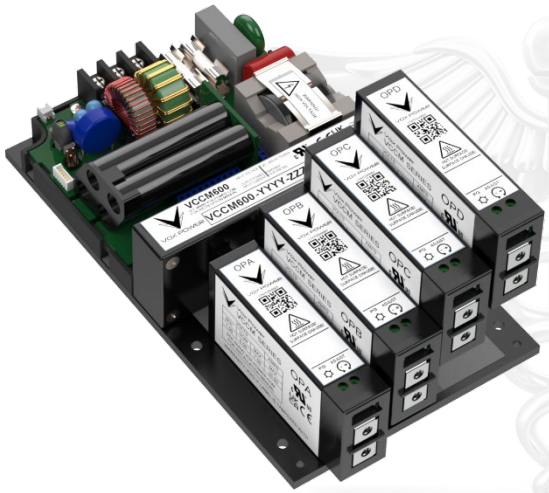
VCCM600M

MEDICAL DATASHEET

AC/DC Conduction Cooled Configurable PSU



600W
Powerful

4" x 7" x 1.61"
Small

Fan-less
Silent

Flexibility meets reliability - modular & fan-less

Vox Power's VCCM600 conduction cooled configurable power supply series combines the advantages of a modular power supply with the high reliability of a fan-less architecture and offers unrivalled performance and flexibility. The VCCM600S power supply delivers a silent 600 Watts, and up to 750 Watts of peak power for 5 seconds, in a rugged 4" x 7" x 1.61" package. The VCCM600 series is the ultimate power solution for demanding medical, industrial, lighting and military applications where reliability, multiple output voltages, user controllable functions and audible noise are of utmost importance.

The VCCM600 series can accommodate up to 4 isolated DC output modules with outputs from 1.5 to 58VDC at 150 Watts per channel. Each output module is produced using 100% SMT components to ensure minimal touch which in turn ensures long term reliability. Each VCCM600 series module can be connected in parallel or series to achieve higher power or voltage levels which can be controlled using the on-board signal functionality. Additional features include a standard 5V/1A bias supply, selective conformal coating, programmable start-up, standby power operation and a standard 5-year warranty.

5 YEAR WARRANTY

MAIN FEATURES & BENEFITS

- 600 Watts output (Vin >120V_{RMS})
- 750 Watts peak rating (5 seconds)
- Small 7" x 4" x 1.61", 13.3W/in^3
- Up to 4 isolated output modules
- Wide output adjust range from 1.5-58V_{DC} at 150W per channel
- Programmable start-up state (laser applications)
- Standby power ≤ 1Watts (In primary inhibit mode)
- Instant & fully safety approved power solutions based on proven technology
- Approved to latest safety standards: IEC/UL60601-1-2 4th Edition (EMC)
- Fan-less & conduction cooled
- Unique module design (100% SMT)
- Efficiency up to 92%
- Remote current/voltage programming
- Parallel & series connection of modules
- 5V 1A bias supply
- Accurate current sharing
- 24-hour samples from distribution
- Supplier & technology consolidation
- SEMI F47 compliant
- MIL-STD 810G, MIL-STD 461F & MIL-STD 704F
- Expert technical support
- 5 year warranty

APPLICATIONS

MEDICAL · LAB & ANALYSIS · LED · DISPLAY · ROBOTICS · COMM · LASER

- 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

SAFETY UL COMPLIANT · SAFETY CE UKCA COMPLIANT · ENVIRONMENTAL Conflict Minerals COMPLIANT · ENVIRONMENTAL Proposition 65 COMPLIANT · ENVIRONMENTAL REACH COMPLIANT · ENVIRONMENTAL RoHS Directive (EU) 2015/863 COMPLIANT · ENVIRONMENTAL SCIP COMPLIANT · ENVIRONMENTAL TSCA COMPLIANT · IMMUNITY SEMI F47 COMPLIANT · ENVIRONMENTAL GreenSoft Technology, Inc. VERIFIED

SPECIFICATIONS

INPUT MODULE SPECIFICATIONS

Parameter	Details	Min	Typical	Max	Units
AC Input Voltage	Nominal range is $100V_{RMS}$ to $240V_{RMS}$	85		264	V_{RMS}
AC Input Frequency	Contact factory for 400Hz operation.	47	50/60	63	Hz
DC Input Voltage	Not covered by safety approvals. Contact Vox Power.	120		370	V_{DC}
Output Power Rating	De-rate linearly from 600Watts at $120V_{RMS}$ to 425Watts at $85V_{RMS}$			600	Watts
Input Current	600Watts output at 120 V_{RMS} input			6	Amps
Input Current Limit			7		Amps
Inrush Current	$265V_{RMS}$, 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, $120V_{RMS}$		0.5	1	Watts
Power Factor			0.99		
Holdup	600Watts output at $120V_{RMS}$ input	17	20	21	mS
UVP	Turn on under voltage protection	78		84	V_{RMS}
Over temperature	Internally monitored.	115		125	°C
Reliability [1]	Input module Transformer module			1.1 0.4	FPMH 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
To ensure reliability, component temperatures must be maintained below recommended levels in the end application.
The "System cooling" section of the user manual should be reviewed in detail and temperatures verified in the end application.

