



VOXPOWER

VCCS300M

MEDICAL DATA SHEET

Single Output Conduction Cooled PSU

BF Rated
Output
2" x 4" x 1.61"
Small
Fan-less
Silent



Cool it your way: Conduction | Convection | Forced Air

The VCCS300M series of conduction cooled power supplies deliver a silent 300 Watts of power in a miniature 2 x 4 x 1.61 Inch package. The VCCS300M series is the ultimate solution for medical applications which require a high efficiency, BF rated, leading edge technology power solution with Class I or II installation capability. The VCCS300M series is designed to be a high reliability medically approved power solution which is produced in redundant minimum touch manufacturing locations which ensures continuity of supply.

MAIN FEATURES

- | | | |
|--|----------------------------------|---|
| • 300 Watts output ($V_{in} > 120V_{RMS}$) | • Low Leakage and Touch Current | • IEC/UL60601-1 Edition 3.1 |
| • 4" x 2" x 1.61" footprint | • BF Rated Output | • MIL-STD 810G |
| • Convection/Conduction/Forced-Air rated | • Class I or II installations | • MIL-STD 461F |
| • High efficiency – up to 95% | • Operating Altitude up to 5000m | • MIL-STD 704F |
| • 5 Year warranty | • IEC/UL60601-1-2 Edition 4 EMC | • Parallel units with droop current sharing |

APPLICATIONS

- | | | |
|-------------------------|-----------------------|-------------------|
| • Ventilators | • Mobile Applications | • Infusion pumps |
| • Respirators | • Medical Displays | • Endoscopes |
| • Laboratory & Analysis | • Medical Lighting | • Home Healthcare |
| • Dental Equipment | • Medical Lasers | |

CUSTOMER BENEFITS

- | | | |
|------------------------------------|-----------------------------|-----------------------------------|
| • Fast time to market | • Market leading technology | • Scalable power architecture |
| • 24 hrs samples from distribution | • Silent operation | • World class engineering support |
| • Safety & EMC certified | • High Reliability | • Redundant manufacturing sites |

SPECIFICATIONS

All specifications are measured @ $T_A=T_{BASE}=25^{\circ}C$, rated input & rated load unless otherwise stated)

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}
Input Current	300Watts output at 120 V _{RMS} input.			3	Amps
Input Current Limit			5		Amps
Inrush Current	265V _{RMS} , 25°C (cold start).			20	Amps
Fusing	Each line fused (5x20 Fast acting, 1500A breaking capacity).			5	Amps
Efficiency	See graphs.			95	%
Power Factor			0.99		
Holdup	300Watts output at 120V _{RMS} input.	14	16		mS
No load Power consumption	220V _{RMS} .		0.8	1	Watts
Output Power Rating	De-rate linearly from 300Watts at 120V _{RMS} to 212.5 Watts at 85V _{RMS} .			300	Watts
Output Voltage (Initial Setting, -25°C to 125°C)	VCCS300M-12	11.88	12	12.12	V _{DC}
	VCCS300M-24	23.76	24	24.24	
	VCCS300M-48	47.52	48	48.48	
Output Current Rating	VCCS300M-12			25	Amps
	VCCS300M-24			12.5	
	VCCS300M-48			6.25	
Output Power Rating	All Models. De-rate linearly from 300Watts at 120V _{RMS} to 212.5Watts at 85V _{RMS} .			300	Watts
Load Regulation	All Models.	-50		50	mV
Line Regulation	All Models.	-0.1		0.1	%V _O
Ripple & Noise ⁽²⁾	12V Model. 20MHz BW, V _{PKPK} .			1.5	%V _O
	All Other Models. 20MHz BW, V _{PKPK} .			1	%V _O
Minimum Load	All Models.			0	Watts
Transient Response	25% to 75% I _{RATED} , 1A/uS.			6	%V _O
	Recovery to within 10% of V _O .			500	uS
Turn on Rise Time	All Models. 10% to 67% of V _O .		2		mS
Turn on Delay	All Models, All Vin, All loads.		800		mS
Current Share	All Models. Droop mode, Vmax @0% load, Vmin @100% Load.	-2.5%		+2.5%	%V _O
Temperature Coefficient	All Models.	-0.02		0.02	%V _O /°C
Over Current Protection	All Models. Constant current mode.	105	115	125	%I _{RATED}
Short Circuit Protection	All Models. Hiccup mode. Activation Threshold.			80	%V _O
Over Voltage Protection	All Models. Auto Restart.			125	%V _O
Over Temperature Protection	All Models. Auto Restart.	105		125	°C
Reliability ⁽¹⁾	All Models.		1.1		FPMH
Warranty	Standard terms and conditions apply.			5	Years
Size	101.3 (L) x 50.8 (W) x 40.2 (H). See diagram for tolerance details				mm
Weight	310				Grams

Notes

- 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.
- Up to 3% in burst mode with no external capacitance.

