	10 A	10 A	—	—	2 A	2.7 - 3.3
3.3 V	D	35 A	60 A	150 A	—	10 A	10 A	—	—	2 A	3.0 - 3.6
5 V	E	35 A	60 A	150 A	—	10 A	10 A	—	—	2 A	4.5 - 5.5
5.2 V	F	35 A	60 A	144 A	—	10 A	10 A	—	—	2 A	4.7 - 5.7
5.5 V	G	34 A	58 A	136 A	—	10 A	10 A	—	—	2 A	5.0 - 6.1
6.0 V	H	23 A	42 A	97.5 A	140 A	10 A*	10 A*	—	—	2 A	5.4 - 6.6
8.0 V	I	20 A	36 A	84.4 A	140 A	10 A	4 A	1 A	1 A	1 A	7.2 - 8.8
10 V	J	18 A	32 A	75 A	140 A	10 A	4 A	1 A	1 A	1 A	9.0 - 11.0
11 V	K	17 A	31 A	68 A	136.3 A	10 A	4 A	1 A	1 A	1 A	9.9 - 12.1
12 V	L	17 A	30 A	62.5 A	125 A	10 A	4 A	1 A	1 A	1 A	10.8 - 13.2
14 V	M	14 A	21 A	53.5 A	107 A	9 A	4 A	1 A	1 A	1 A	12.6 - 15.4
15 V	N	14 A	20 A	50 A	100 A	8 A	4 A	1 A	1 A	1 A	13.5 - 16.5
18 V	O	11 A	19 A	41.6 A	83.3 A	—	—	—	0.5 A	0.5 A	16.2 - 19.8
20 V	P	10.5 A	18 A	37.5 A	75 A	—	—	—	0.5 A	0.5 A	18.0 - 22.0
24 V	Q	8.5 A	15 A	30 A	62.5 A	4 A	2 A	—	0.5 A	0.5 A	21.6 - 26.4
28 V	R	6.7 A	11 A	26.8 A	53.5 A	3 A	2 A	—	0.5 A	0.5 A	25.2 - 30.8
30 V	S	6.5 A	11 A	25 A	50 A	—	—	—	—	—	27.0 - 33.0
33 V	T	6.2 A	10.9 A	22.7 A	35.8 A	—	—	—	—	—	29.7 - 36.3
36 V	U	5.8 A	10 A	20.8 A	35.8 A	—	—	—	—	—	32.4 - 39.6
42 V	V	4.2 A	7.5 A	16 A	35.7 A	—	—	—	—	—	37.8 - 46.2
48 V	W	4.0 A	7.5 A	15.6 A	31.2 A	—	—	—	—	—	43.2 - 52.8
54 V	X	3.7 A	6.0 A	13.9 A	27.7 A	—	—	—	—	—	48.6 - 59.4
60 V	Y	3.5 A	6.0 A	12.5 A	25 A	—	—	—	—	—	54.0 - 66.0
Non-std**	Z	Special Voltage - Consult Factory for specifications									

*Note: Contact Factory for extended range down to 6 V.
**Increments of current not shown can be achieved by paralleling modules (add currents of each module selected).
***Total output power on dual module must not exceed 144 W.
**** For single output modules only.
+ Applicable for iMP1 only.

Ordering Note:
1. The cases and modules of both MP and iMP series can be interchanged to allow more flexibility. If intelligent modules are used with non-intelligent cases, a numeric code "4" is placed at the end of the module code (ex. 4LL0 becomes 4LL4).
2. USB to I²C module order code 73-769-001

Parallel Codes



Ordering Information

Case Size

*i*MP1*

Case Size (mm)
4 = 2.5" x 5" x 10"; 750 W-1100 W, 5 Slots (63.5 x 127 x 254)
8 = 2.5" x 7" x 10"; 1000 W-1200 W, 6 Slots (63.5 x 177.8 x 254)
1 = 2.5" x 8" x 11"; 1200 W-1500 W, 7 Slots (63.5 x 203.2 x 279.4)

*Note: Add "E" after iMP4 to denote IEC input option. e.g. iMP4E
(Not available on iMP8 or iMP1)

Module/Voltage/Option Codes
First - Module Code
Second - Voltage Code
Third - Option Code