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. All slots. 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 [3] Power	Load Reg.	Line Reg.	Cross Reg.	Ripple & Noise	FPMH [1]	Feature Set [2]
	Min.	**Nom.**	Max.									
OPA	1.5V	**5V**	7.5V	25A	125W	187.5W	±50mV	±5mV	±10mV	$50mV_{PP}$	0.5	ABCDEFG
OPB	4.5V	**12V**	15V	15A	150W	225W	±100mV	±12mV	±24mV	$120mV_{PP}$	0.5	ABCDEFG
OPC	9V	**24V**	30V	7.5A	150W	225W	±150mV	±24mV	±48mV	$240mV_{PP}$	0.5	ABCDEFG
OPD	18V	**48V**	58V	3.75A	150W	217.5W	±300mV	±48mV	±96mV	$480mV_{PP}$	0.5	ABCDEFG

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.
Note 3. Individual Output Module Peak power available < 5 seconds @ 50% duty cycle, Overall Input Module power must remain within specified limits.

SAFETY SPECIFICATIONS

Parameter	Details	Typical	Max	Units
Isolation Voltages	Input to Output (2 MOPP). Do not perform test on assembled unit[1]		4000	V_{AC}
	Input to J2 standby control (2 MOPP)		4000	V_{AC}
	Input to Chassis (1 MOPP)		1500	V_{AC}
	Global signals (J3) to Output/Chassis		500	V_{DC}
	Output to Output/Chassis (Standard modules)		500	V_{DC}
Earth Leakage Current	Normal condition, 264Vac, 63Hz, 25°C	200	300	uA
Touch Leakage Current	Output to Earth. Standard modules 264Vac, 63Hz, 25°C NC/SFC	21/146	20/250	uA
Patient Leakage Current	Standard modules 264Vac, 63Hz, 25°C NC/SFC [2]		-----	uA

Note 1. Testing an assembled unit to $4000V_{AC}$ may cause damage. Please refer to application note (APN-002) on Vox Power website or contact Vox Power representative.
Note 2. Not Applicable

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 & 2015/863/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[1]	70	℃
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. 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 EN 60068-2-64: Random, 5 – 500 Hz, 3 axes, 30 min. 810G: Method 514.6, Procedure I (General Vibration) Category 4 (Trucks & Trailers, Composite wheeled vehicle), Figure 514.6C-3. Category 7 (Aircraft, Jet cargo), Figure 514.6C-5 General exposure Category 24, (All, Minimum integrity) Figure 514.6E-1		0.02,2.56		2 0.0122,1	g g^2/Hz, g_{RMS}
Thermal shock	MIL-STD-810G Method 503.5 Procedure I-C. Multi-cycle. 3 shocks.	-51	85			℃
Notes 1. Some specifications may not be met below -20℃.						

ELECTROMAGNETIC COMPLIANCE – EMISSIONS		
Phenomenon	Basic EMC Standard	Test Details
Radiated emissions, electric field	EN55011/32	Class B compliant
Radiated emissions, electric field, 30Hz-18GHz.	MIL-STD-461F: RE102 (Ground, Fixed)	Compliant (When mounted in enclosure)
Conducted emissions	EN55011/32, FCC part 15, CISPR 32/11	Class B compliant
Conducted emissions, power leads, 10kHz-10Mhz.	MIL-STD-461F: CE102	Compliant (External filter may be required)
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[2]	0% 10ms, 0% 20ms (Criterion A) 70% 0.5s, 40% 200mS (Criterion A at 240V and Criterion B at 100V)
Voltage Sag Immunity	SEMI-F47-0706[2]	0% 20mS, 80% 1s,80% 10s,90% continuous (Criterion A) 70% 0.5s, 50% 200mS (Criterion A at 240V and Criterion B at 100V) Criterion A is achieved for full power when Vin >=160V 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 B)
Aircraft Electric Power Characteristic	MIL-STD-704F	SAC102,104,105,109,110 (MIL-HDBK-704-2) & SXF102,104,105,109,110 (MIL-HDBK-704-6)

