P R
B X

POWERBOX Defense Line 600
DBB Series
600W
AC/DC Conduction Cooled
Manual

Table of Contents

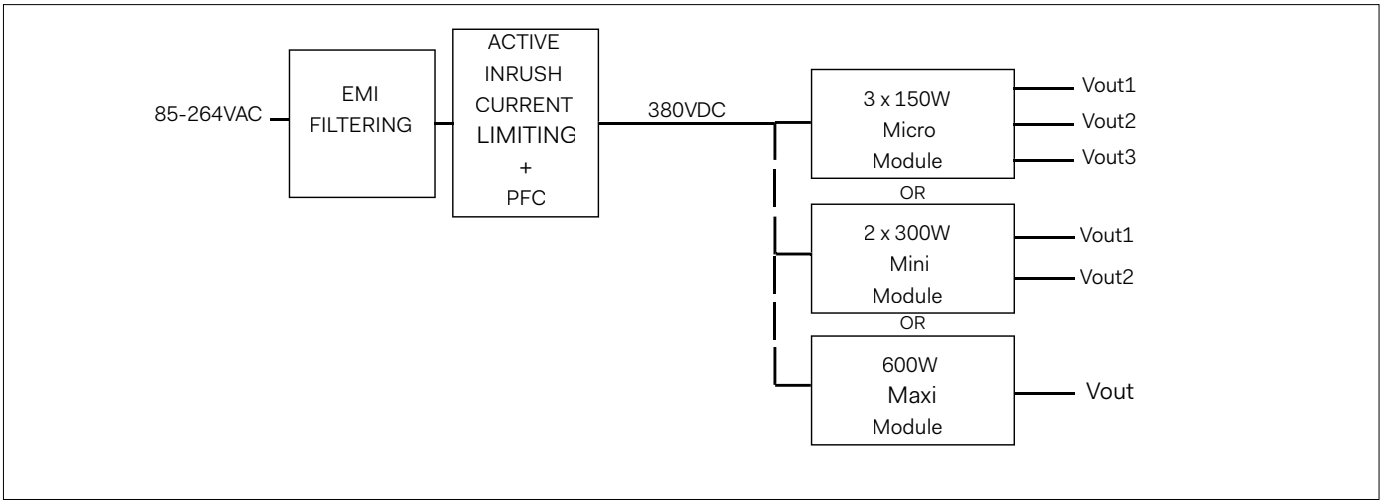
1. Introduction

The DBB, very compact and low profile 600W AC/DC power supply in chassis format, incorporates input filtering, input and output protections, very robust mechanical mounting and connection, conformal coating and MIL-STD options required in most of the severe environments for industrial, defense applications. The PSU provides high reliability, high efficiency, input-to-output isolation, soft start and active very low inrush circuit, overtemperature protection, input over/undervoltage lockout. The PSU is configurable with 1 to 3 outputs in many output voltages from 3V3 to 48VDC, other outputs are even possible as semi-standard versions, they are countinuously short-circuit proof. The 100°C baseplate allows operation in high temperature environment.

2. Features

- 85-264VAC input voltage range, PFC
- 1-3 isolated outputs
- 200*127*40mm very low profile
- Industrial or ruggedized versions
- Active very low inrush current
- Many output configurations available
- Conduction cooled 100°C baseplate
- Safety IEC/EN 60950-1
- RoHS lead-free-solder compliant

3. Block Diagram



4. Options Description

MIL-STD ruggedized (-M)
Meet MIL-STD 461E CE102, MIL-STD 1399-300A, MIL-STD810F shock & vibrations. No laboratory certification.

-40°C operation (-T)
The thermal grade of the DC/DC converters used and other components are changed to comply with low ambient temperature.

Conformal coating (-V)
During manufacturing process, when V option is specified, components and pcb are covered with an acrylic coating to address high level of ambiant humidity application.

Heatsink (-H, -H1)
-H: a 15 mm heatsink is mounted on the baseplate with longitudinal fins.
-H1: a 15 mm heatsink is mounted on the baseplate with transversal fins.

Thermal impedance of -H and -H1 heat sinks are 1,28°C/W in free air convection and 0,4°C/W in 2 m/s air flow.

IP-enclosure (-IP)
IP65 sealed enclosure.

5. Input

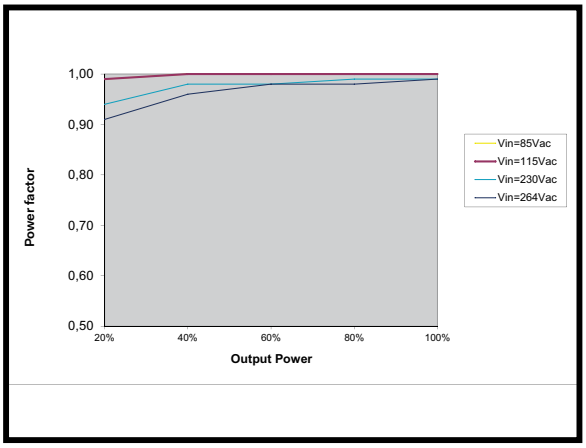
Operating input voltage
85-264VAC. 100-350VDC.
Frequency
44Hz min, 50Hz typ, 440Hz max.
Power factor
0.96 typ, 0.98 max, 230VAC, 50Hz, Pnom.
Input current
16A at Vin min.
No-load input power
15W at Vin typ.
Peak inrush current
4A typ, 10A max at Vin max.
Start-up time
2s typ, 5s max.

Input fuse
A fuse mounted inside the psu protects against damages in case of a failure. The fuse is not user-accessible without opening the unit. In DC mode, reverse polarity at the input is protected and will not cause the fuse to blow.