- 3L0 - 2E2 - 1Q1 - 4LL0 -

Module Codes
Module/voltage/option codes
Module codes:
(None) = 36 W triple O/P (1 slot)
1 = 210 W single O/P (1 slot)
2 = 360 W single O/P (2 slot)
3 = 750 W single O/P (3 slot)
4 = 144 W dual O/P (1 slot)
5 = 1500 W single O/P (4 slot)
6 - 9 = future
Voltage Codes:
See Output Module Voltage/Current table above
Option Codes:
0 = Standard
1 = Module enable
2 = Constant current
3 = 1 & 2 combined
4 = Set for use in standard (non-intelligent case)
5 = Shutdown mode for 1500W
6 = 1 & 5 combined
7 - 9 = future

Case Option Codes

00

Case Option Codes

First digit
0 - 9 = parallel code
(See Parallel Codes table above)

Second digit
0 = No options
1 = Reverse air
3 = Global enable
4 = Fan idle with inhibit
5 = Opt 1 + Opt 3
6 = Opt 1 + Opt 4
7 = Opt 3 + Opt 4
8 = Opt 1 +3 +4
9 = CAN BUS/RS485 73-544-002
C = Opt 3 + Opt 9

Software Code

A

Software code used for configuration change. "A" is standard

Hardware Code

###

Factory assembled for hardware of firmware mods.

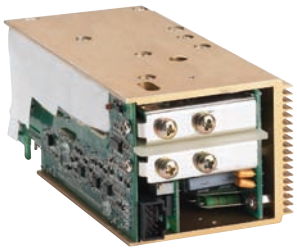
Single



210 W



360 W



750 W



1500 W

Dual



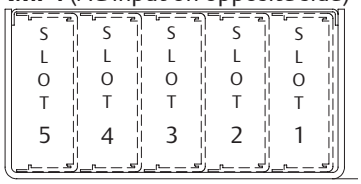
144 W

Triple



36 W

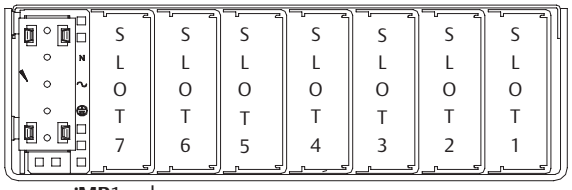
***i*MP4** (AC input on opposite side)



	Input 90-264 Vac	180-264 Vac
***i*MP**4 =2.5" x 5" x 10" 5 available slots (63.5 x 127 x 254)	750 W max.	1100 W max.

***i*MP8 and *i*MP1**

AC input



***i*MP1** only

	Input 85-264 Vac	180-264 Vac
***i*MP**8 =2.5" x 7" x 10" 6 available slots (63.5 x 177.8 x 254mm)	1000 W max.	1200 W max.
***i*MP**1 =2.5" x 8" x 11" 7 available slots (63.5 x 203.2 x 279.4mm)	1200 W max.	1500 W max.

Pin Connectors

Figure 1. AC Input

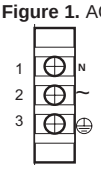
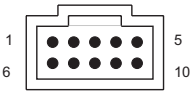
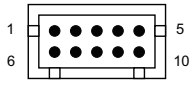


Figure 2. Connector J1



Mates with
Molex 90142-0010 Housing
90119-2110 Pin
Connector Kit Part No.:
70-841-004

Figure 3. Connector J2



Mates with
Landwin 2050S1000 Housing
2053T011V Pin
or
JST PHDR-10VS Housing
JST SPHD-002T-P0.5 (28-24)
JST SPHD-001T-P0.5 (26-22)

Connector Kit Part No.:
70-841-023

AC Input

Pin No.	Function
1	AC neutral
2	AC line (hot)
3	Chassis (earth) ground

PFC Input Connector (control and signals)

Pin No.	Function
1	Input AC OK - "emitter"
2	Input AC OK - "collector"
3	Global DC OK - "emitter"
4	Global DC OK - "collector"
5	External Sync
6	Global inhibit/optional enable logic "0"
7	Global inhibit/optional enable logic "1"
8	Global inhibit/optional enable return
9	+5 VSB housekeeping
10	+5 VSB housekeeping return

