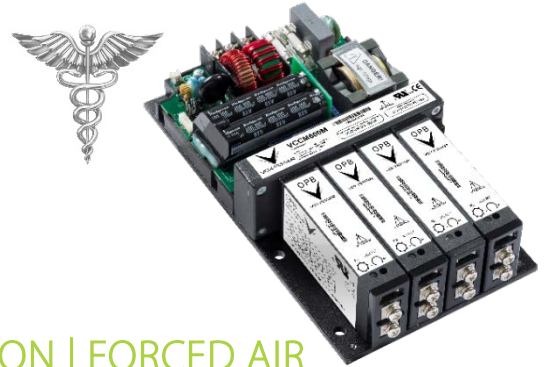


Fan-less  
SILENT

4"x7"x1.61"  
SMALL

600W  
POWERFUL



COOL IT YOUR WAY CONDUCTION | CONVECTION | FORCED AIR



The medically approved VCCM600M conduction cooled configurable power supply delivers a silent 600 Watts and up to 750 Watts of peak power for 5 seconds in a rugged 4" x 7" package and is the ultimate power solution for applications where reliability or audible noise are of concern. The product combines the advantages of a modular and configurable power supply with the high reliability of a fan-less architecture. Depending on your application, the VCCM600M can be configured as a conduction, convection or forced air cooled solution and this versatility allows the unit to be seamlessly integrated across a vast range of applications, which makes it perfect for standardising your power platform.

Designed with highest reliability and versatility in mind, the VCCM600M is suitable for applications ranging from the most controlled to the harshest of environments. Standard features include full output voltage adjust range, externally controllable voltage and current and series & paralleling of outputs. The unique design approach and heat dissipation techniques allows the unit to be mounted in virtually any orientation giving system designers even more flexibility. The series is approved to latest medical safety (IEC/UL60601-1-2 3rd Edition) and EMC standards and features market leading specifications and design in application support.

## MAIN FEATURES

- 600 Watts output ( $V_{in} > 120V_{RMS}$ )
- Peak power capability (750W 5sec)
- 7" x 4" x 1.61" footprint
- Convection/Conduction/Forced-Air cooled
- Modular & user configurable
- Low power standby mode (<1W)
- High efficiency – up to 90%
- Additional 5V 1A bias supply
- Remote voltage & current programming
- Current output signal
- Accurate current sharing
- Programmable start-up state (Laser Apps)
- IEC60601 Ed. 3 (Immunity to Ed. 4)
- MIL-STD 810G
- MIL-STD 461F
- MIL-STD 704F
- SEMI F47 compliant
- 5 Year warranty

## APPLICATIONS

- Medical & diagnostic equipment
- Test & Measurement equipment
- Robotics
- Oil & Gas
- Telecommunications
- Laboratory & Analysis equipment
- Display
- Avionics
- Lasers
- LED lighting
- High vibration & shock
- Retrofit of legacy PSUs

## CUSTOMER BENEFITS

- Fast time to market
- 24 hrs samples from distribution
- Safety & EMC certified
- World class engineering support
- Proven technology
- Eliminates custom design costs
- Field replaceable
- Low cost of ownership
- Technology consolidation
- Supplier consolidation

# SPECIFICATIONS

| INPUT MODULE SPECIFICATIONS |   |     |         |     |                  |
|-----------------------------|---|-----|---------|-----|------------------|
| Parameter                   | Details   | Min | Typical | Max | Units            |
| AC Input Voltage            | Nominal range is 100V <sub>RMS</sub> to 240V <sub>RMS</sub>                               | 85  |         | 264 | V <sub>RMS</sub> |
| AC Input Frequency          | Contact factory for 400Hz operation.  | 47  | 50/60   | 63  | Hz               |
| DC Input Voltage            |   | 120 |         | 370 | V <sub>DC</sub>  |
| Output Power Rating         | De-rate linearly from 600Watts at 120V <sub>RMS</sub> to 425Watts at 85V <sub>RMS</sub>   |     |         | 600 | Watts            |
| Input Current               | 600Watts output at 120 V <sub>RMS</sub> input   |     |         | 6   | Amps             |
| Input Current Limit         |   |     | 7       |     | Amps             |
| Inrush Current              | 265V <sub>RMS</sub> , 25°C (cold start)   |     |         | 20  | Amps             |
| Fusing                      | Each line fused (5x20 Fast acting)  |     |         | 8   | Amps             |
| Efficiency                  | See graphs  |     |         | 90  | %                |
| No load Power consumption   | All outputs fitted and disabled/enabled   |     | 10/21   |     | Watts            |
| Standby Power               | Latched off state, 120V <sub>RMS</sub>  |     | 0.5     | 1   | Watts            |
| Power Factor                |   |     | 0.99    |     |                  |
| Holdup                      | 600Watts output at 120V <sub>RMS</sub> input  | 17  | 20      | 21  | mS               |
| UVP                         | Turn on under voltage protection  | 78  |         | 84  | V <sub>RMS</sub> |
| Over temperature            | Internally monitored.   | 115 |         | 125 | °C               |
| Reliability <sup>(1)</sup>  | Input module  |     |         | 1.1 | FPMH             |
|                             | Transformer module  |     |         | 0.4 | FPMH             |
| Warranty                    | Standard terms and conditions apply   |     |         | 5   | Years            |
| Size                        | 177.8 (L) x 101.6 (W) x 41.0 (H). See diagram for tolerance details                       |     |         |     | mm               |
| Weight                      | 650 + 100 per output module   |     |         |     | Grams            |
| Note 1.                     | 30°C base & ambient, 100% load, SR332 Issue 2 Method I, Case 3, Ground, Fixed, Controlled |     |         |     |                  |