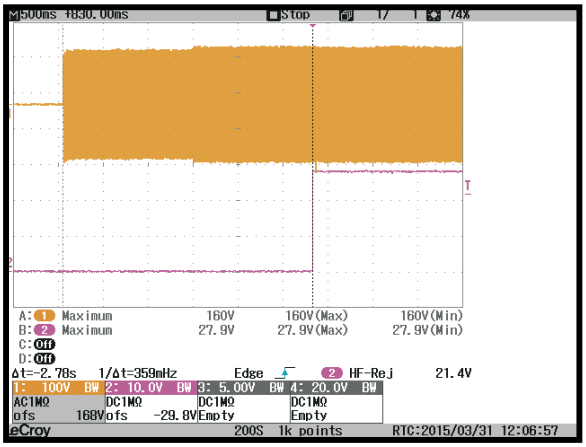
Fuse type
Littelfuse, 10A, 0451010.MRL.

Transient protection
A VDR (Voltage Dependent Resistor) and a common mode input filter form an effective protection against input transients in severe environments.

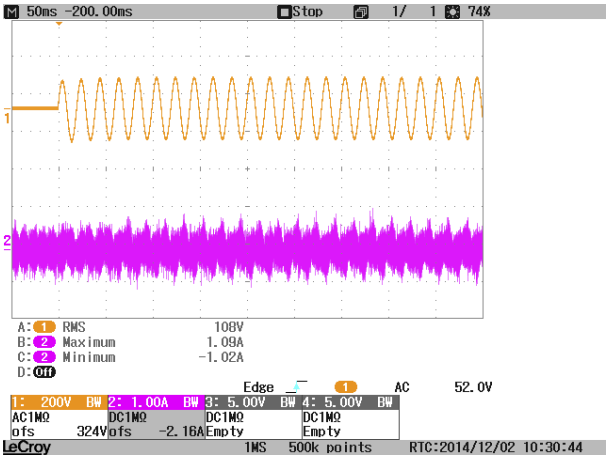
Power factor curve - DBB-28600-MTV-IP



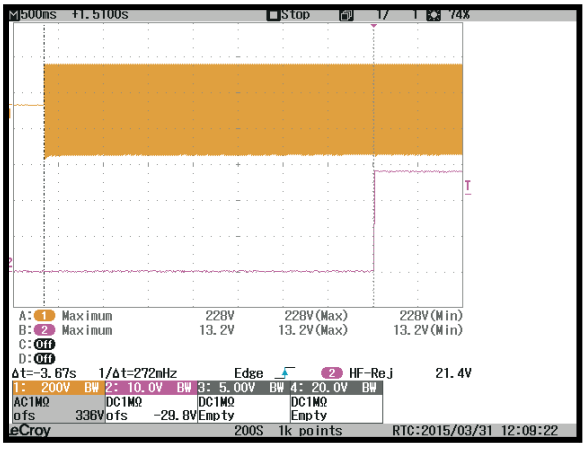
Establisment time curve 115VAC 50Hz - DBB-28600-MTV-IP



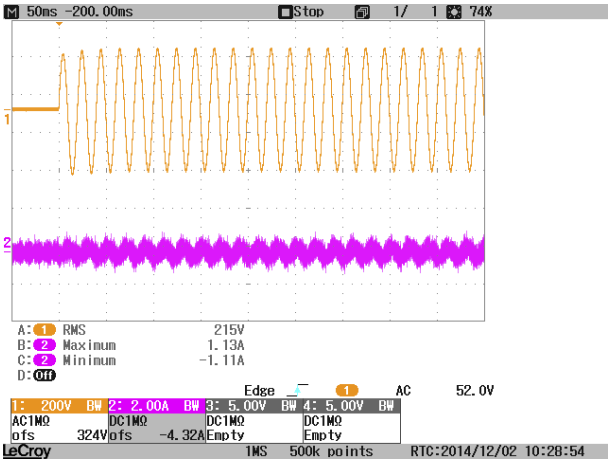
Inrush current at 115VAC - DBB-28600-MTV-IP



Establisment time curve 230VAC 50Hz - DBB-28600-MTV-IP



Inrush current at 230VAC - DBB-28600-MTV-IP



6. Output

Output		**3V3**			**5V**			**12V**			**15V**			**24V**			**28V**			**48V**		
Characteristics	**Conditions**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**min**	**typ**	**max**	**Unit**
Output voltage			3V3			5			12			15			24			28			48		V
Trim range	Factory set	3		3.6	4.5		5.5	10.8		13.2	13.5		16.5	21.6		26.2	25.2		30.8	43.2		51.8	V
Overvoltage protection				4.5			6.5			14.9			18.5			29.1			34			58	V
Output noise	20Mhz		100			100			150			150			150			150			200		mVpp
Efficiencyf			75			83			85			84			85			83			84		%
Load regulation	Vin nom			1			1			0.5			0.5			0.4			0.4			0.4	%
M board		**includes 1 M module below**																					
Output current		0		80	0		80	0		50	0		40	0		25	0		21.5	0		12.5	A
Max power				264			400			600			600			600			600			600	W
Output current limit			92	104		92	108		57.5	67.5		46	56		29	39		24	29		14	17	A
m board		**includes up to 2 m modules below**																					
Output current		0		45	0		40	0		25	0		20	0		12.5	0		10.7	0		6.25	A
Max power				150			200			300			300			300			300			300	W
Output current limit			54	64		46	52		29	35		23	26		14.5	17		12.5	14.5		7.2	8.2	A
µ board		**includes up to 3 µ modules below**																					
Output current		0		22.7	0		20	0		12.5	0		10	0		6.25	0		5.3	0		3.1	A
Max power				75			100			150			150			150			150			150	W
Output current limit			25	31		23	26		14.5	17		11	14		7.2	8.2		6.2	7		3.6	4.4	A

See "options and configurations" section for all the power possibilities.