I²C Bus Output Connector

Pin No.	Function
1	No connection
2	No connection
3	No connection
4	Serial clock signal (SCL)
5	Serial data signal (SDA)
6	Address bit 0 (A0)
7	Address bit 1 (A1)
8	Address bit 2 (A2)
9	Secondary return (GND)
10	5 Vcc external bus (5 VCC. Bus)

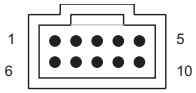
*i*MP Modules
DC-DC Converter Output Modules

Control Signal Information, J1 Control Connector

Pin No.	Function	
1	+ Remote Sense	single or dual o/p main
2	Remote Margin / V. Program	single o/p
3	Margin High	single o/p
4	- Remote Sense / Margin Low	single or dual o/p main
5	Spare	
6	Module, Isolated Inhibit	single or dual o/p
7	Module Inhibit return	single or dual o/p
8	Current Share (SWP)	single or dual o/p main
9	+ Remote Sense V2	dual o/p, single is spare
10	- Remote Sense V2	dual o/p, single is spare

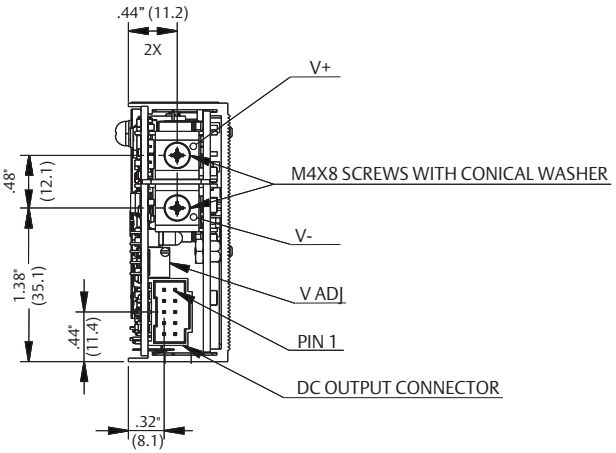
*Note: All iMP modules have a green DCOK LED.
(except for 36 W module)

