

P R B X

POWERBOX Defense Line 150
DBD Series
Up to 150W Single Output
AC/DC Rugged Power Supply
Manual

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1. Introduction

The DBD series, very compact and low profile 150W AC-DC power supply in chassis format, incorporates input filtering, input and output protections, very robust mechanical mounting and connection, optional conformal coating and MIL-STD options required in most of the severe environment for industrial and defense applications. The PSU provides high reliability, high efficiency, input-to-output isolation, soft start and active very low inrush current, overtemperature protection, input over/undervoltage lockout. The PSU is configurable in many output voltages from 2V to 48VDC and other outputs are possible as semi-standard version. Outputs are continuously short-circuit proof. The 100°C baseplate allows operation in high temperature environment.

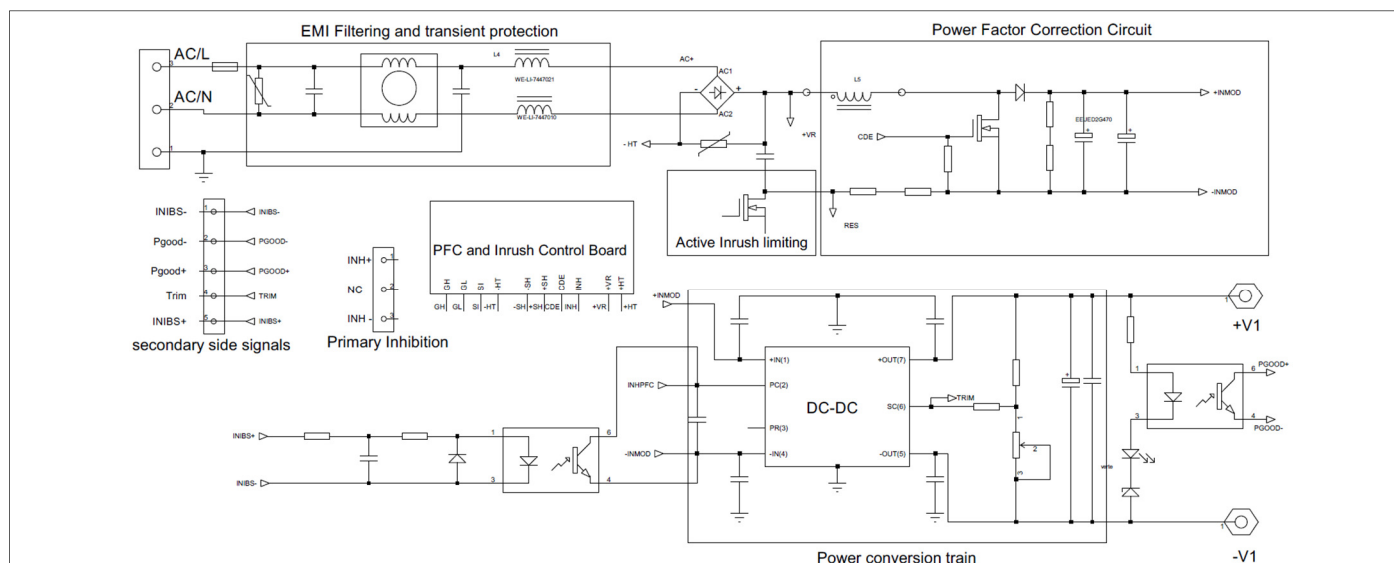
2. Features

85-264VAC, 47-440Hz or 100-350 VDC Input voltage ranges

1 isolated output up to 150W

Active very low inrush current limiting circuit

4. Block diagram



165 x 61 x 35mm very low profile

Industrial or ruggedized for harsh environment

Many output configurations available

Conduction cooled 100°C baseplate

Safety IEC/EN 62368-1, RoHS lead-free-solder compliant

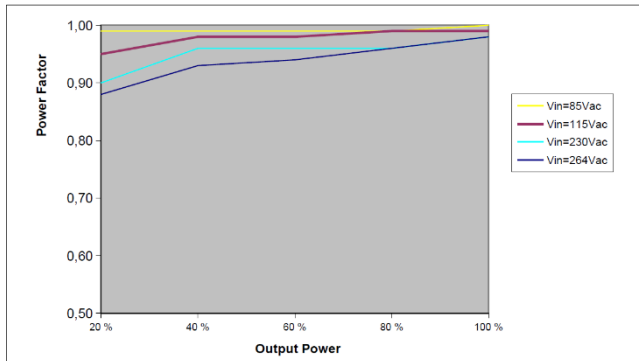
3. Options

Ruggedizing (-M)	MIL-STD 461E CE102, MIL-STD 1399-300A, MIL-STD810E shock & vibrations compliance.
-40°C operation (-T)	Thermal grade of DC/DC converters and other components are changed to comply with low ambient temperature.
Conformal coating (-V)	Components and PCB are covered with an acrylic coating to address high level of ambient humidity.
Heatsink (-H, -H1)	-H: 15 mm heatsink with longitudinal fins. -H1: 15 mm heatsink with transversal fins.
IP enclosure (-IP)	Build in IP65 sealed enclosure.