General conditions: 25°C ambient. For each output voltage max. power configuration.

Parallel operation

Parrallel operation is possible in the same unit or between different units for m-boards, M-boards and dual M-board with active current sharing through the PR signal. The outputs put in parallel MUST be exactly the same, all OUT+ connected together and all OUT- connected together when PR are linked (risk of damage otherwise).

Redundant systems operation

When systems require a very high level of reliability and should work normally in the event of a failure, N+1 redundancy is implemented where N is the number of converter to support power requirement. If one converter fails, the remaining ones still delivers the power to the loads. Redundant operation requires external oring diodes.

Hold-up time

The psu provides internal hold-up time (see curve).

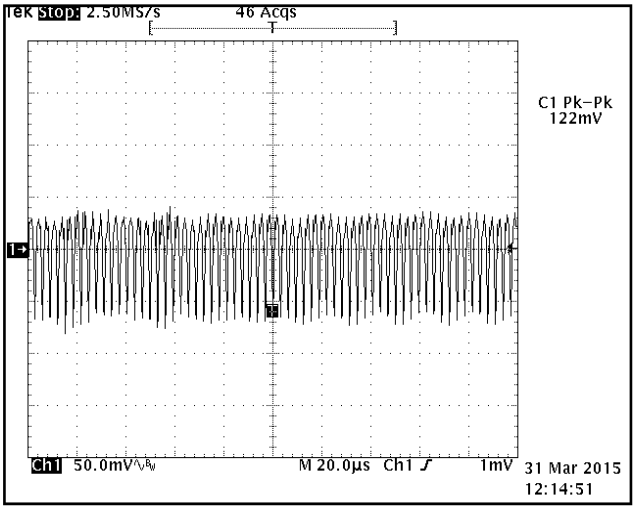
Output current limitation

All outputs are continously protected against short-circuit by a constant current limitation (no foldback) with automatic recovery. See Table 6 for values.

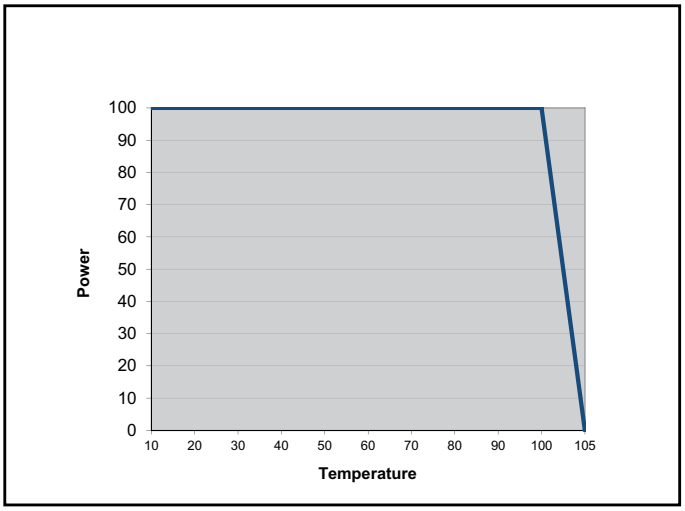
Overvoltage protection

An OVP is incorporated on each output. All outputs are cut if an OVP is detected. This protection is latch style (Recovery after AC reset or inhibit).

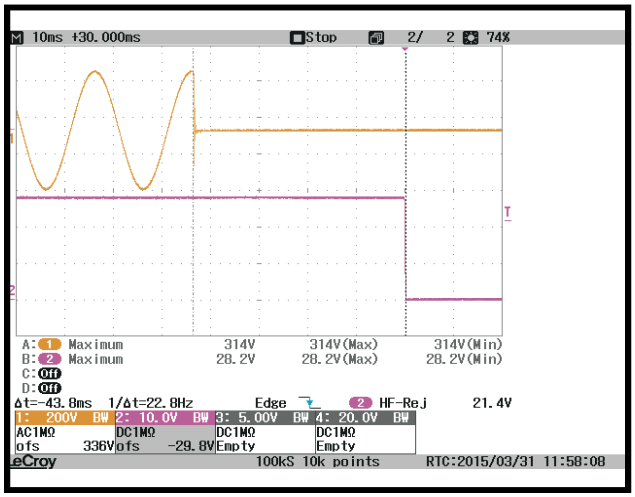
Waveforms output noise - DBB-28600-MTV-IP



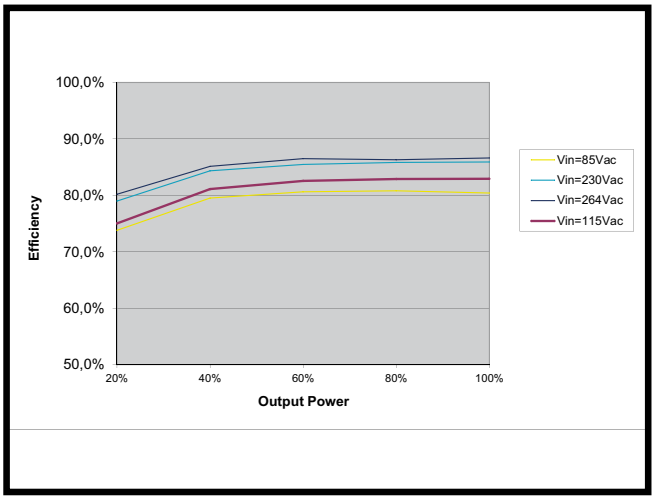
Derating - DBB-28600-MTV-IP



Hold up time - DBB-28600-MTV-IP



Efficiency curve - DBB-28600-MTV-IP



7. Auxiliary Functions

Remote on/off (INHIB)

An isolated INHIB signal disables corresponding output voltage when connected to RTN. Outputs inhibited: INH level LOW.

