powerbox
Powering Progress

OPERATION AND INSTALLATION MANUAL

PBB2S MK II SERIES DC UNINTERRUPTIBLE POWER SUPPLIES

347-1602 Issue A

IMPORTANT SAFETY ADVICE AND WARNINGS

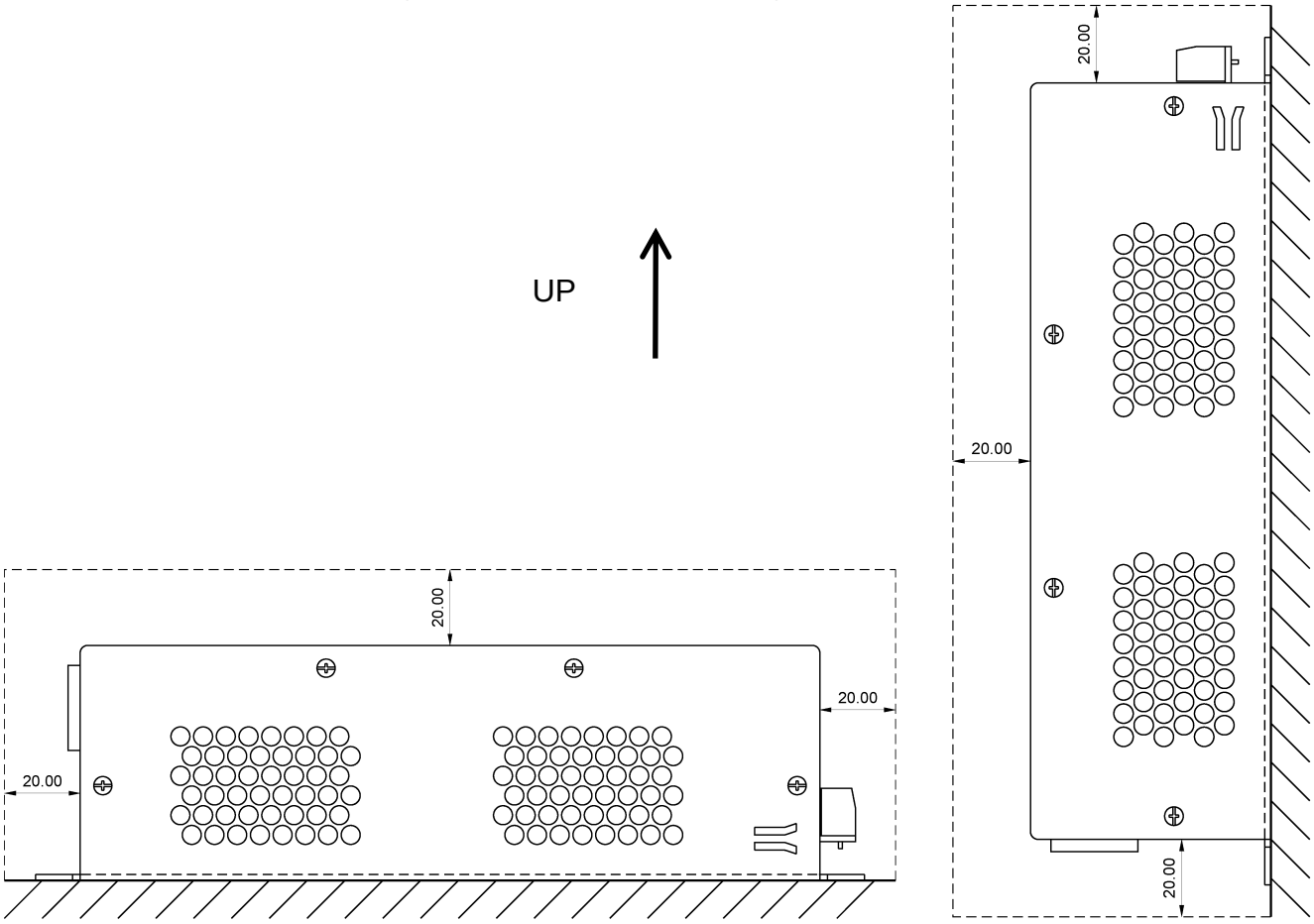
Please read carefully and understand this manual before using this product.