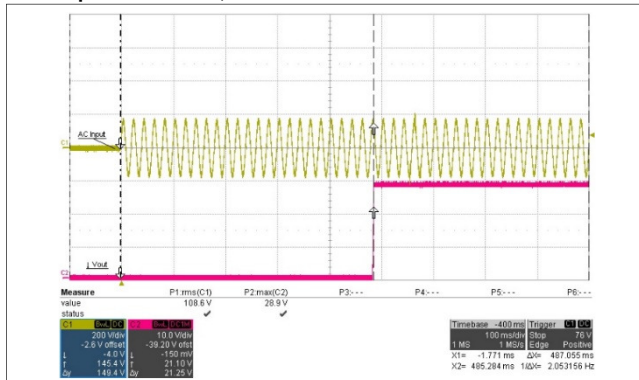
5. Input

Operating voltage range	85 ~ 264VAC or 100 ~ 350VDC
Frequency	47 ~ 440Hz
Power factor	230VAC, 50Hz, P _{nom} . 0.96typ, 0.98max
Input current	V _{in} min 2,5A _{max}
No-load input power	V _{in} typ 8W _{typ}
Peak inrush current	V _{in} max 5A _{max}
Start-up time	1s _{max}
Fuse	Schurter 3403.0173 5A Not user accessible
Transient protection	VDR and common mode filter

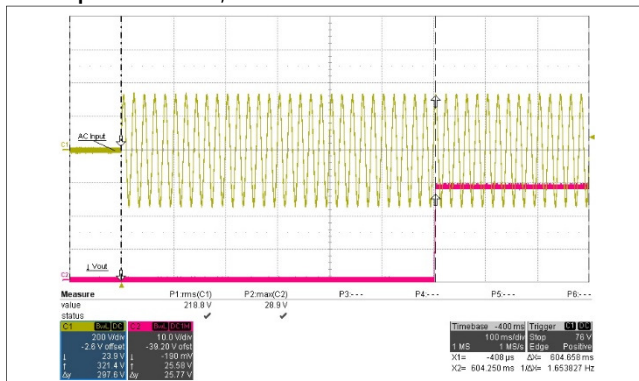
Power factor: DBD-28150



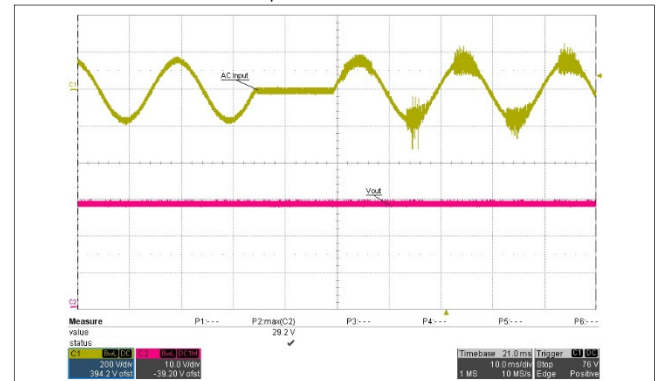
Start-up at 115VACin, 50Hz: DBD-28150



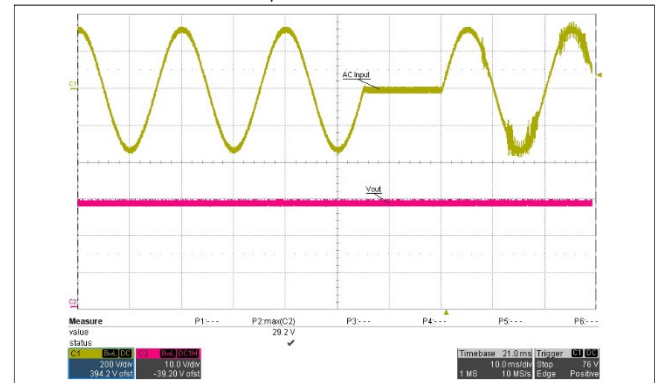
Start-up at 230VACin, 50Hz: DBD-28150



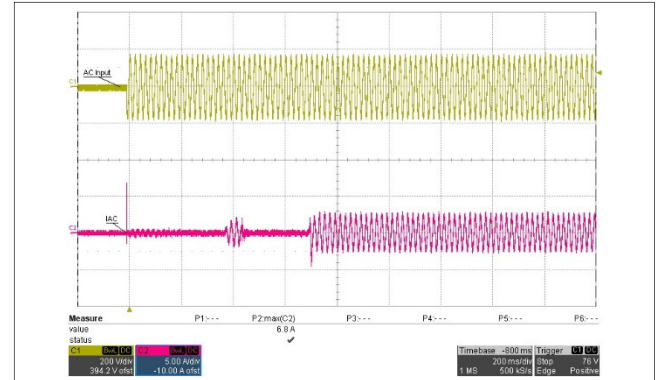
Power break at 115VACin, 100% load: DBD-28150