Notes:

1. Criterion A = No degradation of performance or loss of function.
   Criterion B = Temporary degradation of performance or loss of function is allowed, provided the function is self-recoverable.
   Criterion C = Temporary loss of function is allowed but requires operator intervention to recover.
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, RoHs 2011/65/EU	
UKCA	Safety S.I. 2016:1101, EMC S.I. 2016:1091, RoHs S.I. 2012:3032	
CB certificate and report available on request		

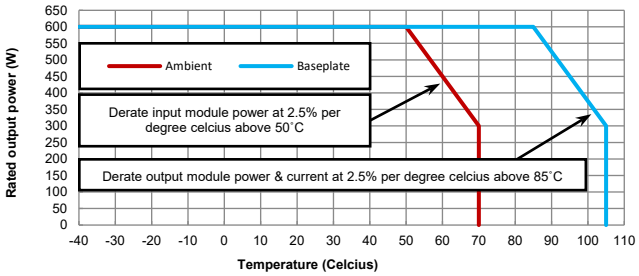
THERMAL PERFORMANCE

Details

Conduction cooled

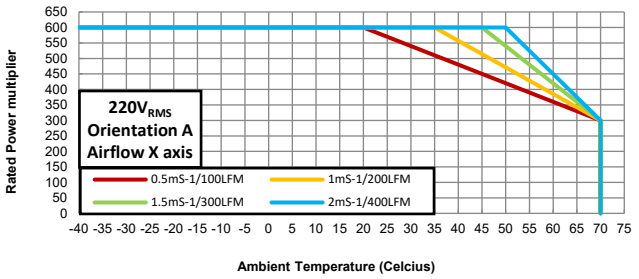
Apply appropriate deratings to both input and output modules based on ambient and baseplate temperatures.
Ambient derating applies to input module rated & peak power.
Baseplate derating applies to output module power and current, and bias supply power.
Plot shows rated power of a fully configured system 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 explaination and example calculations.
Any mounting orientation is allowed.

Performance curves



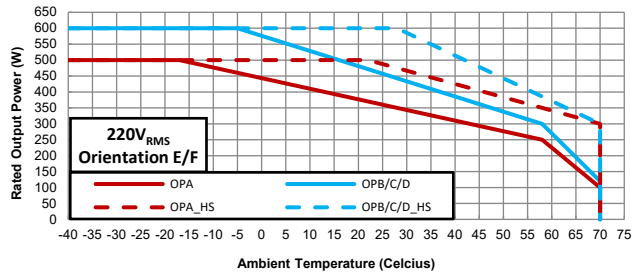
Forced Air cooled

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_{RMS} input voltage.
Actual ratings must be determined in the user application.
See user manual for more detailed information.

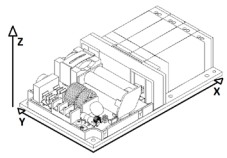
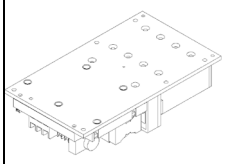
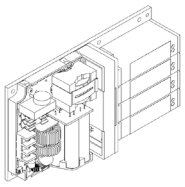
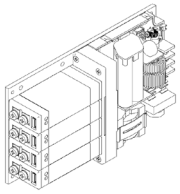
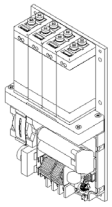
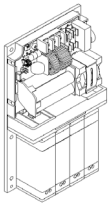


Convection cooled

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_{RMS} input voltage.
Actual ratings must be determined in the user application.
See user manual for more detailed information.