SAFETY SPECIFICATIONS

Parameter	Details	Max	Units	Notes
Isolation Voltages	Input to Output (2 MOPP) ⁽¹⁾	4000	V _{AC}	
	Input to Chassis (1 MOPP)	2000	V _{AC}	
	Output to Chassis (1 MOPP)	1500	V _{AC}	
Earth Leakage Current	NC/SFC (Class I), 264Vac, 63Hz, 25°C	<200/<400	µA	
Touch (Enclosure) Leakage Current	NC (Class I/Class II), 264Vac, 63Hz, 25°C	0/<200	µA	
	SFC (Class I/Class II), 264Vac, 63Hz, 25°C	<200/<500		
Patient Leakage Current	NC (Class I/Class II), 264Vac, 63Hz, 25°C	<100/<100	µA	
	SFC (Class I/Class II), 264Vac, 63Hz, 25°C	<100/<200		

Notes

- Use DC equivalent voltage to test assembled unit.
- NC = Normal Condition, SFC = Single Fault condition
- Leakage currents will sum for paralleled units. N units will have N times the leakage current.

INSTALLATION SPECIFICATIONS

Parameter	Details	Parameter	Details
Equipment class	I or II ⁽¹⁾	Flammability Rating	94V-2
Overvoltage category	II	Ingress protection rating	IP10
Material Group	IIIb (indoor use only)	Intended usage environment	Home Healthcare (M)/ Industrial (S)
Pollution degree	2		

1. Conditions of acceptability may apply. See UL report.

ENVIRONMENTAL						
Parameter	Details	Non-Operational		Operational		Units
		Min	Max	Min	Max	
Air Temperature	Operational limits subject to appropriate de-ratings	-51	+85	-40 ⁽¹⁾	70	°C
Humidity	Relative, non-condensing	5	95	5	95	%
Altitude		-200	5000	-200	5000 ⁽²⁾	m
Shock	IEC60068-2-27: Half sine, 3 axes, 3 positive & 3 negative.		50, 11		30,18	g, mS
Vibration	IEC60068-2-6: Sine, 10 – 500 Hz, 3 axes, 1 oct/min., 10 cycles each axis IEC60068-2-64: Random, 5 – 500 Hz, 3 axes, 30 min. MIL-STD-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 g2/Hz, g _{RMS}
Thermal shock	MIL-STD-810G: Method 503.5 Procedure I-C. Multi-cycle. 3 shocks.	-51	85			°C

- Notes
- Some specifications may not be met below -20°C.
 - Additional power derating may be necessary at high altitudes to ensure component temperatures remain within specification.