Output voltage adjustment (ADJ)

Output can be ajusted 90-110 % Vnom. with the potentiometer at the output side or by an external voltage 0,6 to 1,25V max. referred to RTN.

Remote sense (+S -S)

This feature enables compensation of voltage drop across the connector contacts and the load lines. Remote Sense, max 0,5V per line compensation (If local sense, connect locally S+ to OUT+ and S- to OUT- of the corresponding output).

Output type	Total drop	Positive line drop
V1, V2	<0.5V	<0.25V

Power good & LED (Pgood+ Pgood-)

Collector isolated optocoupled signal referred to RTN, closed when all outputs voltages are OK. Led is also available for each output.

Auxiliary bias voltage (+5VAUX)

Auxiliary supply limited to 200mA. Referred to RTN.

Paralleling signal (PR)

Parallel only identical outputs (voltage and power). Outputs in parallel will current share when their corresponding PR are connected together. When outputs are coming from different boards, RTN have to be connected together.

8. Electromagnetic

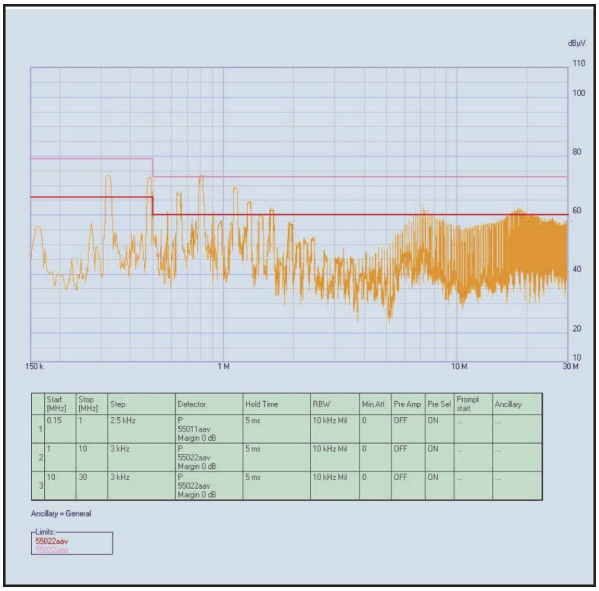
Immunity		Standard		Level	Value	Waveform	Source imped.	Test procedure	Mode	Criteria
Surges	Built to meet	EN61000-4-5	DM	3	1kV	1,2/50µs	12 ohms		OP	B
			CM		2kV	1,2/50µs	12 ohms		OP	A
Electrostatic discharge	Built to meet	EN61000-4-2		4	8kV	1/50µs	330 ohms	10 pos, 10 neg	OP	B
Fast transients/burst	Built to meet	EN61000-4-4		4	4kV	5/50µs	50 ohms		OP	B

Note: Built to meet EN 61000-4, -3, -11, Harmonics EN 61000-3-2, Flickers EN 61000-3-3.

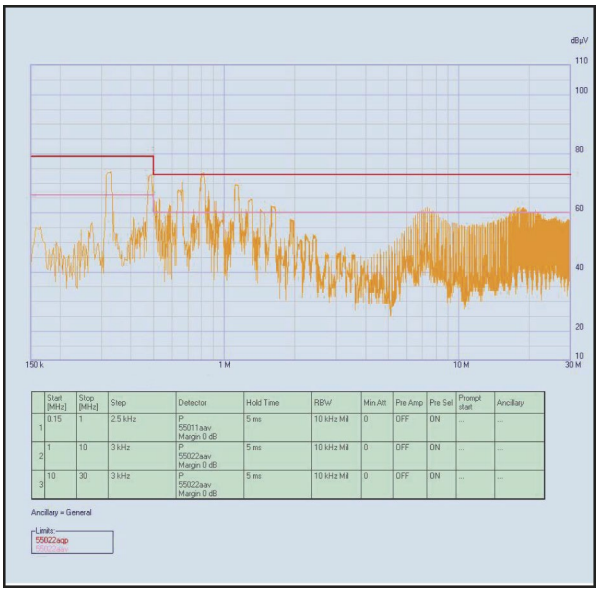
Emissions

Depending to the configurations, EMI-results could change. Add an external filter to comply to EN55022A and MIL-STD461E CE102.

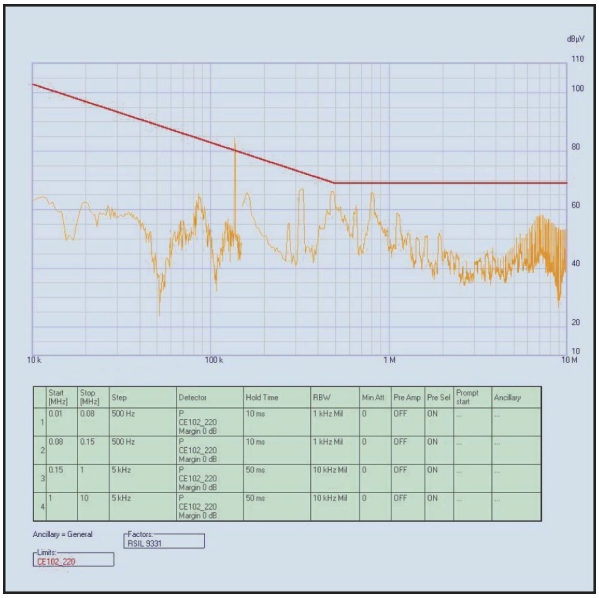
According to EN55022A IN 230VAC OUT 600W Neutral for DBB-28600-MTV-IP