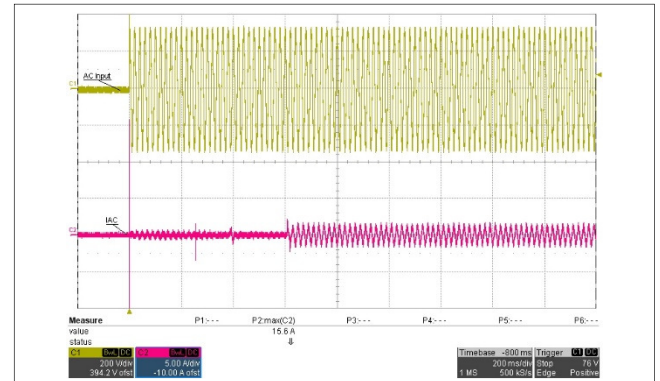
Power break at 230VACin, 100% load: DBD-28150



Inrush current at 115VACin: DBD-28150



Inrush current at 230VACin: DBD-28150



6. Output

Output		2V			3V3			5V			8V			12V			15V			24V			28V			48V			Unit
Characteristics	Conditions	min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max	min	typ	max	
Output voltage			2			3,3			5			8			12			15			24			28			48	V	
Trim range	Factory set	1,8		2,2	3		3,6	4,5		5,5	7,2		8,8	10,8		13,2	13,5		16,5	21,5		26,2	25,2		30,8	43,2		51,8	V
Overvoltage protection				2,9			4,5			6,5			10,1			14,9			18,5			29,1			34			58	V
Output noise	20MHz		80			75			75			150			100			100			100			100			150	mVpp	
Efficiency			73			75			83			82			85			84			84			83			84	%	
Load regulation	Vin nom.			1			1			1			0,5			0,5			1			0,5			0,5			0,5	%
μ-board 75W (50W for 2V, 3V3, 5V)																													
Output current		0		25	0		15	0		10			0	6,25	0		5	0		3,13	0		2,7	0		1,56	A		
Max. Power				50			50			50				75			75			75			75			75		75	W
Output current limit			29	34		17,5	20,6		11,5	13,5				7,2	8,5		5,8	6,8		3,6	4,25		3,1	3,7		1,8	2,2	A	
μ-board 150W (75W for 3V3, 100W for 5V, 8V)																													
Output current				0		22,7	0		20	0		12,5	0		12,5	0		10	0		6,25	0		5,3	0		3,1	A	
Max. power						75			100			100			150			150			150			150			150	W	
Output current limit					25	31		23	26		14,5	17		14,5	17		11	14		7,2	8,2		6,2	7		3,6	4,4	A	

General conditions: 25°C ambient, full load. Refer to 'options and configurations' for possible configuration.

Parallel operation & current share

Parallel operation is possible between different units, but there is no active current sharing signal available on the DBD. Output external circuit has to be used (risk of damage otherwise). DBC Series recommended for higher power configurations.

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 and output external circuit (risk of damage otherwise). DBC Series recommended for N>1 configurations.

Hold-up time

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

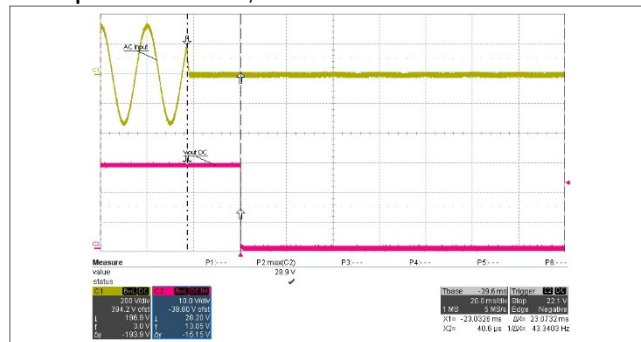
Output current limitation

All outputs are continuously protected against short-circuit by a constant current limitation (no foldback) with automatic recovery. Refer to output table for values.