Figure 4. Connector J1

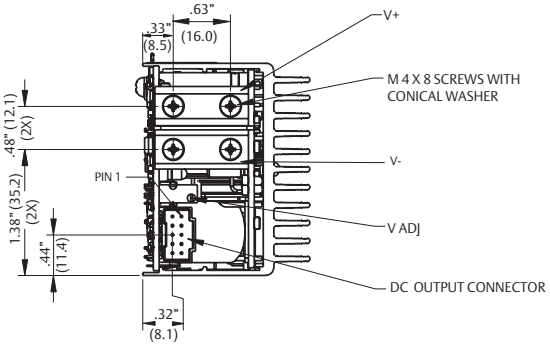


Mates with
Molex 90142-0010 Housing
90119-2110 Pin

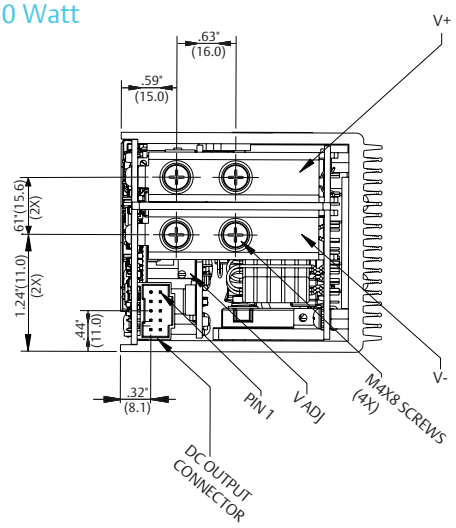
Single 210 Watt



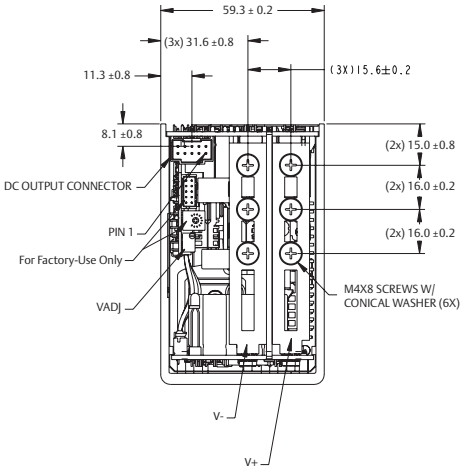
Single 360 Watt



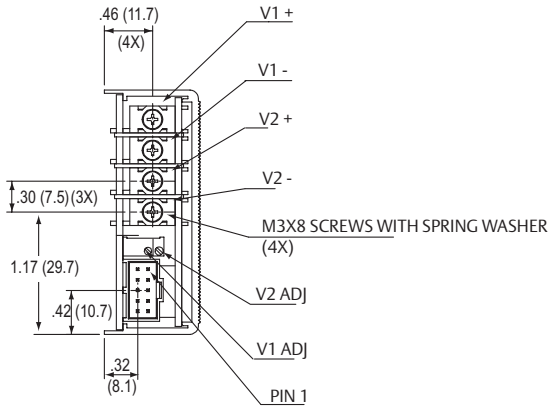
Single 750 Watt



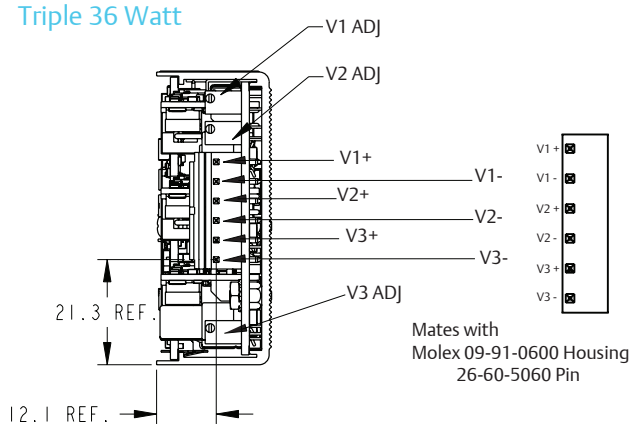
Single 1500 Watt



Dual 144 Watt



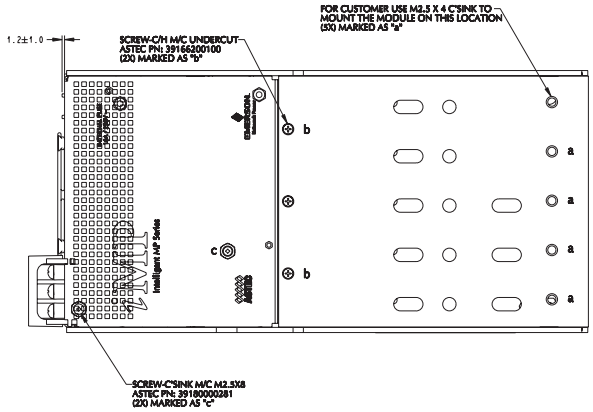
Triple 36 Watt

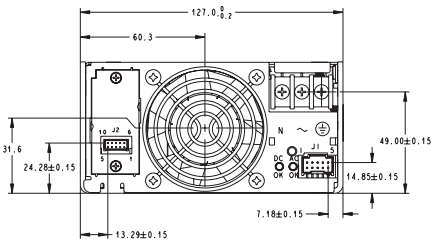


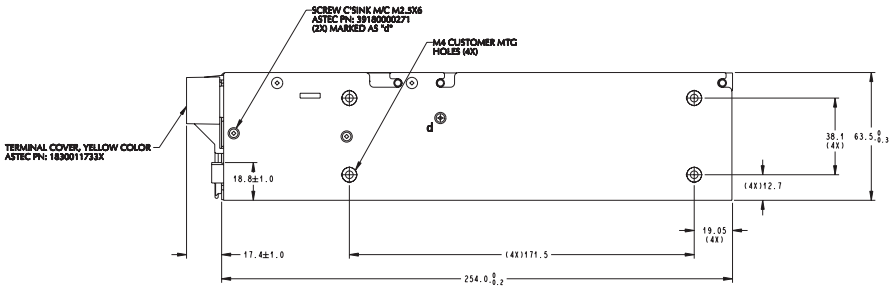
Mates with
Molex 09-91-0600 Housing
26-60-5060 Pin