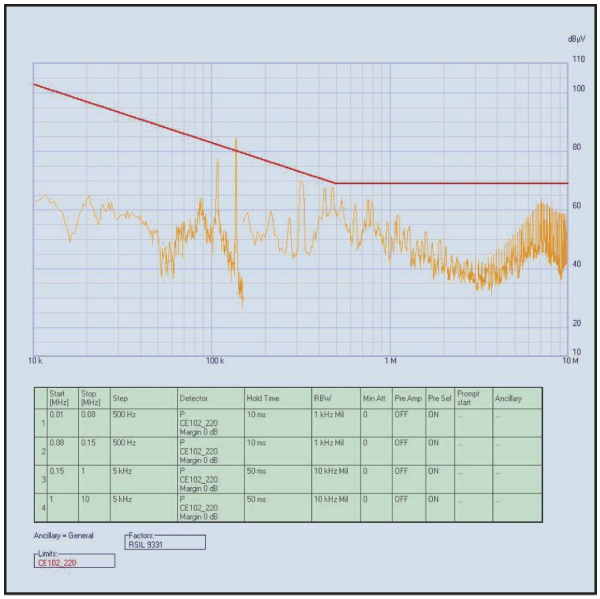
According to EN55022A IN 230VAC OUT 600W Phase for DBB-28600-MTV-IP



According to MIL-STD461E CE102 - 220V 600W Neutral for DBB-28600-MTV-IP



According to MIL-STD461E CE102 - 220V 600W Phase for DBB-28600-MTV-IP



9. Environmental

Thermal considerations

When a converter is mounted in conduction cooled, the temperature measured on the baseplate should not exeed 100°C. When heatsink option is used in convection cooling and is operating at its nominal output power at the max. ambiant temperature, the temperature measured on the heatsink should not exceed 100°C.

Thermal protection

A temperature protection (OTP) is integrated in each output module, disabling output when baseplate temperature exceeds 105°C (+/-5°C). The converter automatically restarts, when the temperature drops below 70°C . Nevertheless, exceeding the max operating temperature may cause failures of the converter.

Temperature		**Standard**			**T option**			
Conditions		**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
Ambient	Operating (see derating)	-20		+71	-40		+71	°C
Heatsink		-20		+100	-40		+100	°C
Storage	Not operating	-40		+125	-40		+125	°C

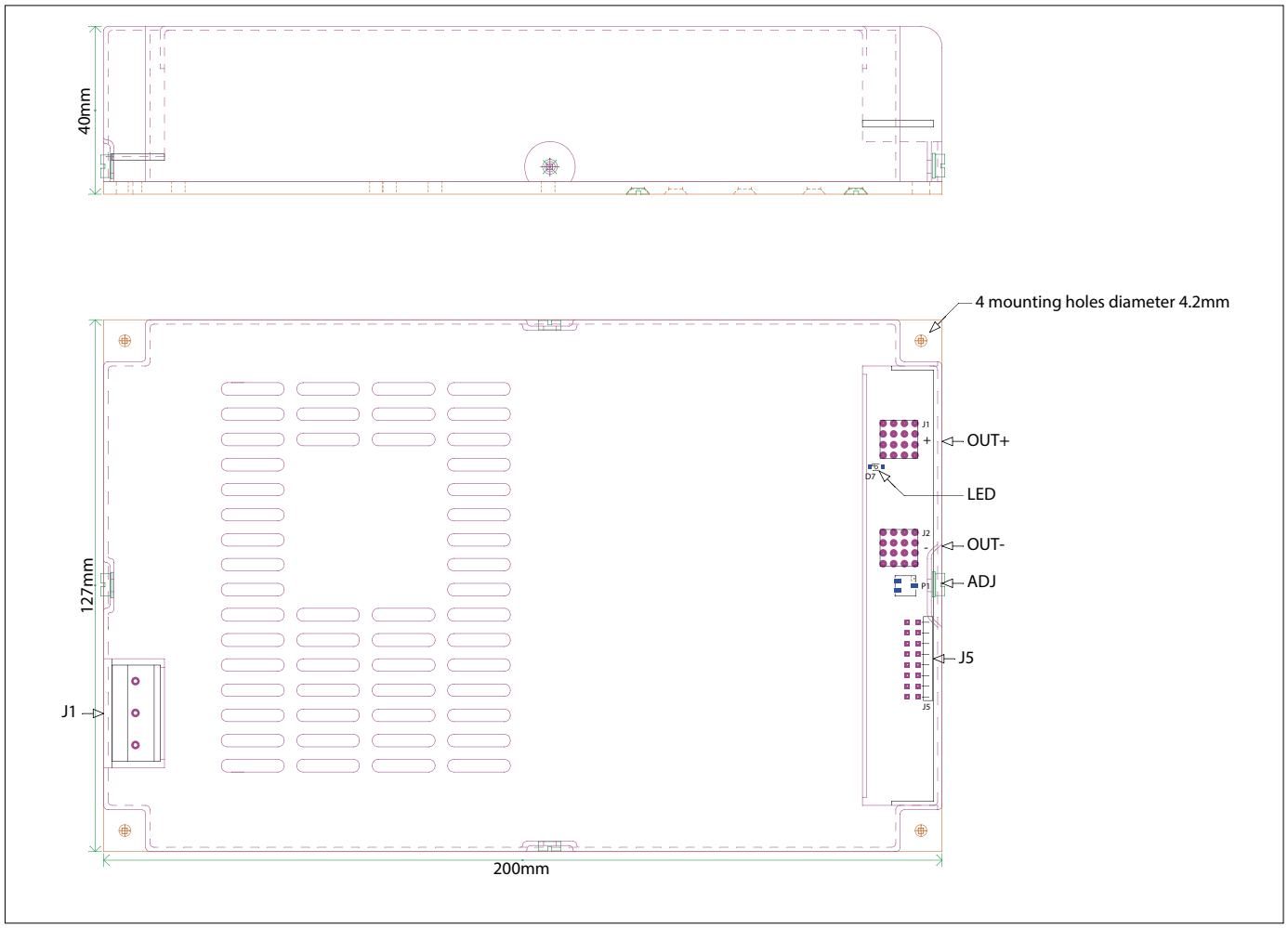
In operation, there is no power derating as long as the baseplate temperature is in the below indacated range.