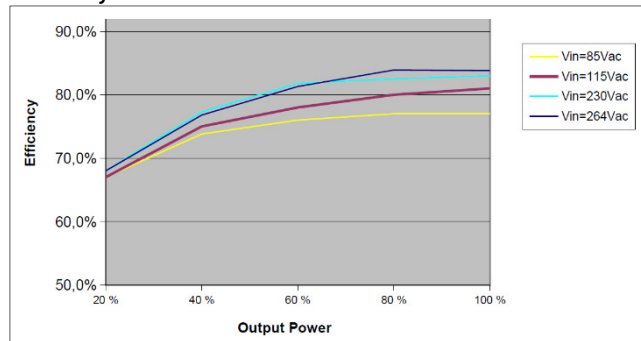
Overvoltage protection

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

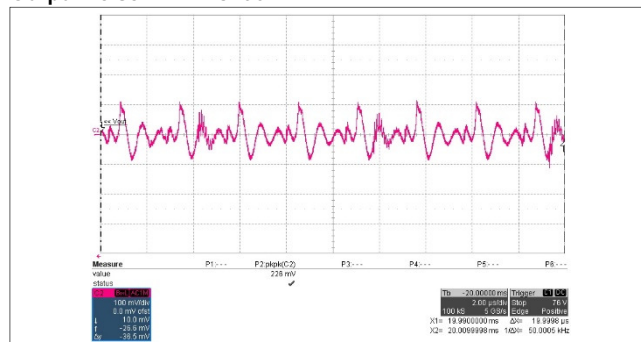
Hold up time at 230VAC, 100% load: DBD-28150



Efficiency curve: DBD-28150



Output noise: DBD-28150



7. Auxiliary functions

Remote On/Off (INHIB)

-Secondary Inhibit: Output disabled if 5V TTL between INIBS+ and INIBS-, enabled if 0V or open. This signal is isolated by optocoupler.
 -Primary Inhibit: Output disabled if INH+ shorted to INH-. This signal is referenced to the primary side (not isolated), it has to be handle with care (external isolated contact, noise and transient filtered).

Output voltage adjustment (ADJ)

A potentiometer at the output side allows output voltage variation from -10% to +10% of Vnom. The TRIM signal allows output voltage to be adjusted by an external voltage 1.15 to 1.25Vmax voltage referenced to -OUT. Please consult factory for extended range modification of adjustment down to -50%.

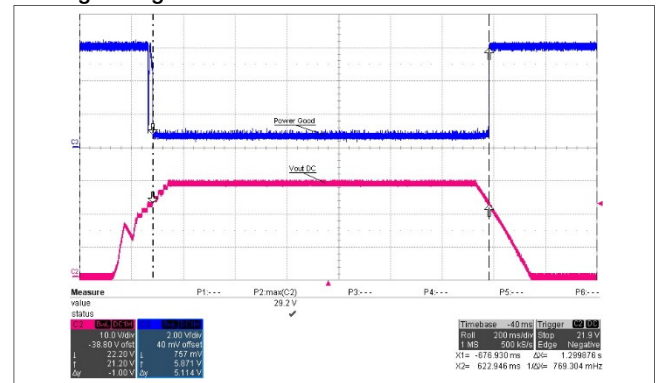
Remote sense (+S -S)

There is no remote sense functionality integrated in the DBD for compensation of voltage drop across the connector contacts and the load lines. Remote Sense can be done by an external circuit acting on the TRIM signal.

PowerGood & LED (Pgood+ Pgood-)

Isolated Open collector Pgood+, Pgood-, closed if Vout is in its normal range (30VDC/10mAmax). A green led placed at the output on the top side indicates output voltage is ON.

Powergood signal: DBD-28150



8. Electromagnetic compatibility

Electromagnetic immunity

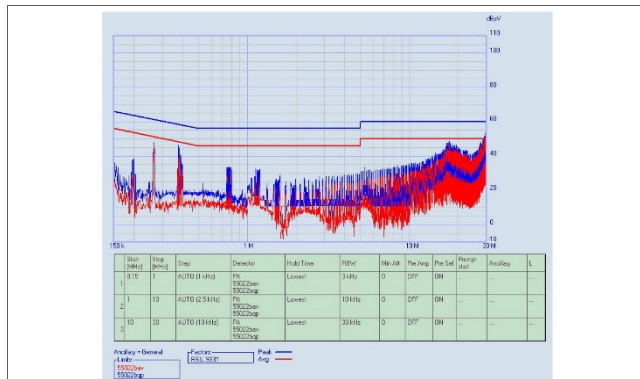
	Standard	Level	Value	Waveform	Source impedance	Test procedure	Mode	Criteria
Harmonics	EN 61000-3-2							
Flicker	EN 61000-3-3							
Electrostatic discharge (to case)	EN 61000-4-2	4	8kV	1 / 50µs	330Ω	10pos., 10neg.	OP	B
Radiated immunity	EN 61000-4-3							
Electrical fast transients/burst	EN 61000-4-4	4	4kV	5 / 50µs	50Ω		OP	B
Surges	EN 61000-4-5	DM	1kV	1.2 / 50µs	12Ω		OP	B
		CM	2kV	1.2 / 50µs	12Ω		OP	A
Conducted immunity	EN 61000-4-6							
Dips and interruptions	EN 61000-4-11							

All compliance build to meet.