| GLOBAL SIGNALS SPECIFICATIONS |  |       |         |         |       |
|-------------------------------|--|-------|---------|---------|-------|
| Parameter                     | Details  | Min   | Typical | Max     | Units |
| Bias Voltage                  |  | 4.8   | 5       | 5.2     | Volts |
| Bias Current                  |  |       |         | 1       | Amps  |
| AC_OK Voltage                 | Low output level/High output level   | 0/4.8 | 0.03/5  | 0.1/5.2 | Volts |
| AC_OK Current                 |  |       |         | 10      | mA    |
| Power Good Voltage            | Open collector output. Low output level. All slots. Absolute maximum = 6V. | 0.1   |         | 0.3     | Volts |
| Power Good Current            | Open collector output. Current sink only. All Slots.                       |       |         | 50      | mA    |
| Tsns Voltage                  | Typical at 0°C internal temperature, 19.5mV/°C                             | 0     | 0.4     | 5       | Volts |
| Tsns Current                  |  |       |         | 100     | uA    |
| Inhibit Voltage               | Low input level/High input level. All slots.                               | 0/2.5 |         | 0.8/6   | Volts |
| Inhibit Current               | 10k input impedance. All slots.  |       |         | 1       | mA    |

| OUTPUT MODULE SPECIFICATION SUMMARY |   |            |       |                |             |            |           |           |            |                     |                     |                            |
|-------------------------------------|---|------------|-------|----------------|-------------|------------|-----------|-----------|------------|---------------------|---------------------|----------------------------|
| MODEL                               | Output Voltage  |            |       | Output Current | Rated Power | Peak Power | Load Reg. | Line Reg. | Cross Reg. | Ripple & Noise      | FPMH <sup>(1)</sup> | Feature Set <sup>(2)</sup> |
|                                     | Min.  | Nom.       | Max.  |                |             |            |           |           |            |                     |                     |                            |
| OPA                                 | 1.5V  | <b>5V</b>  | 7.5V  | 25A            | 125W        | 187.5W     | ±50mV     | ±5mV      | ±10mV      | 50mV <sub>PP</sub>  | 0.5                 | ABCDEFG                    |
| OPB                                 | 4.5V  | <b>12V</b> | 15V   | 15A            | 150W        | 225W       | ±100mV    | ±12mV     | ±24mV      | 120mV <sub>PP</sub> | 0.5                 | ABCDEFG                    |
| OPC                                 | 9V  | <b>24V</b> | 30V   | 7.5A           | 150W        | 225W       | ±150mV    | ±24mV     | ±48mV      | 240mV <sub>PP</sub> | 0.5                 | ABCDEFG                    |
| OPD                                 | 18V   | <b>48V</b> | 58V   | 3.75A          | 150W        | 217.5W     | ±300mV    | ±48mV     | ±96mV      | 480mV <sub>PP</sub> | 0.5                 | ABCDEFG                    |
| OPE                                 | 4.5V  | <b>5V</b>  | 5.5V  | 100A           | 500W        | TBD        | TBD       | TBD       | TBD        | TBD                 | TBD                 | AEFGHIJ                    |
| OPF                                 | 10.8V   | <b>12V</b> | 13.2V | 50A            | 600W        | TBD        | TBD       | TBD       | TBD        | TBD                 | TBD                 | AEFGHIJ                    |
| OPG                                 | 21.6V   | <b>24V</b> | 26.4V | 25A            | 600W        | TBD        | TBD       | TBD       | TBD        | TBD                 | TBD                 | AEFGHIJ                    |
| OPH                                 | 43.2V   | <b>48V</b> | 52.8V | 12.5A          | 600W        | TBD        | TBD       | TBD       | TBD        | TBD                 | TBD                 | AEFGHIJ                    |
| Note 1.                             | Output module, 30°C base, 100% load, SR332 issue 2 Method I, Case 3, Ground, Fixed, Controlled  |            |       |                |             |            |           |           |            |                     |                     |                            |
| Note 2.                             | A = Remote Sense, B = External Voltage control, C = External constant current control, D = Current output signal, E = Current share, F = Over Voltage protection, G = Over temperature protection, H = BF rating, I = PMBUS capability, J = Internal ORing mosfet |            |       |                |             |            |           |           |            |                     |                     |                            |