Immunity to Environmental Conditions

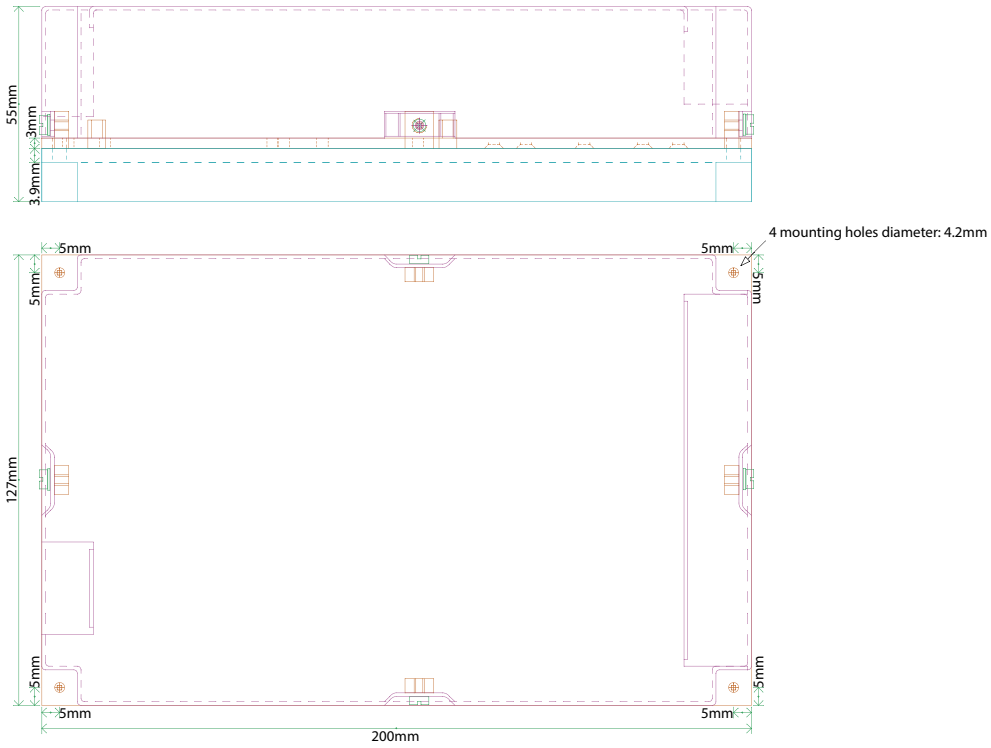
Test Method	**Standard**	**Test Conditions**	**Status**
Damp heat	MIL STD 810F Proc. 507.4	Humidity 93%, 40°C, 56 days	Option (-V), built to meet
Shock	MIL STD 810F Proc. 516.5	20g/18ms half size, 5g/30ms	Option (-M), built to meet
Vibration	MIL STD 810F Proc. 514.5	4-80Hz (2,8m/s^2) /2Hz, non operating 160-500Hz, (0,175m/s^2)^2/Hz, non operating	Option (-M), built to meet

10. Mechanical

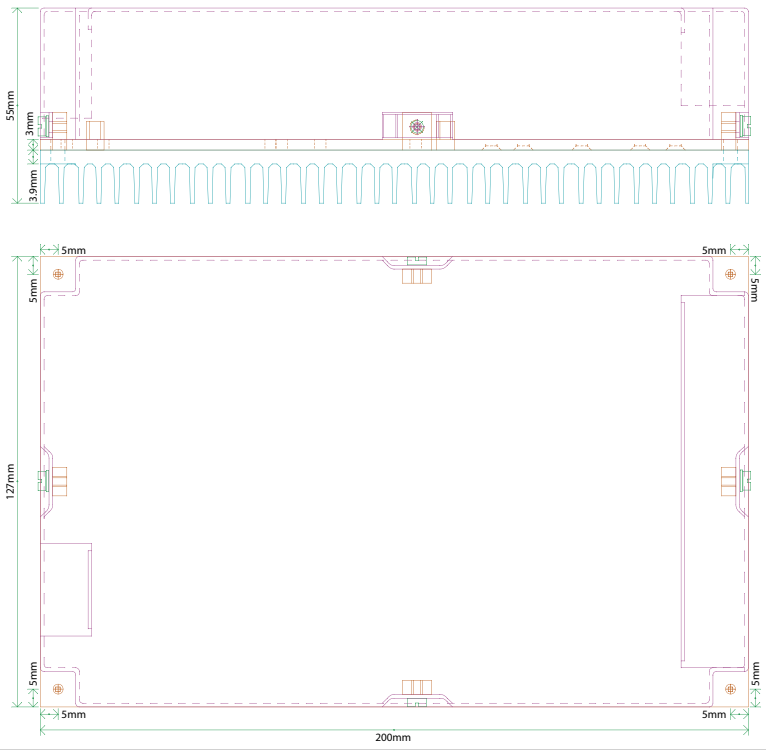
Size: 200 x 127 x 40 mm.
Aluminum Natural.
Weight Approx 1,02 kg.