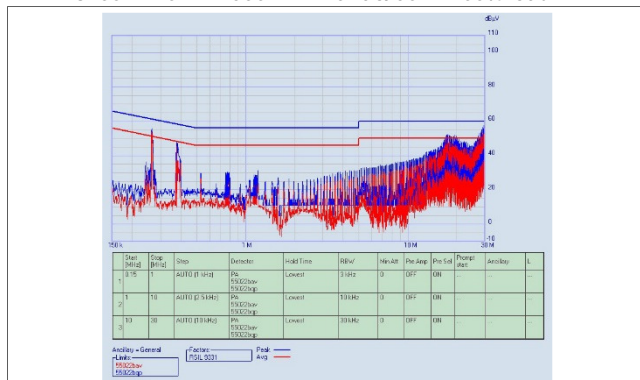
Electromagnetic emissions

According to the configuration and revision, EMI results could change.
External filter may be required to meet EN55022A or B and MIL-STD461E CE102.

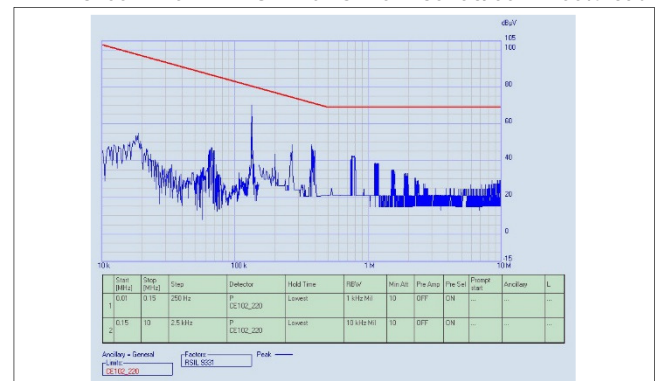
DBD-28150 IND04: EN55022B 230Vac/50Hz 100% load



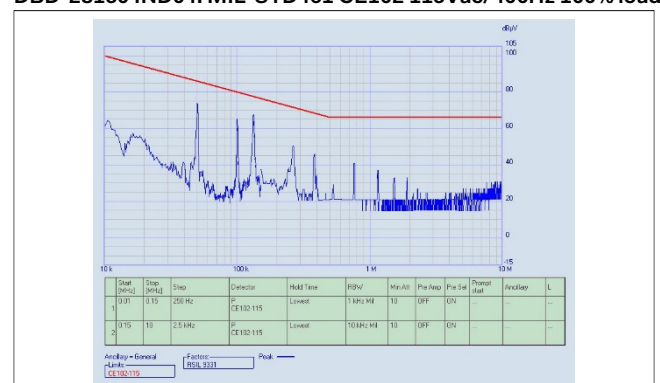
DBD-28150 IND04: EN55022B 115Vac/50Hz 100% load



DBD-28150 IND04: MIL-STD461 CE102 230Vac/50Hz 100% load



DBD-28150 IND04: MIL-STD461 CE102 115Vac/400Hz 100% load



9. Environmental

Immunity to Environmental Conditions

Test method	Standard	Test conditions	Requirement
Humidity	MIL-STD-810F, 507.4	Humidity 93%, 40°C, 56 days	Option -V
Shock	MIL-STD-810F, 516.5	20g / 18ms half sine, 5g / 30ms	Option -M
Vibration	MIL-STD-810F, 514.5	4-80Hz (2,8m/s ²)/Hz, non operating	Option -M
		160-500Hz (0,175m/s ²)/Hz, non operating	

Thermal considerations

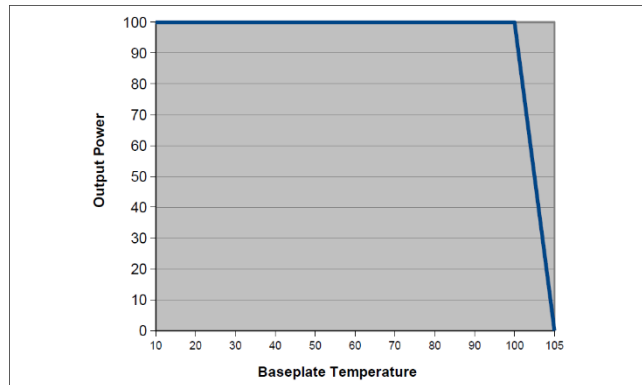
When a converter is mounted in conduction cooled, the temperature measured on the baseplate should not exceed 100°C.
When heatsink option is used in convection cooling and is operating at its nominal output power at the max. ambient temperature, the temperature measured on the heatsink should not exceed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