| SAFETY SPECIFICATIONS   |   |         |                 |                |
|-------------------------|---|---------|-----------------|----------------|
| Parameter               | Details   | Max     | Units           | Notes          |
| Isolation Voltages      | Input to Output (2 MOPP)                            | 4000    | V <sub>AC</sub> |                |
|                         | Input to J2 standby control (2 MOPP)                | 4000    | V <sub>AC</sub> |                |
|                         | Input to Chassis (1 MOPP)                           | 1500    | V <sub>AC</sub> |                |
|                         | Global signals (J3) to Output/Chassis               | 500     | V <sub>DC</sub> |                |
|                         | Output to Output/Chassis (Standard modules)         | 500     | V <sub>DC</sub> |                |
| Earth Leakage Current   | Output to Output/Chassis (BF Rated modules, 1 MOPP) | 1500    | V <sub>AC</sub> |                |
|                         | Normal condition, 264Vac, 63Hz, 25°C                | 200     | uA              |                |
| Touch Leakage Current   | Standard modules NC/SFC                             | 20/200  | uA              |                |
|                         | BF rated modules NC/SFC                             | TBD/TBD | uA              |                |
| Patient Leakage Current | Standard modules 264Vac, 63Hz, 25°C NC/SFC          | ----    | uA              | Not applicable |
|                         | BF rated modules 264Vac, 63Hz, 25°C NC/SFC          | TBD/TBD | uA              |                |

| INSTALLATION SPECIFICATIONS |                        |                            |                 |
|-----------------------------|------------------------|----------------------------|-----------------|
| Parameter                   | Details                | Parameter                  | Details         |
| Equipment class             | I                      | Flammability Rating        | 94V-2           |
| Overvoltage category        | II                     | Ingress protection rating  | IP10            |
| Material Group              | IIIb (indoor use only) | ROHS compliance            | 2011/65/EU      |
| Pollution degree            | 2                      | Intended usage environment | Home Healthcare |

| ENVIRONMENTAL SPECIFICATIONS |   |                 |            |                    |                |   |
|------------------------------|---|-----------------|------------|--------------------|----------------|---|
| Parameter                    | Details   | Non-Operational |            | Operational        |                | Units                                     |
|                              |   | Min             | Max        | Min                | Max            |   |
| Air Temperature              | Operational limits subject to appropriate de-ratings  | -51             | +85        | -40 <sup>(1)</sup> | 70             | °C  |
| Humidity                     | Relative, non-condensing  | 5               | 95         | 5                  | 95             | %   |
| Altitude                     |   | -200            | 5000       | -200               | 3000           | m   |
| Shock                        | EN 60068-2-27: Half sine, 3 axes, 3 positive & 3 negative.<br>810G: Method 516.6, Procedure IV, Transit drop  |                 | 50, 11     |                    | 30, 18         | g, mS                                     |
| Vibration                    | EN 60068-2-6: Sine, 10 – 500 Hz, 3 axes, 1 oct/min., 10 cycles each axis<br>EN 60068-2-64: Random, 5 – 500 Hz, 3 axes, 30 min.<br>810G: Method 514.6, Procedure I (General Vibration)<br>Category 4 (Trucks & Trailers, Composite wheeled vehicle), Figure 514.6C-3.<br>Category 7 (Aircraft, Jet cargo), Figure 514.6C-5 General exposure<br>Category 24, (All, Minimum integrity) Figure 514.6E-1 |                 | 0.02, 2.56 |                    | 2<br>0.0122, 1 | g<br>g <sup>2</sup> /Hz, g <sub>RMS</sub> |
| Thermal shock                | MIL-STD-810G Method 503.5 Procedure I-C. Multi-cycle. 3 shocks.   | -51             | 85         |                    |                | °C  |
| Notes                        | 1. Some specifications may not be met below -20°C.  |                 |            |                    |                |   |