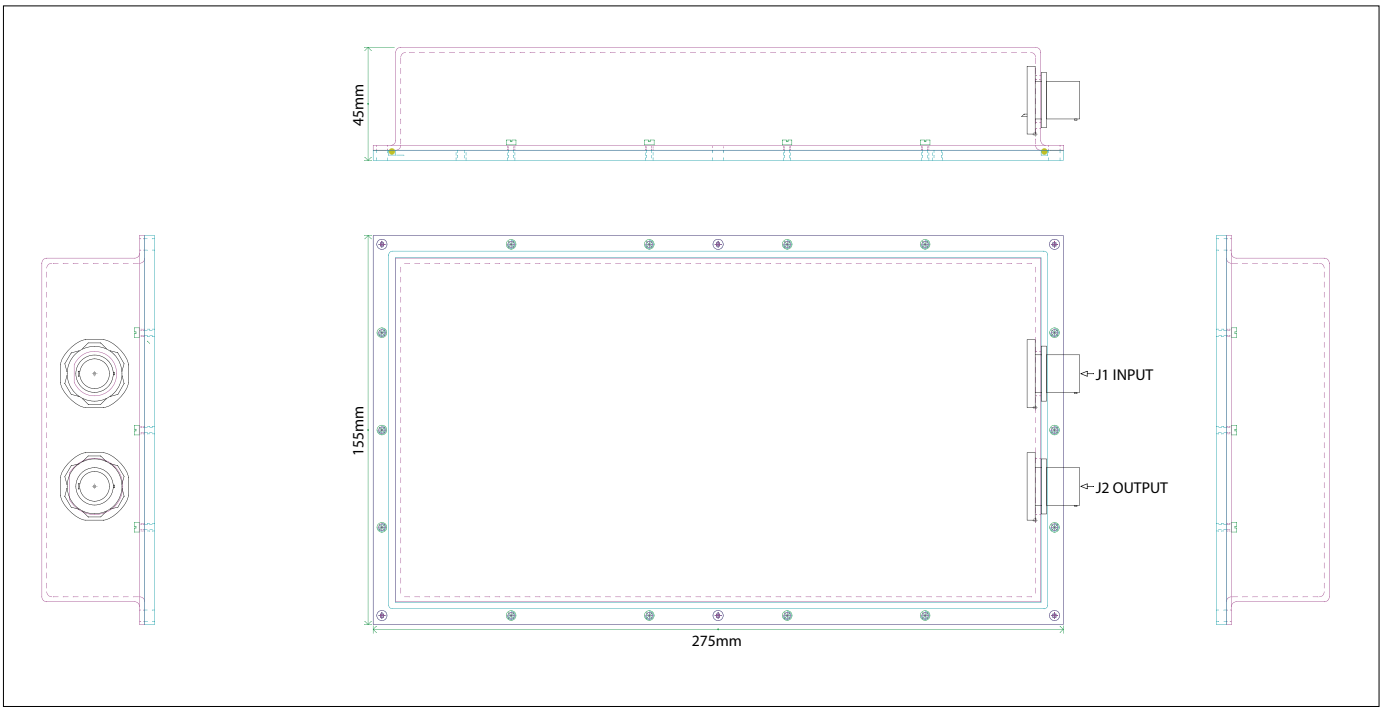
H option



H1 option

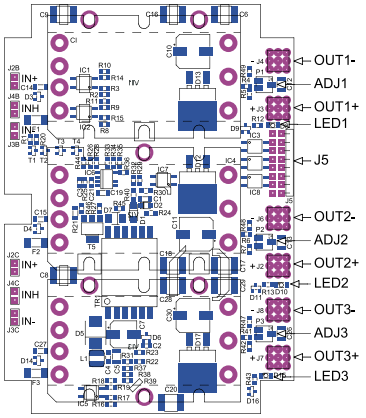


IP option

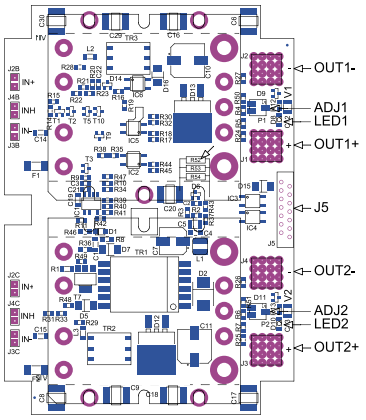


11. Connector Pin Allocation

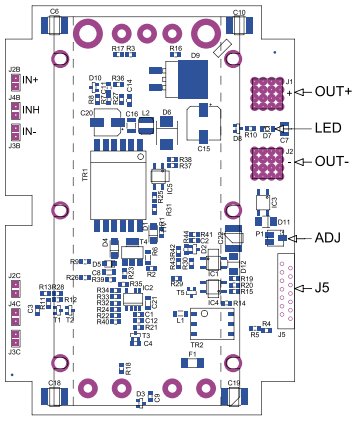
Description	Pin	Connector
Input screw type connector GMKDS 3/3-7.62		
1	J1-1	Earth
2	J1-2	Neutral AC/N
3	J1-3	Line AC/L
Output M-board power connectors		
OUT+	J1	Würth Press-Fit M4 Ref : 7461095
OUT-	J2	Würth Press-Fit M4 Ref : 7461095
Output m-board power connectors		
OUT1+	J1	Würth Press-Fit M3 Ref : 7461093
OUT1-	J2	Würth Press-Fit M3 Ref : 7461093
OUT2+	J3	Würth Press-Fit M3 Ref : 7461093
OUT2-	J4	Würth Press-Fit M3 Ref : 7461093
Output µ-board power connector 6 Pins Male		
OUT1+	J1-1	Würth Press-Fit M3 Ref : 7461093
OUT1-	J1-2	Würth Press-Fit M3 Ref : 7461093
OUT2+	J1-3	Würth Press-Fit M3 Ref : 7461093
OUT2-	J1-4	Würth Press-Fit M3 Ref : 7461093
OUT3+	J1-6	Würth Press-Fit M3 Ref : 7461093
OUT3-	J1-7	Würth Press-Fit M3 Ref : 7461093
Signals Wurth 690368191472 Female 2*7 pins		
µ-board	m-board	M-board
J5-1 : ACFAIL	J5-1 : ACFAIL	J5-1 : ACFAIL
J5-2 : PGOOD	J5-2 : PGOOD	J5-2 : PGOOD
J5-3 : RTN	J5-3 : RTN	J5-3 : RTN
J5-4 : INHIB	J5-4 : INHIB	J5-4 : NC
J5-5 : +5VAUX	J5-5 : +5VAUX	J5-5 : +5VAUX
J5-6 : S1+	J5-6 : S1+	J5-6 : NC
J5-7 : S1-	J5-7 : S1-	J5-7 : NC
J5-8 : ADJ1	J5-8 : ADJ1	J5-8 : NC
J5-9 : NC	J5-9 : PR1	J5-9 : PR1
J5-10 : NC	J5-10 : NC	J5-10 : NC
J5-11 : ADJ2	J5-11 : PR2	J5-11 : INHIB
J5-12 : S2+	J5-12 : S2+	J5-12 : S1+
J5-13 : S2-	J5-13 : S2-	J5-13 : S1-
J5-14 : ADJ3	J5-14 : ADJ2	J5-14 : ADJ1



DBB µ-board



DBB m-board



DBB M-board

12. Safety and Installation

These converters are components, intended exclusively for integration into other equipment by an industrial assembly process or by a professionally competent person. Installation must strictly follow the safety regulations in respect of the enclosure, mounting, creepage and clearance distances, markings of the end-use application. Connection to the system shall be made via the Würth press-fit connectors. The AC/L is internally fused. This fuse is designed to protect the converter against overcurrent caused by a failure, but may not be able to satisfy all requirements. External fuses in the wiring circuit to one or both input pins may be necessary to ensure compliance with local requirements. Do not open the PSU, or the warranty will be invalidated. Make sure that there is sufficient thermal baseplate dissipation (max. temperature: 100°C). This should be verified by measuring the case of temperature at the specified measuring point, when the converter is operated in the end-use application.