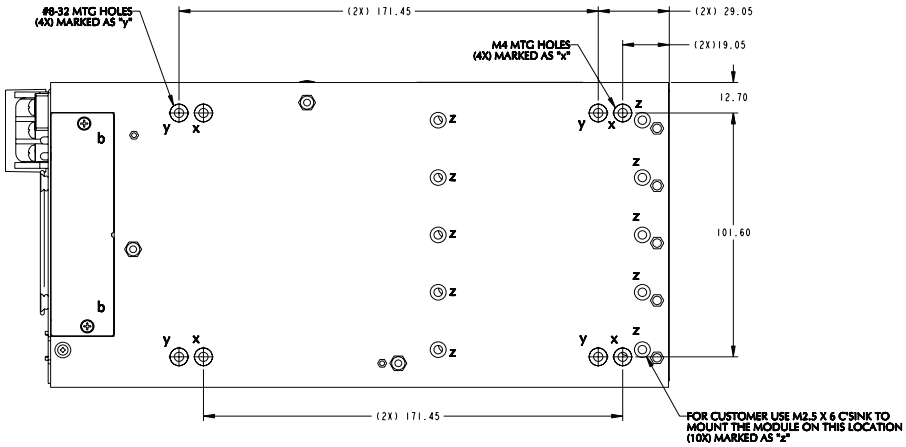
*i*MP Series
*i*MP4 (750/1100 Watts Max)

5-Inch Case Size: *i*MP4: 2.5” x 5” x 10” (63.5mm x 127mm x 254mm)
Weight: *i*MP4 Case: 3 lbs. • 360 W Single 1.0 lb.
• 750 W Single: 1.6 lbs. 144 W Dual: 0.6 lb.