| ELECTROMAGNETIC COMPLIANCE – EMISSIONS          |                                      |                                       |
|---|--------------------------------------|---------------------------------------|
| Phenomenon                                      | Basic EMC Standard                   | Test Details                          |
| Radiated emissions, electric field              | EN55011/22                           | Class B compliant                     |
| Radiated emissions, electric field, 30Hz-18GHz. | MIL-STD-461F: RE102 (Ground, Fixed)  | Compliant (When mounted in enclosure) |
| Conducted emissions                             | EN55011/22, FCC part 15, CISPR 22/11 | Class B compliant                     |
| Conducted emissions, power leads, 10kHz-10MHz.  | MIL-STD-461F: CE102                  | Compliant                             |
| Harmonic Distortion                             | IEC61000-3-2                         | Compliant                             |
| Flicker & Fluctuation                           | IEC61000-3-3                         | Compliant                             |

| ELECTROMAGNETIC COMPLIANCE – IMMUNITY  |   |   |
|--|---|---|
| Phenomenon   | Basic EMC Standard  | Test Details  |
| Electrostatic discharge  | IEC61000-4-2  | Test level 4: 15kV air, 8kV contact, IEC60601-1-2:2014 compliant  |
| Radiated RF EM fields  | IEC61000-4-3  | Test Level 3: (10V/m, 80MHz-2.7GHz) sine wave AM 80% 1kHz   |
| Proximity fields from RF wireless communications equipment                                   | IEC61000-4-3  | Test levels as per IEC60601-1-2:2014 Table 9  |
| Radiated susceptibility, electric field, 2 MHz to 40 GHz.                                    | MIL-STD-461F: RS103   | 20V   |
| Electrical Fast Transients/bursts  | IEC61000-4-4  | Test Level 3: (2kV Power, 1kV I/O) 5kHz(ed3) & 100kHz(ed4)  |
| Conducted susceptibility, Bulk cable injection, impulse excitation                           | MIL-STD-461F: CS115   |   |
| Surges   | IEC61000-4-5  | Test Level 3: 1kV L-N, 2kV L-E. As per IEC60601-1-2:2014  |
| Conducted susceptibility, damped sinusoidal transients, cables and power leads, 10kHz-100MHz | MIL-STD-461F: CS116   |   |
| Shipboard Electric Power. Voltage Spike Test   | MIL-STD-1399, SECTION 300A  | Type 1, 115V 60Hz single phase  |
| Conducted disturbances induced by RF fields  | IEC61000-4-6  | Test Level 3: 10V, 0.15 to 80Mhz sine wave AM 80% 1kHz  |
| Conducted susceptibility, power leads, 30Hz-150kHz   | MIL-STD-461F: CS101   |   |
| Conducted susceptibility, Bulk cable injection, 10kHz-200MHz                                 | MIL-STD-461F: CS114   |   |
| Power Frequency Magnetic Fields  | IEC61000-4-8  | Test level 4: 30A/m 50Hz  |
| Radiated susceptibility, Magnetic field, 30Hz-100kHz   | MIL-STD-461F: RS101   |   |
| Voltage Dips   | IEC61000-4-11 <sup>(2)</sup>  | 0% 10ms, 0% 20ms, 70% 0.5s (Criterion A)<br>40% 200mS (Criterion A at 240V and Criterion C at 100V)   |
| Voltage Sag Immunity   | SEMI-F47-0706 <sup>(2)</sup>  | 0% 20mS, 70% 0.5s, 80% 1s, 80% 10s, 90% continuous (Criterion A)<br>50% 200mS (Criterion A at 240V and Criterion C at 100V)<br>Criterion A is achieved for full power when Vin >= 160V<br>Criterion A is achieved at all input voltages when Pout <= 350W |
| Voltage interruptions  | IEC61000-4-11   | 0% 250/300 cycle as per IEC60601-1-2:2014 (Criterion C)   |
| Aircraft Electric Power Characteristic   | MIL-STD-704F  | SAC102,104,105,109,110 (MIL-HDBK-704-2) &<br>SXF102,104,105,109,110 (MIL-HDBK-704-6)  |
| Notes:   | 1. Criterion A = No degradation of performance or loss of function.<br>Criterion B = No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer.<br>Criterion C = Temporary loss of function is allowed, provided the function is self-recoverable.<br>2. Tested at nominal range (100V to 240V). Line deratings applied where appropriate. |   |