Standards and Approvals

The converters are built to meet the safety standards IEC 60950-1, EN 60950-1. 'Built to meet' mentioned in the different paragraphs of the datasheet means that Powerbox has designed the product to meet the standard but not certified it in a laboratory. 'Qualified' means that the test has been made in a certified laboratory.

Cleaning Agents and Process

The converters are not hermetically sealed. In order to avoid possible damage, any penetration of liquids shall be avoided.

Isolation

The electric strength test is performed in the factory in accordance with IEC/EN 60950.

Electric Strength

Characteristic		Input to Earth	Input to Output	Output to Earth	Output to Output	Unit
Electric strength	Design strength	1500	3000	500		Vrms
	Factory test for production	2000	2000	500		Vdc
Insulation resistance				> 100	>100	Mohms

Reliability

MIL-HFBK-217F, notice 2	Model	Heatsink Temp	GB	GF
MTBF (Hours)	DBB	40°C	285000	16500
		70°C	139000	82300
		100°C	86600	51000

MTBF-calculation for a specific part number has to be ordered.

12. Options and Configuration

Input Stage DBB	**Position A**			
Vin	1	2	3	For µ-board
	1	2		For m-board
	1			For M-board

DBB -	**OUT1**	**OUT2**	**OUT3**	**-**	***)**
	µ	µ	µ		
	m	m			
	M				
	m	m			
	M				

***)Options**

H : Heatsink longitunal fins
H1 : Heatsink transversal fins
IP : IP65 enclosure
M : Ruggedized
T : -40°C
V : Conformal coating

µ-µ-µ : µ-board out1, out2, out3 : Up to 3 outputs with µ-modules from 2V to 48VDC 150W.

µ		**µ**		**µ**	
V	**W**	**V**	**W**	**V**	**W**
N	N	N	N	N	N
2	50	2	50	2	50
3V3	50, 75	3V3	50, 75	3V3	50, 75
5	50, 100	5	50, 100	5	50, 100
8	100	8	100	8	100
12	75, 150	12	75, 150	12	75, 150
15	75, 150	15	75, 150	15	75, 150
24	75, 150	24	75, 150	24	75, 150
28	75, 150	128	75, 150	28	75, 150
36	75, 150	36	75, 150	36	75, 150
48	75, 150	48	75, 150	48	75, 150

m-m : m-board out1, out2 : Up to 2 outputs with m-modules from 2V to 48VDC 300W.

m		**m**	
V	**W**	**V**	**W**
N	N	N	N
2	100	2	100
3V3	100, 150	3V3	100-150
5	150, 200	5	150, 200
8	200	8	200
12	200, 300	12	200, 300
15	200, 300	15	200, 300
24	200, 300	24	200, 300
28	200, 300	28	200, 300
36	200, 300	36	200, 300
48	200, 300	48	200, 300

M : M-board: 1 output with M-module from 2V to 54VDC 600W.

M	
V	**W**
N	N
2	160
3V3	200, 264
5	300, 400
8	300, 400
12	400, 600
15	400, 600
24	400, 600
28	400, 600
32	600
36	400, 500, 600
48	400, 600
54	600

Empty slots are filled with "NN"

Example :

DBB-48150-48150-48150-M (1 microboard with 3 outputs of 48V 150W with MIL-STD option).
DBB-3V375-5100-12150 (1 microboard with 3 different outputs).