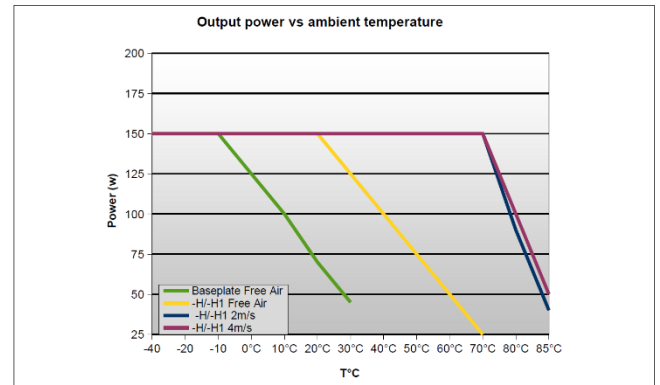
Temperature derating

DBD-28150: conduction cooled



Temperature derating

DBD-28150: convection and forced air



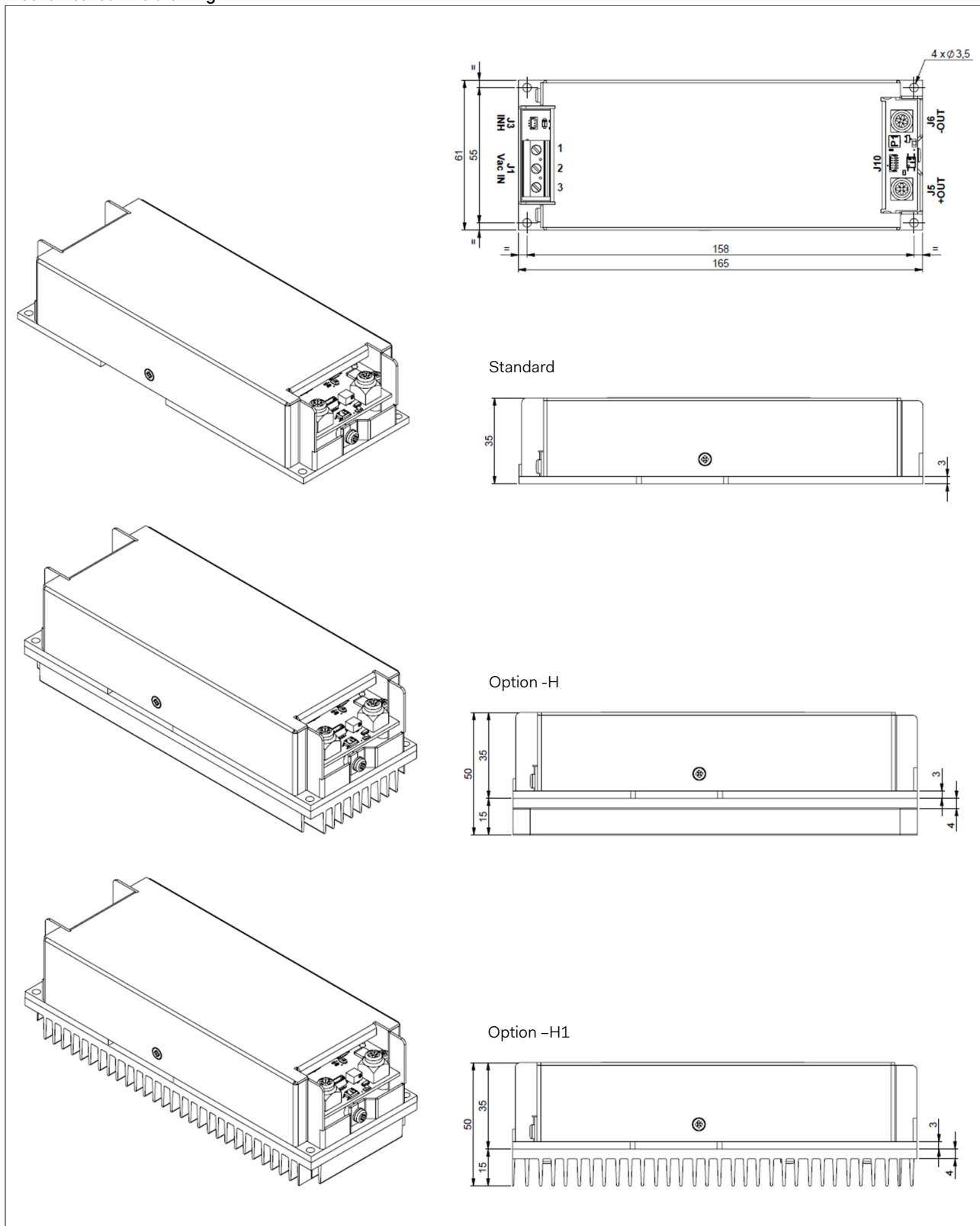
Temperatures

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

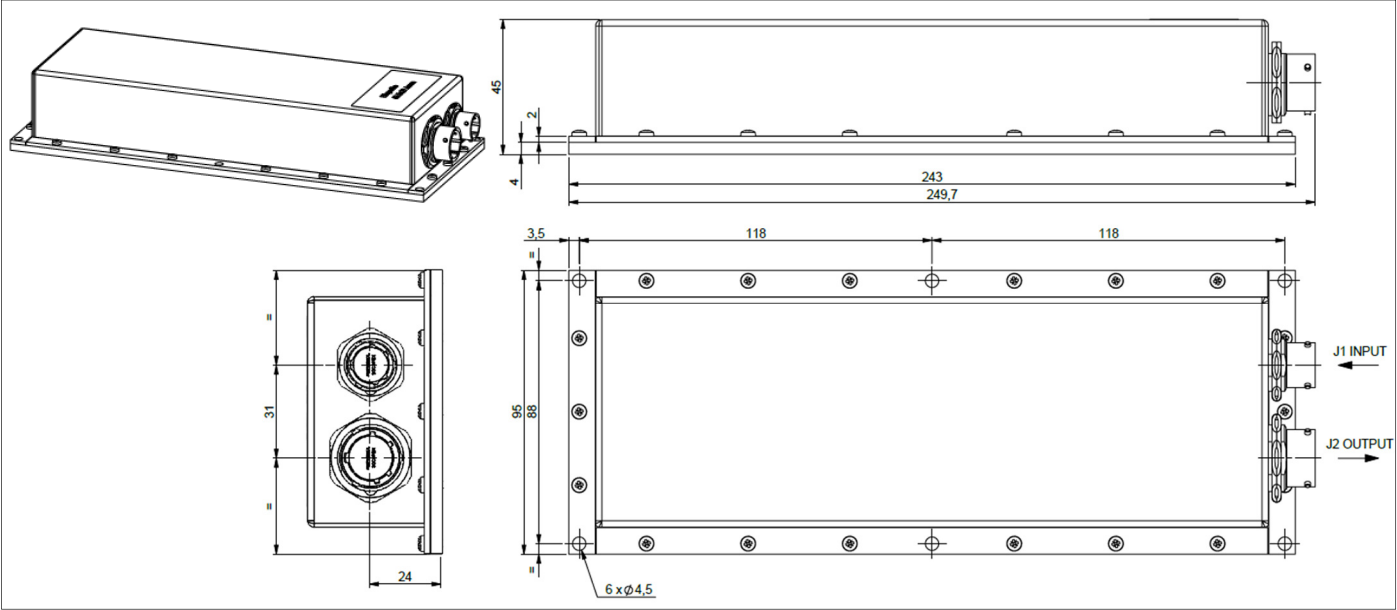
In operation, there is no power derating as long as the baseplate temperature is in the indicated range.