| AGENCY APPROVALS                               |   |             |
|--|---|-------------|
| Standard                                       | Details   | File        |
| IEC 60601-1:2005/AMD1:2012/COR1:2014           | 3rd Edition   | UL: E316486 |
| UL60601-1:2006                                 |   |             |
| CAN/CSA - C22.2 No. 60601-1:14 - Edition 3     | Medical Equipment Part 1: General requirements for basic Safety and essential Performance |             |
| ANSI/AAMI ES60601-1(2005 +C1:09 +A2:10)        | Medical Equipment Part 1: General requirements for basic Safety and essential Performance |             |
| CE MARK  | LVD 2014/35/EU, EMC 2014/30/EU  |             |
| CB certificate and report available on request |   |             |

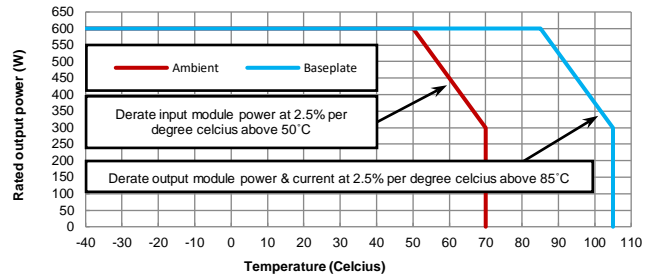
## THERMAL PERFORMANCE

### Details

#### Conduction cooled

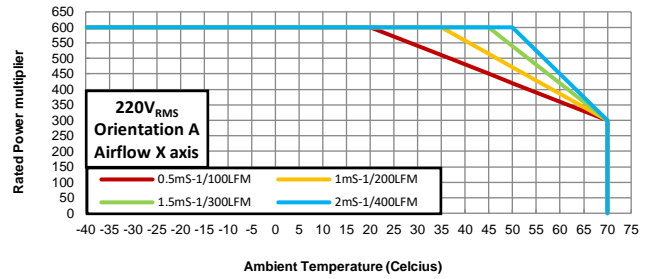
Apply appropriate deratings to both input and output modules based on ambient and baseplate temperatures.  
 Ambient derating applies to input module rated & peak power.  
 Baseplate derating applies to output module power and current, and bias supply power.  
 Plot shows rated power VCCM600M Datasheet of a fully configured system with 4 x 150W output modules fitted.  
 Similar deratings apply to input module peak power, output module peak power and output module current.  
 See user manual for a detailed explanation and example calculations.  
 Any mounting orientation is allowed.

### Performance curves



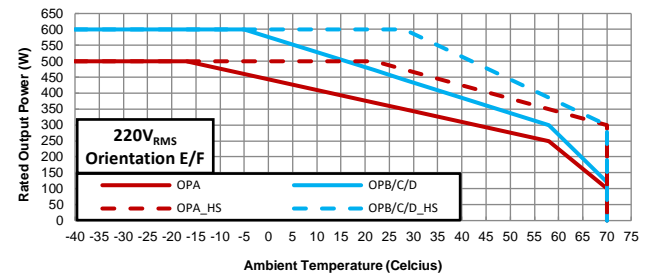
#### Forced Air cooled

Plot shows typical performance of a fully configured VCCM600M-CCCC system under controlled conditions with no heatsink attached and unit mounted 25mm from surface.  
 Unit mounted in orientation A with air flow in X direction, 220 V<sub>RMS</sub> input voltage.  
 Actual ratings must be determined in the user application.  
 See user manual for more detailed information.

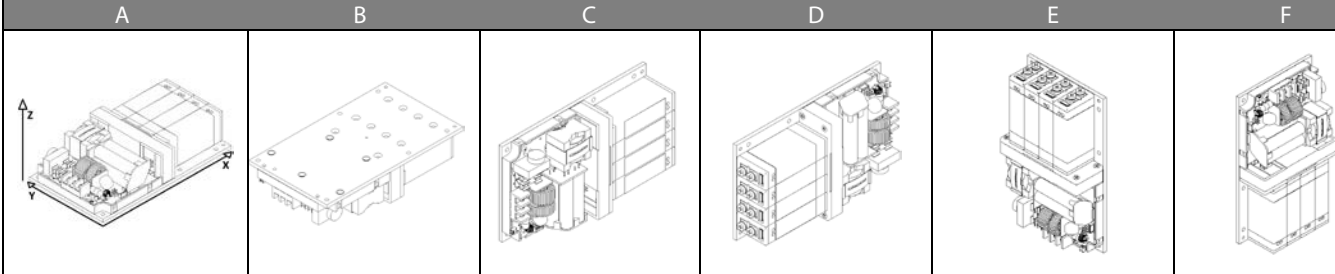


#### Convection cooled

Plot shows typical performance of a fully configured system under controlled conditions.  
 Solid line shows performance with no heatsink attached.  
 Dashed line shows performance with standard Vox heatsink attached.  
 Unit mounted in orientation E in free space, 220 V<sub>RMS</sub> input voltage.  
 Actual ratings must be determined in the user application.  
 See user manual for more detailed information.