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

ELECTROMAGNETIC COMPLIANCE – IMMUNITY		
Phenomenon	Basic EMC Standard	Test Details
Electrostatic discharge	IEC61000-4-2	Test level 4: 15kV air, 8kV contact
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
Electrical Fast Transients/bursts	IEC61000-4-4	Test Level 3: (2kV Power, 1kV I/O) 5kHz(ed3) & 100kHz(ed4)
Surges	IEC61000-4-5	Test Level 3: 1kV L-N, 2kV L-E
Conducted disturbances induced by RF fields	IEC61000-4-6	Test Level 3: 10V, 0.15 to 80MHz sine wave AM 80% 1kHz
Power Frequency Magnetic Fields	IEC61000-4-8	Test level 4: 30A/m 50Hz
Voltage Dips	IEC61000-4-11 ⁽²⁾	0% 10ms (Criterion A) 0% 20ms (Criterion B ⁽³⁾) 70% 0.5s, 40% 0.2s (Criterion A at 240V and Criterion B at 100V)
Voltage interruptions	IEC61000-4-11	0% 250/300 cycle as per IEC60601-1-2:2014 (Criterion B) 0% 20mS (Criterion B ⁽³⁾)
Voltage Sag Immunity	SEMI-F47-0706 ⁽²⁾	80% 1s,80% 10s,90% continuous (Criterion A) 70% 0.5s, 50% 0.2s (Criterion A at 240V and Criterion B at 100V ⁽⁴⁾)
Shipboard Electric Power. Voltage Spike Test	MIL-STD-1399, SECTION 300A	Type 1, 115V 60Hz single phase
Conducted susceptibility, power leads	MIL-STD-461F: CS101	30Hz-150kHz
Conducted susceptibility, Bulk cable injection	MIL-STD-461F: CS114	10kHz-200MHz
Conducted susceptibility, Bulk cable injection, impulse excitation	MIL-STD-461F: CS115	
Conducted susceptibility, damped sinusoidal transients, cables and power leads	MIL-STD-461F: CS116	10kHz-100MHz
Radiated susceptibility, Magnetic field	MIL-STD-461F: RS101	30Hz-100kHz
Radiated susceptibility, electric field	MIL-STD-461F: RS103	2 MHz to 40 GHz, 20V
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:
- 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.
 - Tested at nominal range (100V to 240V). Line deratings applied where appropriate.
 - Criterion A is achieved for all input voltages when Pout <= 280W
 - Criterion A is achieved for full power when Vin >=160V or at all input voltages when Pout <= 200W

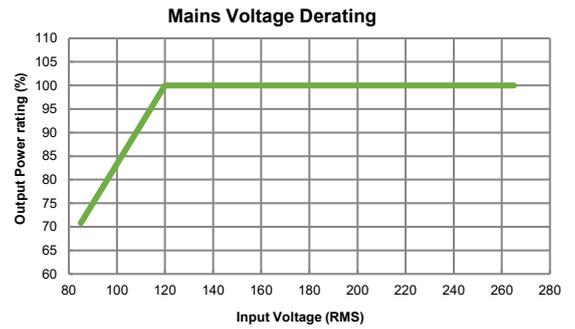
AGENCY APPROVALS		
Standard	Details	File
IEC 60601-1:2005, COR1:2006, COR2:2007, AMD1:2012	Edition 3.1 - Medical electrical equipment— Part 1: General requirements for basic safety and essential performance	
ANSI/AAMI ES60601-1: A1:2012, C1:2009/(R)2012 & A2:2010/(R)2012	Medical electrical equipment— Part 1: General requirements for basic safety and essential performance	UL: E316486
CAN/CSA-C22.2 No. 60601-1:14	Medical electrical 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	
Approval certificates available at www.vox-power.com		

POWER RATINGS

Mains Voltage Derating ⁽⁴⁾

Mains Voltage Derating Table		
Mains Voltage (V _{RMS})	Output Power	(%)
120	300	100%
110	275	91.7%
100	250	83.3%
90	225	75.0%
85	212.5	70.8%

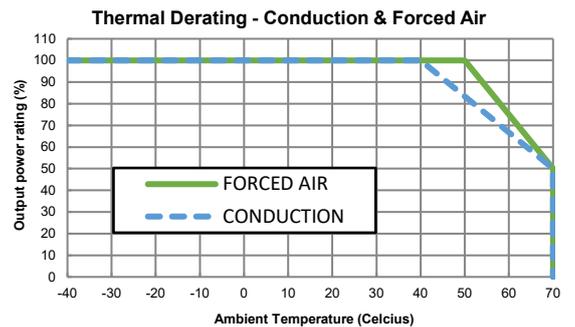
The output power must be de-rated by 2.5% for every 3 volts below 120V_{RMS}, down to a minimum of 85V_{RMS}.



Thermal Derating - Conduction & Forced Air Cooled ^(3,4)

Thermal Derating Table – Conduction & Forced Air		
T _{AMBIENT} (°C)	Conduction (%)	Forced Air (%)
-40	100%	100%
40	100%	100%
50	83.3%	100%
70	50.0%	50%

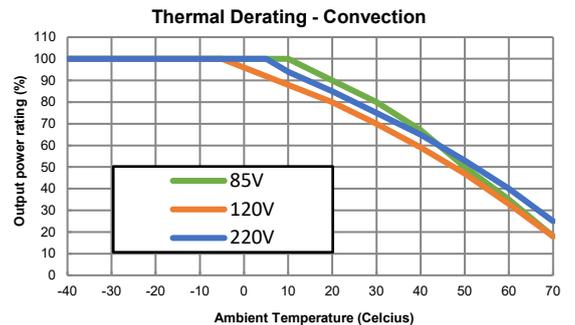
1. The conduction cooled rating for all models applies under the following conditions.
Baseplate temperature ⁽²⁾ ≤ T_{AMBIENT} + 15°C
2. The forced air rating for all models applies for 1MS⁻¹ (200LFM). See *Mechanical Dimensions and Mounting* section for Airflow direction.
3. Mounted with baseplate at the bottom, 40mm above surface.