10.Mechanical

Mechanical outline drawing



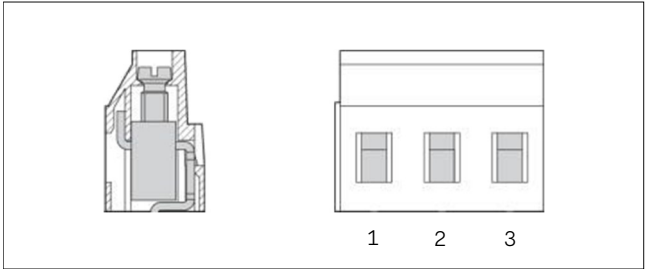
Mechanical outline drawing - IP option



11. Pin allocation

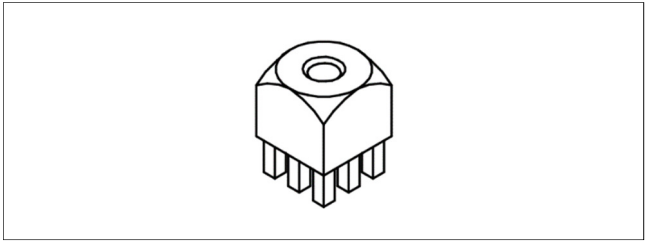
Input: Phoenix Contact GMKDS 3/3-7.62

J1-1	Earth
J1-2	Neutral AC/N
J1-3	Line AC/L



Output: Würth Press-Fit M4 Ref: 7461095

J5	OUT+
J6	OUT-

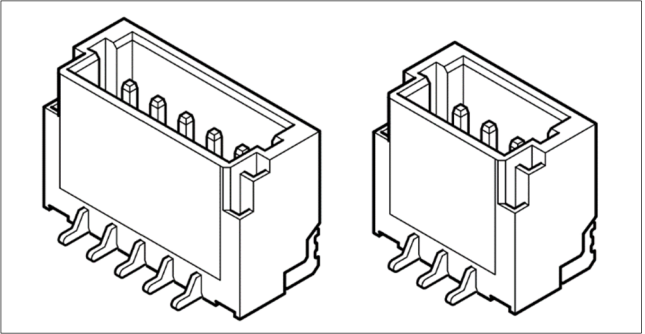


Signals: JST BM03B-SRSS-TB(LFSN)