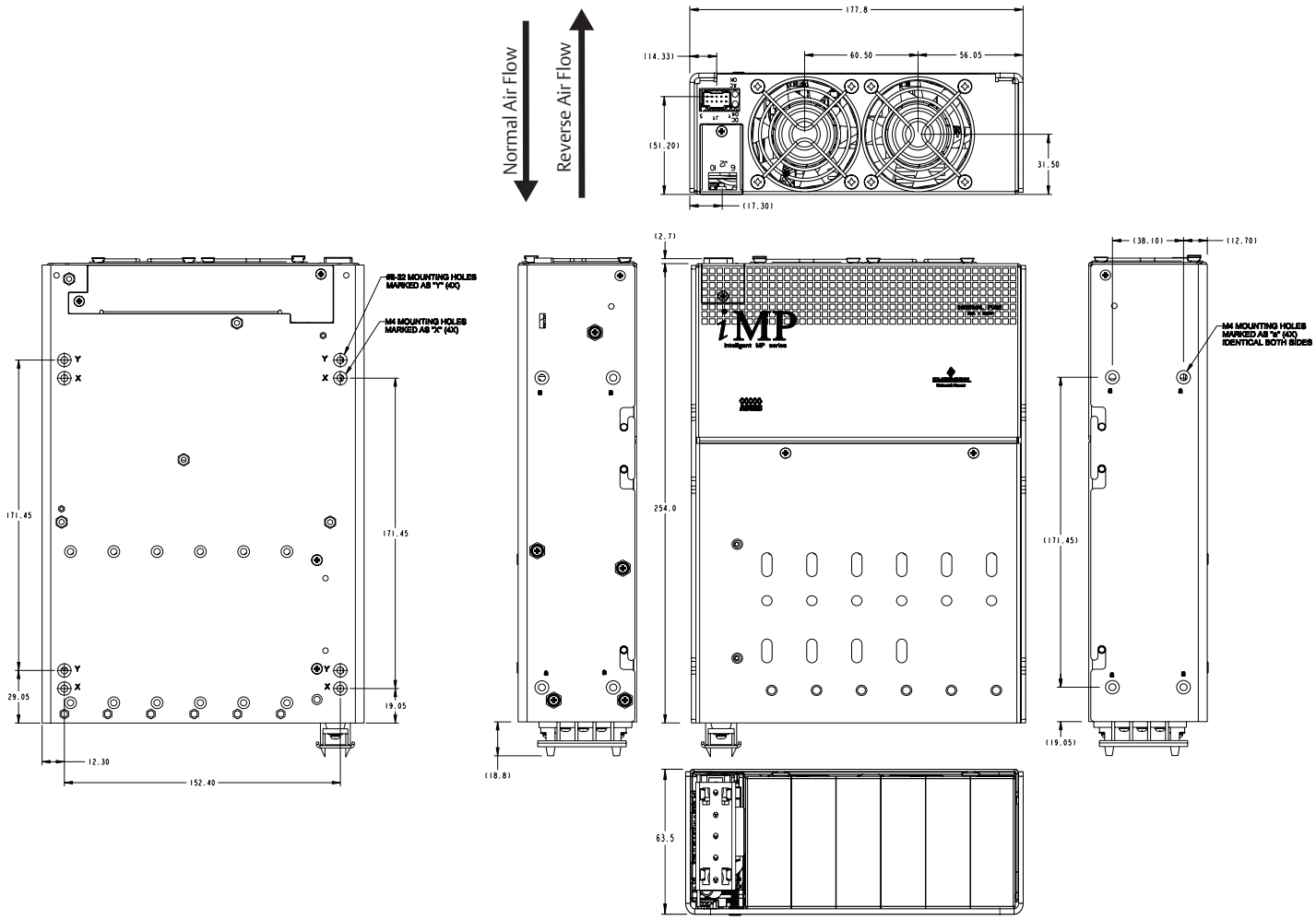


Notes

1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375” centers). Max torque: 6 in-lbs. (0.67 N-m). (Optional IEC input connector)
2. Control connectors: (J1) 10 position housing, gold plated contacts. Mates with Molex 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series). Connector kit includes mating connector and 10 pins, Astec part #70-841-004. (J2) 10 position housing (Landwin 2051P1000T). Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or JST PHDR-IOVS Housing and JST SPHD-002T-PO.5 pins.
3. Chassis material: aluminum with chemical film coating (conductive).
4. All dimensions are in millimeters and inches, and are typical.
5. Customer mounting -3 sides M4, bottom also includes 8-32 mounting holes. Max. penetration is 0.150” (3.8 mm). Max. torque: 5 in-lbs. (0.57 N-m).
6. Output module connections: All single O/P modules are M4 x 8mm screws. Max. torque: 10 in-lbs. (1.13 N-m).
   Dual O/P module is M3 x 8mm screws. Max. torque: 5 in-lbs. (0.57 N-m).

*i*MP Series
*i*MP8 (1000/1200 Watts Max)

7-Inch Case Size: *i*MP8: 2.5" x 7" x 10" (63.5mm x 177.8mm x 254mm)
Weight: *i*MP8 Case: 4.1 lbs. • 210 W Single: 0.6 lb. • 360 W Single: 1.0 lb. • 750 W Single: 1.6 lbs. 144 W Dual: 0.6 lb.