Thermal Derating - Convection Cooled ^(3,4)

Thermal Derating Table – Convection			
Ambient Temperature	85V _{RMS} ⁽²⁾ (%)	120V _{RMS} (%)	220V _{RMS} (%)
-40	100%	100%	100%
-5	100%	100%	100%
5	100%	92%	100%
10	100%	88%	94%
20	90%	80%	85%
30	80%	70%	75%
40	67%	59%	65%
50	50%	47%	53%
60	25%	33%	40%
70	18%	18%	25%

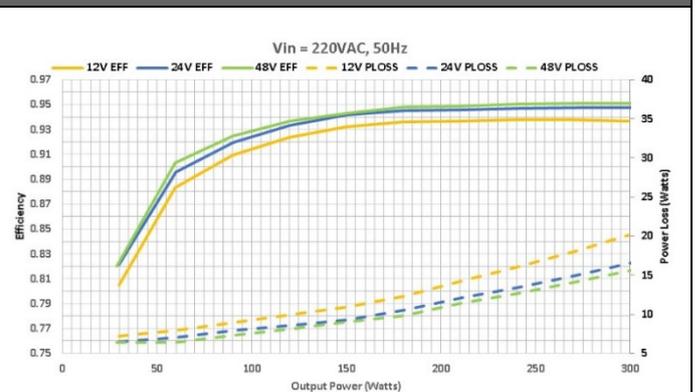
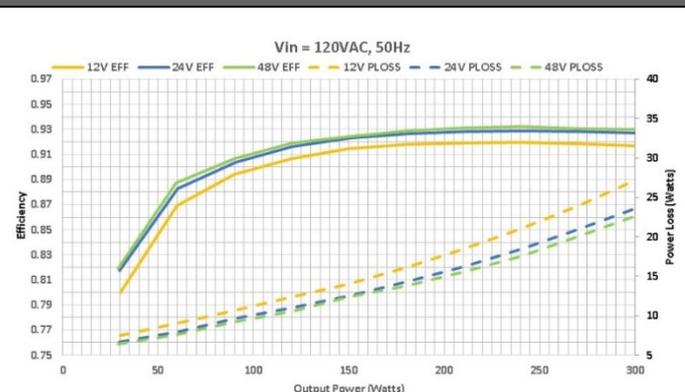
- The convection cooled rating applies under the following conditions,
No forced airflow or conduction cooling. The VCCS300 is mounted horizontally.
- Mains voltage deratings apply at 85V_{RMS}.



Notes:

1. Ambient air temperature is the air temperature immediately surrounding the PSU. If the PSU is mounted within an enclosure, the internal enclosure ambient temperature should be used.
2. Baseplate temperature is measured at baseplate temperature sensing location TP1. See *Mechanical Dimensions and Mounting* section for Airflow direction.
3. Thermal deratings are derived from maximum component temperatures under controlled conditions. Component temperatures must be verified in the end application as described in the "Component Temperatures" section of the user manual.
4. **Mains Voltage deratings are cumulative with thermal deratings.**