J3-1	INH+	Primary inhibit, positive
J3-2	NC	Not connected
J3-3	INH-	Primary inhibit, negative

Signals: JST BM05B-SRSS-TB(LFSN)

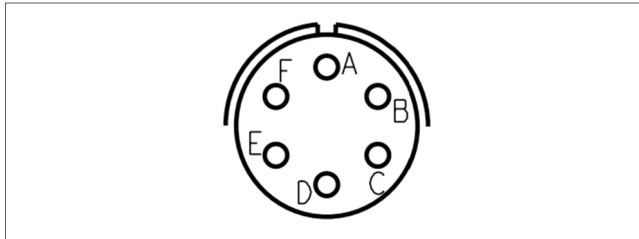
J10-1	INIBS-	Secondary inhibit, negative
J10-2	PGOOD-	Output OK, emitter
J10-3	PGOOD+	Output OK, collector
J10-4	TRIM	Output voltage adjustment
J10-5	INIBS+	Secondary inhibit, positive



12. Pin allocation -IP option

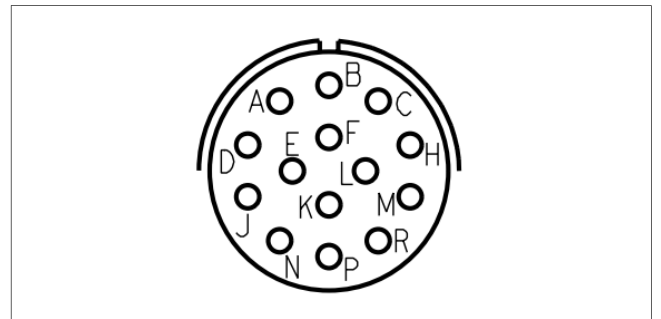
Input: Amphenol Male 451-07A106P50

J1-A	INH+	Primary inhibit, positive
J1-B	Line AC/L	
J1-C	NC	
J1-D	Earth	
J1-E	-HT	Primary inhibit, negative
J1-F	Neutral AC/N	



Output: Amphenol Female 451-07A1214S50

J2-B	OUT+	
J2-C	OUT+	
J2-F	OUT+	
J2-H	OUT+	
J2-L	OUT-	
J2-M	OUT-	
J2-P	OUT-	
J2-R	OUT-	
J2-A	INIBS+	Secondary inhibit, positive
J2-D	INIBS-	Secondary inhibit, negative
J2-E	TRIM	Output voltage adjustment
J2-N	PGOOD-	Output OK, emitter
J2-J	PGOOD+	Output OK, collector
J2-K	NC	Not connected



13. Safety and isolation

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 male connector.

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 62368-1, EN 62368-1.

'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.

Electric strength

Characteristic	IN-PE	IN-OUT	OUT-PE	OUT-OUT	Unit
Design strength	1500	3000	500		Vrms
Prod. test (>10s)	2120	2120	500		VDC
Insulation resistance			>100	>100	MΩ

Electric strength test is performed in the factory in accordance with IEC/EN 62368.

Reliability

MIL-HDBK-217F, NTC 2	Model	Baseplate temp.	GB	GF
MTBF (Hours)	DBD, Single output, 150W	40°C	302750	172566
		70°C	145320	84558
		100°C	88644	52426

MTBF calculation for a specific part number ordered separately.

14. Part number configuration

DBD	-	28	150	-	MTV	-	IP
Series Name		Output Voltage	Output Power		Options		Format
		2: 2VDC	50: 50W		□: No option		□: IP00
		3V3: 3,3VDC	75: 75W		H: Heatsink longitudinal fins		IP: IP65
		5: 5VDC	100: 100W		H1: Heatsink transversal fins		
		8: 8VDC	150: 150W		M: Ruggedizing		
		12: 12VDC			T: -40°C		
		15: 15VDC			V: Conformal coating		
		24: 24VDC					
		28: 28VDC					
		48: 48VDC					

Configuration

DBD Series units are factory configurable consisting of a common input stage with protective circuitry, filtering, rectifier and active PFC followed by single output up to 150W output. The DBD Series units are not field configurable.

Example configurations

DBD-48150-MTV

(Single isolated outputs of 48V 150W with MIL-STD, -40°C and conformal coating options)

DBD-3V375-T-IP

(Single output of 3.3V 75W with -40C option and IP65 enclosure)

DBD-2875

(Single output of 28V 75W with no options)

Available output configurations

U [V]	Available power, P [W]
2	50
3V3	50, 75
5	50, 100
8	100
12	75, 150
15	75, 150
24	75, 150
28	75, 150
48	75, 150