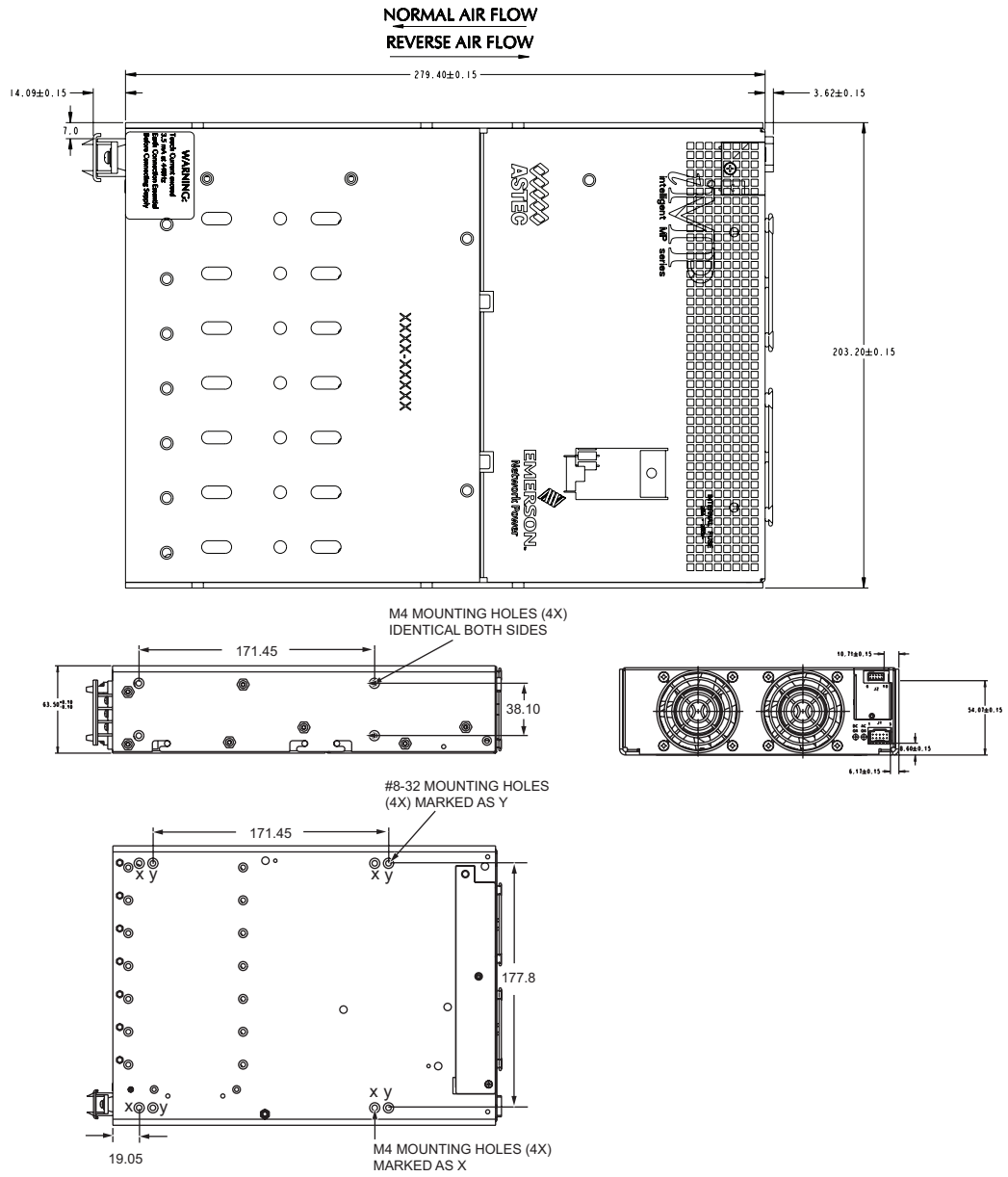


Notes

1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375" centers). Max torque: 6 in-lbs. (0.67 N-m).
2. Control connectors: (J1) 10 position housing, gold plated contacts. Mates with Molex 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series) Connector kit includes mating connector and 10 pins, Astec part #70-841-004. (J2) 10 position housing (Landwin 2051P1000T). Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or JST PHDR-IOVS Housing and JST SPHD-002T-PO.5 pins.
3. Chassis material: aluminum with chemical film coating (conductive).
4. All dimensions are in millimeters and inches, and are typical.
5. Customer mounting -3 sides M4, bottom also includes 8-32 mounting holes. Max. penetration is 0.150" (3.8 mm). Max. torque: 5 in-lbs. (0.57 N-m).
6. Output module connections: All single O/P modules are M4 x 8mm screws. Max. torque: 10 in-lbs. (1.13 N-m).
   Dual O/P module is M3 x 8mm screws. Max. torque: 5 in-lbs. (0.57 N-m).

*i*MP Series
*i*MP1 (1200/1500 Watts Max)

8-Inch Case Size: *i*MP1: 2.5" x 8" x 11" (63.5mm x 203.2mm x 279.4mm)
Weight: *i*MP1 Case: 5.0 lb. • 210 W Single: 0.6 lb.
• 360 W Single: 1.0 lb. • 750 W Single: 1.6 lb.
• 144 W Dual: 0.6 lb.