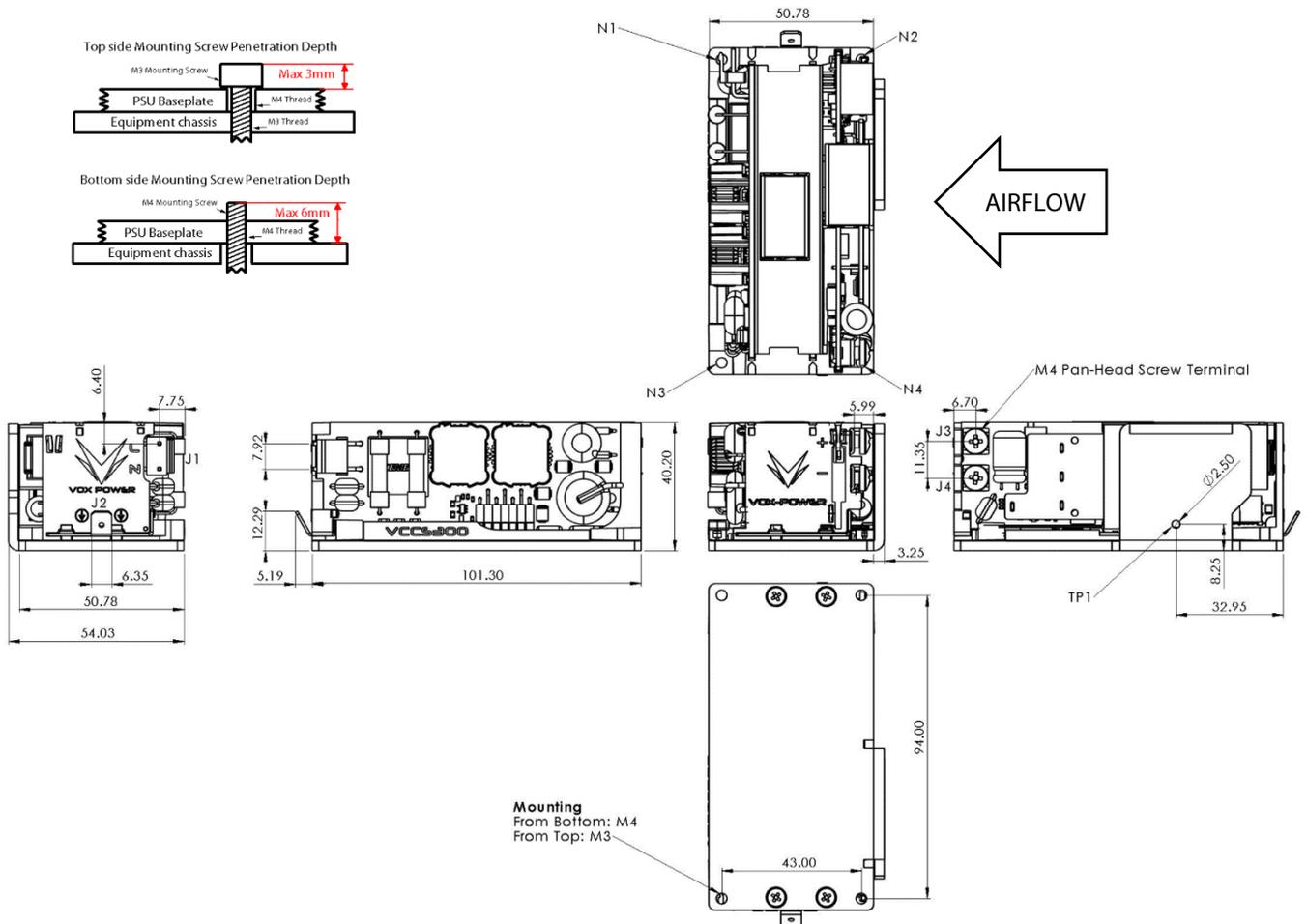
TYPICAL EFFICIENCIES



MECHANICAL DIMENSIONS AND MOUNTING

SCREWS

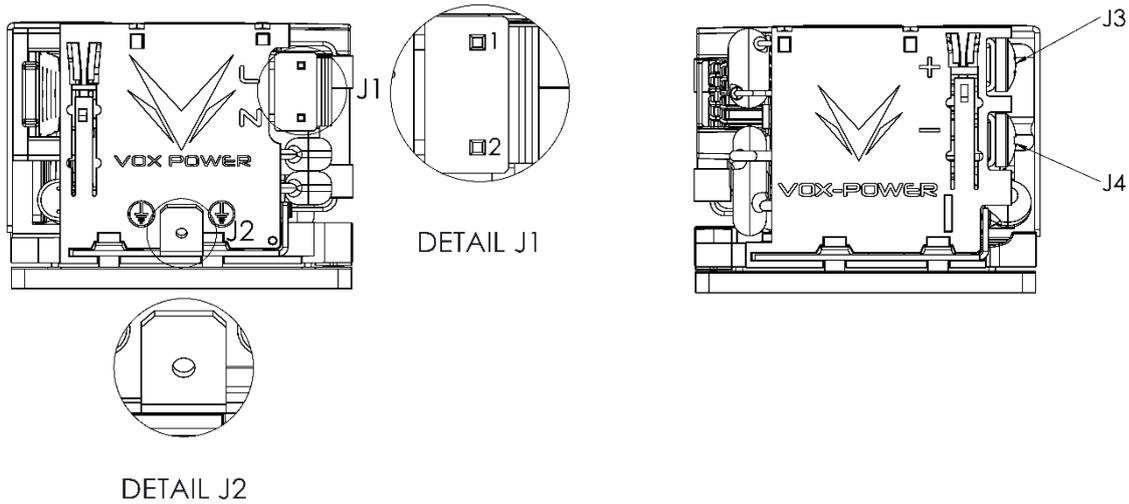
Location	Details	Penetration	Tightening
Baseplate Mount (Screw from top side): N1 – N4 ⁽¹⁾	M3 Hex Socket Head Cap Screw	3mm Head height	0.50NM
Baseplate Mount (Screw from bottom side): N1 – N4	M4 - Customer Preference	6mm from bottom of Baseplate	0.55NM
Output Terminal	M4 SEM POZI	M4 SEM screw, 8mm max length	0.55NM