### Orientation definitions

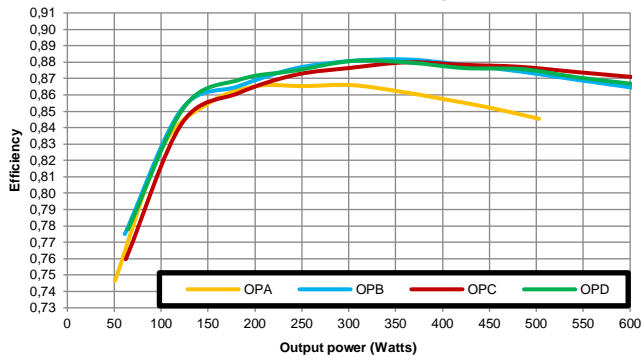


#### Notes

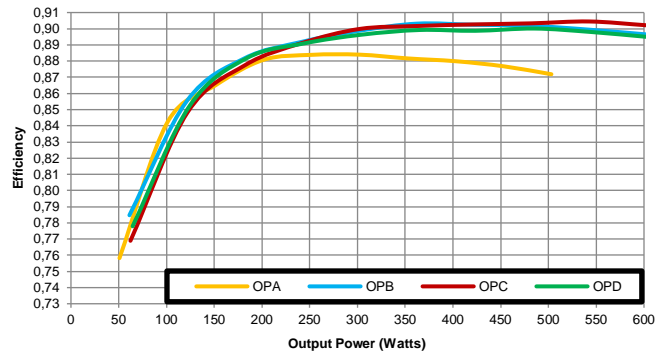
1. Line and other deratings applied where appropriate.
2. Ambient temperature is the temperature immediately surrounding the unit.