Notes

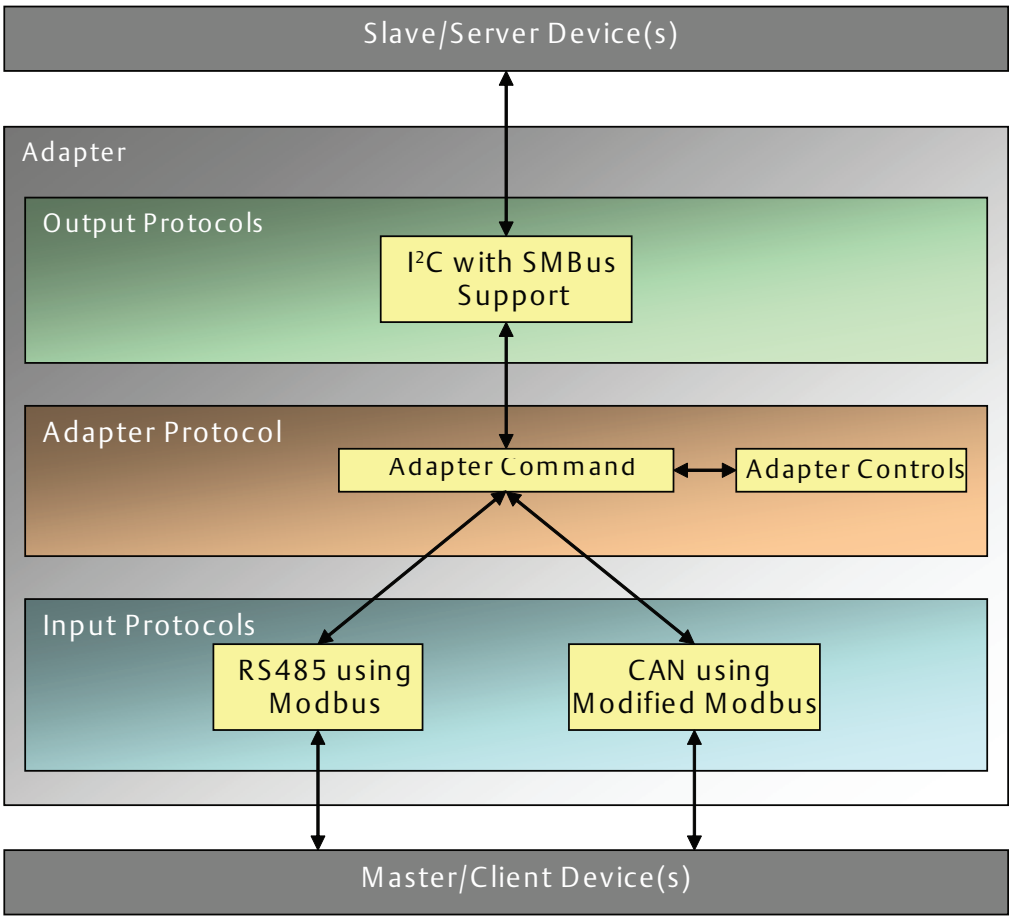
1. Input: Barrier type. Three No. 6-32 B.H. screws (0.375" centers). Max torque: 6 in-lbs (0.67 N-m).
2. Control connectors: (J1) 10 position housing, gold plated contacts. Mates with Molex 90142-0010 housing with 90119-2110 crimp contacts (Molex C - Grid III Series). Connector kit includes mating connector and 10 pins, Astec part #70-841-004. (J2) 10 position housing (Landwin 2051P1000T). Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or JST PHDR-IOVS Housing and JST SPHD-002T-PO.5 pins.
3. Chassis material: aluminum with chemical film coating (conductive).
4. All dimensions are in millimeters and inches, and are typical.
5. Customer mounting -3 sides M4, bottom also includes 8-32 mounting holes. Max. penetration is 0.150" (3.8 mm). Max. torque: 5 in-lbs. (0.57 N-m).
6. Output module connections: All single O/P modules are M4 x 8mm screws. Max. torque: 10 in-lbs. (1.13 N-m).
   Dual O/P module is M3 x 8mm screws. Max. torque: 5 in-lbs. (0.57 N-m).

Optional CANBUS or RS485 Interface

The RS485/CAN-to-I^{2}C uses 2 Input Protocols and 1 Output Protocol.

The Input Protocols used are RS485 using Modbus (Command Index: 0x01), and CAN using modified Modus (Command Index: 0x02).

The Output Protocol use is: I^{2}C with SMBus support (Command Index: 0x80).



RS485/CAN - to - I2C

For Detailed Info, Download the Software Requirements Specification (SRS) from www.PowerConversion.com/imp



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