Notes

- Top Side mounting screws are obstructed by components in some areas. M3 Hex socket screws should be used to allow angled access for tightening with a 2.5mm hex ball screwdriver. Care should be taken to ensure components are not damaged while tightening.

CONNECTOR DETAILS



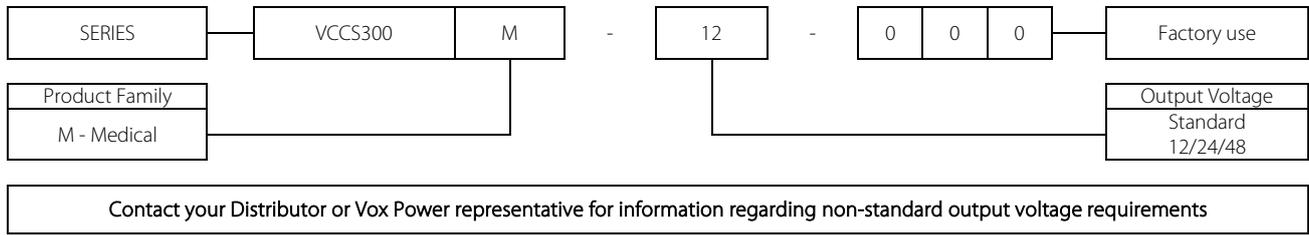
MATING CONNECTORS

Ref.	Details	Manufacturer	Housing	Terminal
J1 - Mains Input Cct. 1 - Live, Cct. 2 - Neutral	2 Pin, 7A, 250V _{AC} , 7.92mm Locking ⁽¹⁾	JST	VAR-2	SVA-41T-P1.1
J2 - Protective Earth	FASTON, PIDG series, Positive lock 0.25EX	TE Connectivity	-	165536-1
J3 - Positive Output Power J4 - Negative Output Power	M4 terminal, 0.55Nm	KST	-	SNBS5-4

Notes

1. Cable 18-20AWG, 300V, >7A, 105°C.
2. Direct equivalents may be used for any connector parts.
3. All cables must be rated 105°C min, equivalent to UL1015

PART NUMBERING SYSTEM



All specifications are believed to be correct at time of publishing. Vox Power Ltd reserves the right to make changes to any of its products and to change or improve any part of the specification, electrical or mechanical design or manufacturing process without notice. Vox Power Ltd does not assume any liability arising out of the use or application of any of its products and of any information to the maximum extent permitted by law. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any products of Vox Power Ltd. VOX POWER LTD DISCLAIMS ALL WARRANTIES AND REPRESENTATIONS OF ANY KIND WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF SUITABILITY, FITNESS FOR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT. Please consult your local distributor or Vox Power directly to ensure that you have the latest revision before using the product and refer to the latest relevant user manual for further information relating to the use of the product. Unless specifically otherwise agreed in writing by Vox Power, products sold by Vox Power are not intended for use in connection with life support systems, human implantations, nuclear facilities or systems, aircraft spacecraft, military or naval missile, ground support or control equipment used for the purpose of guidance navigation or direction of any aircraft spacecraft or military or naval missile or any other application where product failure could lead to loss of life or catastrophic property damage. The user will indemnify and hold Vox Power harmless from any loss, cost or damage resulting from its breach of the provisions.