## TYPICAL EFFICIENCIES

Typical Load Efficiency at 120V<sub>RMS</sub> input voltage

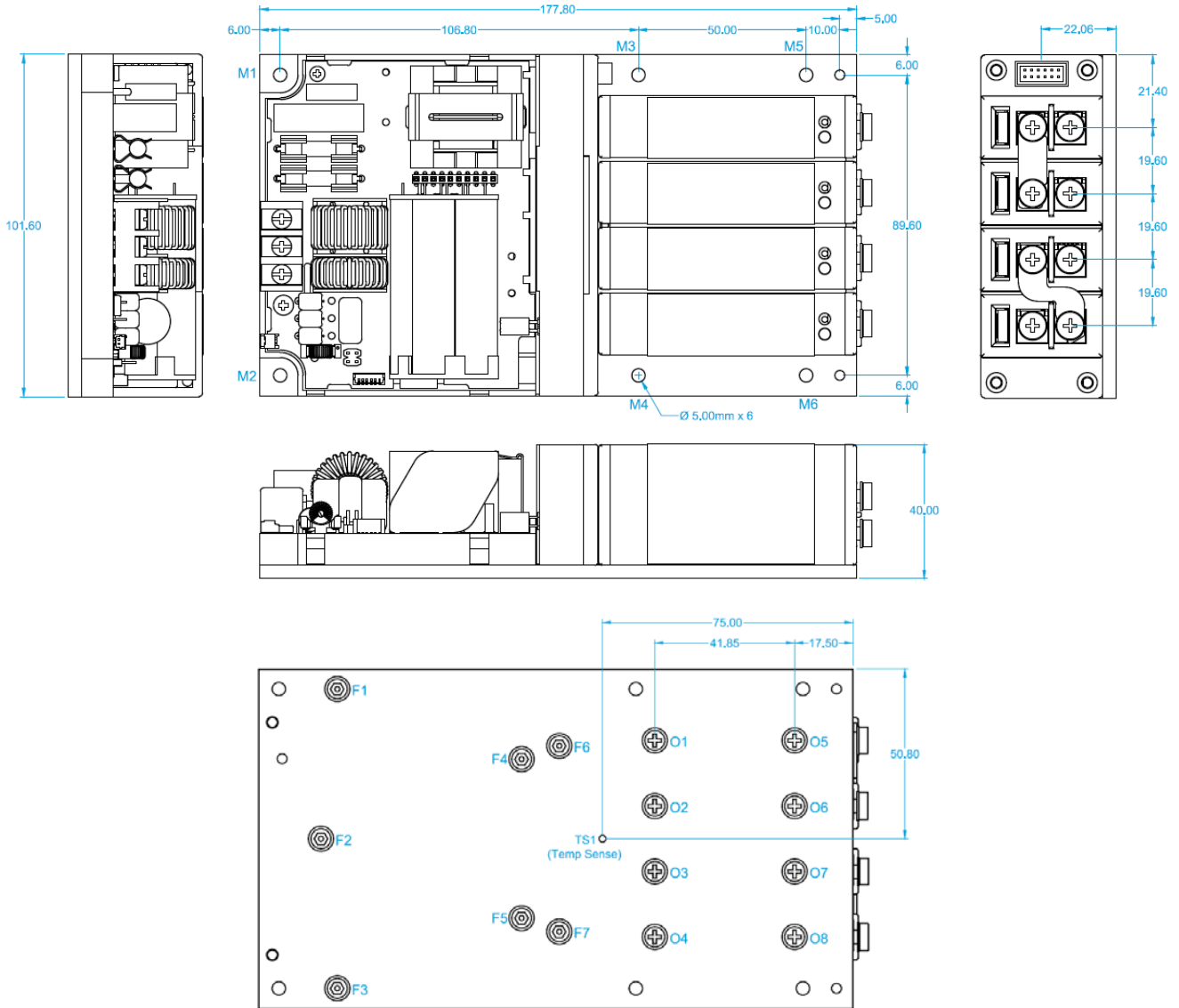


Typical Load Efficiency at 220V<sub>RMS</sub> input voltage



## MECHANICAL DIMENSIONS AND MOUNTING SCREWS

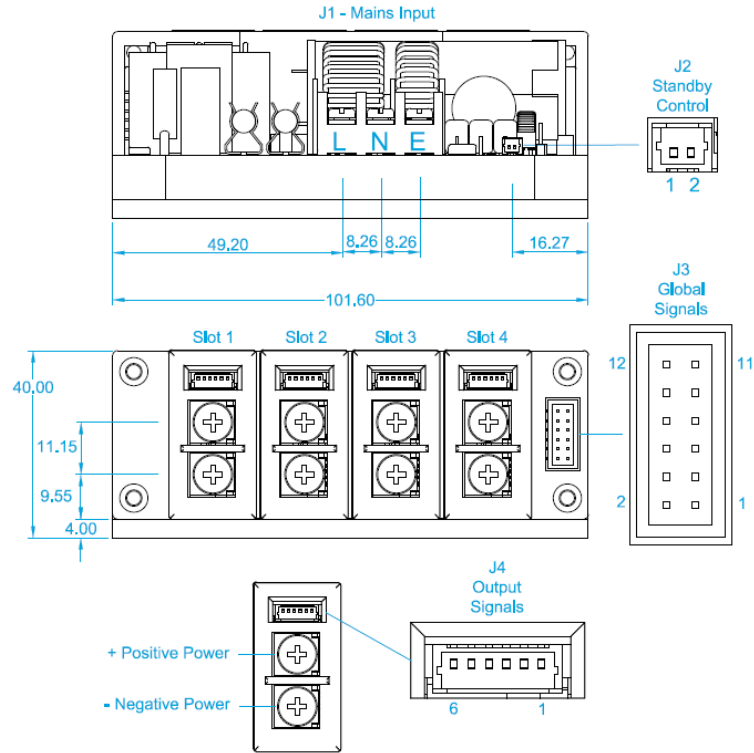
| Location                          | Details                    | Penetration                  | Tightening              |
|-----------------------------------|----------------------------|------------------------------|-------------------------|
| Baseplate Mount: M1 – M6          | Hole size, Diameter 5.00mm | 4mm Baseplate thickness      | 0.55 NM                 |
| Output Module Mount: O1 – O8      | M3 CSK                     | M3 CSK screw, 8mm max length | 0.35NM                  |
| Input module Mount: F1 – F5       | Do not remove or adjust    | Do not remove or adjust      | Do not remove or adjust |
| Transformer module Mount: F6 – F7 | M3 CSK                     | M3 CSK screw, 8mm max length | 0.35NM                  |



Unless stated otherwise, All dimensions are in millimeters and in accordance with DIN2768-1A2 CLASS C