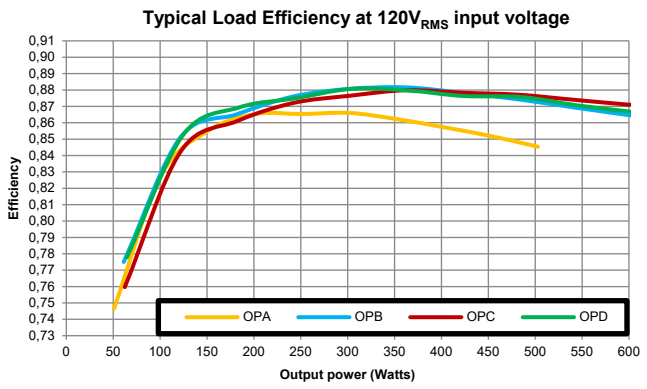
Orientation definitions

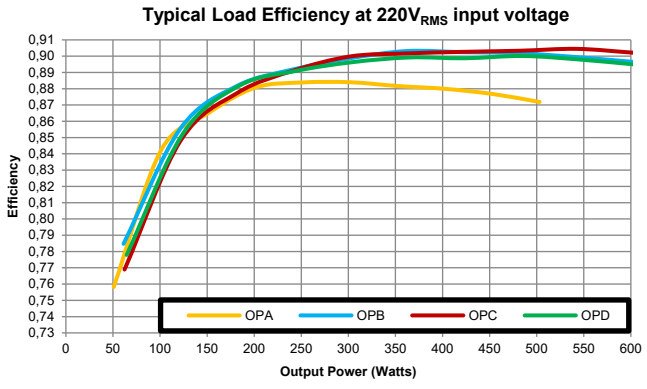
A	B	C	D	E	F
					

Notes

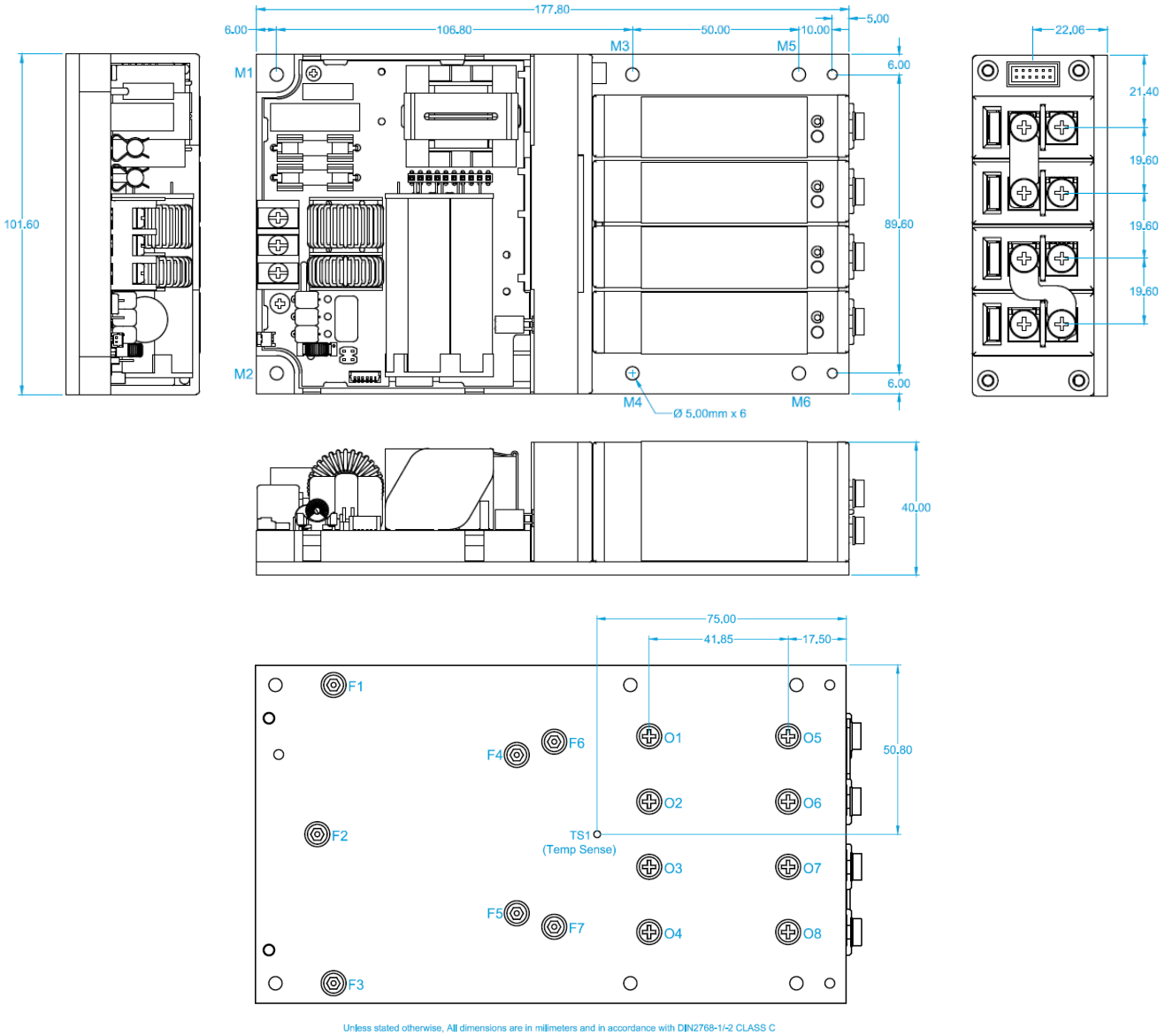
1. Line and other deratings applied where appropraite.
2. Ambient temperature is the temperature immediately surrounding the unit.