## CONNECTOR DETAILS

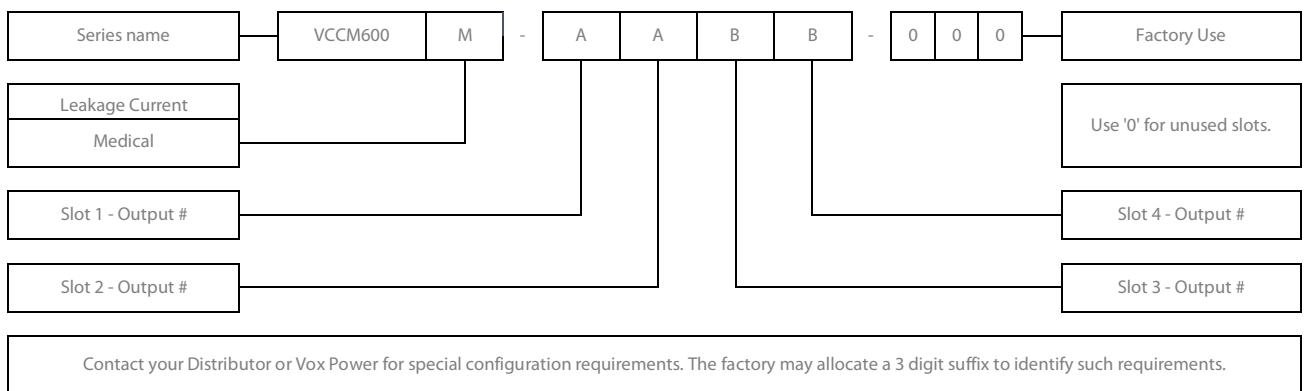
| PINOUTS Details             |  |
|-----------------------------|--|
| <b>J1 – Mains Input</b>     |  |
| 1                           | Live                                   |
| 2                           | Neutral                                |
| 3                           | Earth                                  |
| <b>J2 – Standby control</b> |  |
| 1                           | Standby control negative               |
| 2                           | Standby control positive               |
| <b>J3 – Global Signals</b>  |  |
| 1                           | Slot 4 - Power Good                    |
| 2                           | Slot 4 - Inhibit                       |
| 3                           | Slot 3 - Power Good                    |
| 4                           | Slot 3 - Inhibit                       |
| 5                           | Slot 2 - Power Good                    |
| 6                           | Slot 2 - Inhibit                       |
| 7                           | Slot 1 - Power Good                    |
| 8                           | Slot 1 - Inhibit                       |
| 9                           | Temperature sense (T <sub>SENS</sub> ) |
| 10                          | AC OK                                  |
| 11                          | +5V (Bias Supply 1A)                   |
| 12                          | COM                                    |
| <b>J4 - Output Signals</b>  |  |
| 1                           | - Sense                                |
| 2                           | + Sense                                |
| 3                           | COM                                    |
| 4                           | I Control                              |
| 5                           | V Control                              |
| 6                           | +5V (Bias Supply 20mA)                 |



Unless stated otherwise, All dimensions are in millimeters and in accordance with DIN2765-1-2 CLASS C

| MATING CONNECTORS    |   |              |            |            |
|----------------------|---|--------------|------------|------------|
| Ref.                 | Details   | Manufacturer | Housing    | Terminal   |
| J1 - Mains Input     | 3 Pin, Barrier, 6-32 Steel Screws, 0.8 Nm or 7 Lb-In Torque <sup>(1)</sup>  |              |            |            |
| J2 - Standby control | 2 Pin, 1.25mm, with Friction Lock, 28-30AWG   | MOLEX        | 0510210200 | 0500588000 |
| J3 - Global Signals  | 12 Pin, 2mm, with Friction Lock, 24-30 AWG, WIRE TO BOARD   | MOLEX        | 0511101260 | 0503948051 |
|                      | 12 Pin, 2mm, with Friction Lock, 24-30 AWG, IDT CABLE TO BOARD  | MOLEX        | 0875681273 |            |
| J5 - Output Signals  | 6 PIN, 1.25mm, with Friction Lock, 28-30AWG   | MOLEX        | 0510210600 | 0500588000 |
| Output Power         | Positive/Negative, M4 terminal, use appropriately rated crimp terminal  |              |            |            |
| Notes                | 1. Cable 14-18AWG, 300V, 16A, 105°C, use appropriately rated crimp terminal.<br>2. Direct equivalents may be used for any connector parts.<br>3. All cables must be rated 105°C min, equivalent to UL1015 |              |            |            |

## PART NUMBERS AND ORDERING INFORMATION



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