TYPICAL EFFICIENCIES



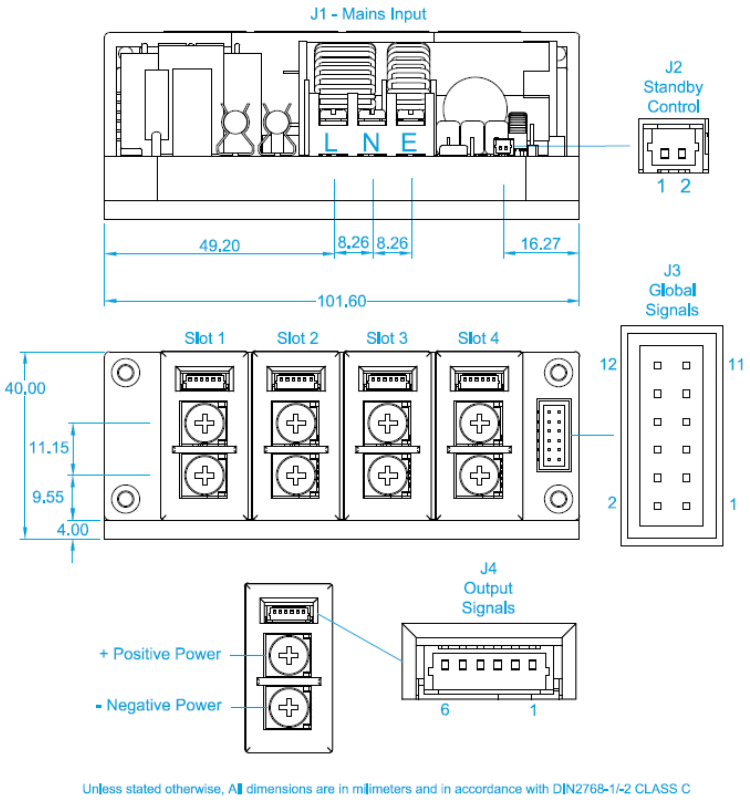


MECHANICAL DIMENSIONS AND MOUNTING			
SCREWS			
Location	Details	Penetration	Tightening
Baseplate Mount: M1 – M6	Hole size, Diameter 5.00mm	4mm Baseplate thickness	0.55 NM
Output Module Mount: O1 – O8	M3 CSK	M3 CSK screw, 8mm max length	0.50NM
Input module Mount: F1 – F5	Do not remove or adjust	Do not remove or adjust	Do not remove or adjust
Transformer module Mount: F6 – F7	M3 CSK	M3 CSK screw, 6mm max length	0.50NM
Output Module Terminal	M4 SEM	M4 SEM screw, 8mm max length	0.55NM



CONNECTOR DETAILS

PINOUTS J1 – Mains Input	
Circuit	Details
1	Live
2	Neutral
3	Earth
J2 – Standby control	
Circuit	Details
1	Standby control negative
2	Standby control positive
J3 – Global Signals	
Circuit	Details
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_{SNS})
10	AC OK
11	+5V (Bias Supply 1A)
12	COM
J4 -Output Signals	
Circuit	Details
1	- Sense
2	+ Sense
3	COM
4	I Control
5	V Control
6	+5V (Bias Supply 10mA)



Unless stated otherwise, All dimensions are in millimeters and in accordance with DIN2768-1/-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 [1]			
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	
J4 - Output Signals	6 PIN, 1.25mm, with Friction Lock, 28-30AWG	MOLEX	0510210600	0500588000
Output Power	Positive/Negative, M4 terminal, 0.55 NM, use appropriately rated crimp terminal			

Notes
1. Cable 14-18AWG, 300V, 16A, 105°C, use appropriately rated crimp terminal.
2. Direct equivalents may be used for any connector parts.
3. All cables must be rated 105°C min, equivalent to UL1015

PART NUMBERS AND ORDERING INFORMATION

Series name	VCCM600	M	-	A	A	B	B	-	0	0	0	Factory Use

- Leakage Current
- Medical

Use '0' for unused slots.

- Slot 1 - Output #
- Slot 2 - Output #
- Slot 4 - Output #
- Slot 3 - Output #

Contact your Distributor or Vox Power for special configuration requirements. The factory may allocate a 3 digit suffix to identify such requirements.