- This DC Uninterruptible Power Supply (DC UPS) uses an external battery to back up its DC output when AC mains power fails. This battery is to be connected to the BATTERY +/- terminals.
- The external battery must be a valve-regulated (AGM or gel) lead-acid battery.
- Models PBB2S-13-3.5 MK II and PBB2S-13-7 MK II use external 12V lead-acid batteries (6 x 2Vcells) with total capacity (C10) between 7Ah and 20Ah.
- Model PBB2S-28-3.5 MK II uses external 24V lead-acid batteries (12 x 2V cells) with total capacities (C10) between 7Ah and 20Ah.
- Larger capacity batteries than those listed above can be accommodated; however, the battery charging time will be longer.
- WARNING: Do not use non-rechargeable batteries with this product.
- Explosive gases may be released by the external battery during charging. This battery must be placed in a well-ventilated area.
- Whenever AC mains is present, this DC UPS will charge the external battery automatically. Charging current is provided by an internal current-limited taper charger.
- This DC UPS is designed for indoor use only and must never be exposed to water, rain or any liquids.
- This DC UPS is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the DC UPS by a person responsible for their safety. Children should be supervised to ensure that they do not play with the DC UPS.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

IMPORTANT INSTALLATION REQUIREMENTS

- The PBB2S MK II DC UPS is designed to be mounted on a flat surface using M4 or equivalent fasteners on 210 x 90mm centers. Refer to the mechanical diagram at the end of this manual.
- As shown in Figure 1, the unit can be mounted either horizontally or in the shown vertical orientation (output terminals at top) without any additional protection. Clearance of 20mm must be provided on all sides to ensure proper cooling and reliable operation.

Figure 1: PBB2S MK II Mounting Orientations



- If the DC UPS is to be mounted in any other orientation, it must be installed using a separate fire barrier or inside a separate fire enclosure complying with AS/NZS 62368.1 Cl. 6.4.7 and 6.4.8 or equivalent.
- If the DC UPS is installed inside another enclosure:
  - There must be at least 20mm of free air clearance from the sides and top of the DC UPS to any surface of the enclosure or to any other objects inside the enclosure which may impede cooling airflow.
  - Ventilation holes must be provided in the enclosure to ensure free flow of cooling air around the DC UPS and to keep the air temperature around it within its derating curve. As a minimum, at least 200cm^2 of open ventilation area (individual hole area x number of holes) must be installed above the DC UPS and a further 200cm^2 of open ventilation must be installed below the DC UPS. Alternatively, 400cm^2 of open ventilation may be provided adjacent to the DC UPS.
  - If other power-dissipating equipment is installed inside the enclosure, these ventilation areas must be increased as required to maintain the surrounding air temperature around the DC UPS within its derating curve. Refer to Figure 3.
  - The air temperature inside the enclosure should be checked under operation to ensure that it is within the DC UPS's derating curve.
- In all installations, the DC UPS is to be connected to the AC mains power via the provided supply cord. This is to be plugged into an earthed 10A general purpose outlet which is compliant with AS/NZS 3112.
- In all installations, including when the DC UPS is installed inside another enclosure, it must be possible to disconnect the DC UPS from the AC mains power by unplugging the provided supply cord plug from the AC mains general purpose outlet.

- It is recommended that batteries be installed according to AS2676.1:2020 or AS2676.2:2020. For installations using PBB2S-28-3.5 MK II with battery capacity greater than 10Ah, this is mandatory. In particular, one or both of the battery leads must be protected against overcurrent by a fuse or circuit breaker located close to the battery. Refer to Figure 2. If the negative terminal of the battery is solidly earthed, then a fuse or circuit breaker is only required in the positive terminal. If neither terminal of the battery is solidly earthed, then fuses or circuit breakers are required in both terminals. It is recommended that the positive terminal of the battery not be earthed. These protective devices must be sized to interrupt the short circuit current of the battery.
- Connections from the DC UPS to the load and to the battery are made via the OUT +/- and BATTERY +/- terminals. This is a pluggable screw terminal block which is suitable for up to 2.5mm^2 wire.
- This terminal block must not be unplugged under load. Disconnect the AC mains supply and all loads from the DC UPS before unplugging this terminal block.
- The cables between the battery and the DC UPS, battery fuses or circuit breaker, must be able to withstand the prospective short-circuit current which the battery is able to deliver for a period of at least 1 second.
- When initially powering the DC UPS after installation, follow the procedure in COMMISSIONING.

FEATURES AND OPERATION

The PBB2S MK II series is a family of 13.8Vdc 3.25A and 6A, and 27.6Vdc 3.0A off-line DC uninterruptible power supplies which operate from 115-240Vac mains power. When connected to an external lead-acid battery, these units provide uninterrupted power to a DC load in the event of a mains failure.

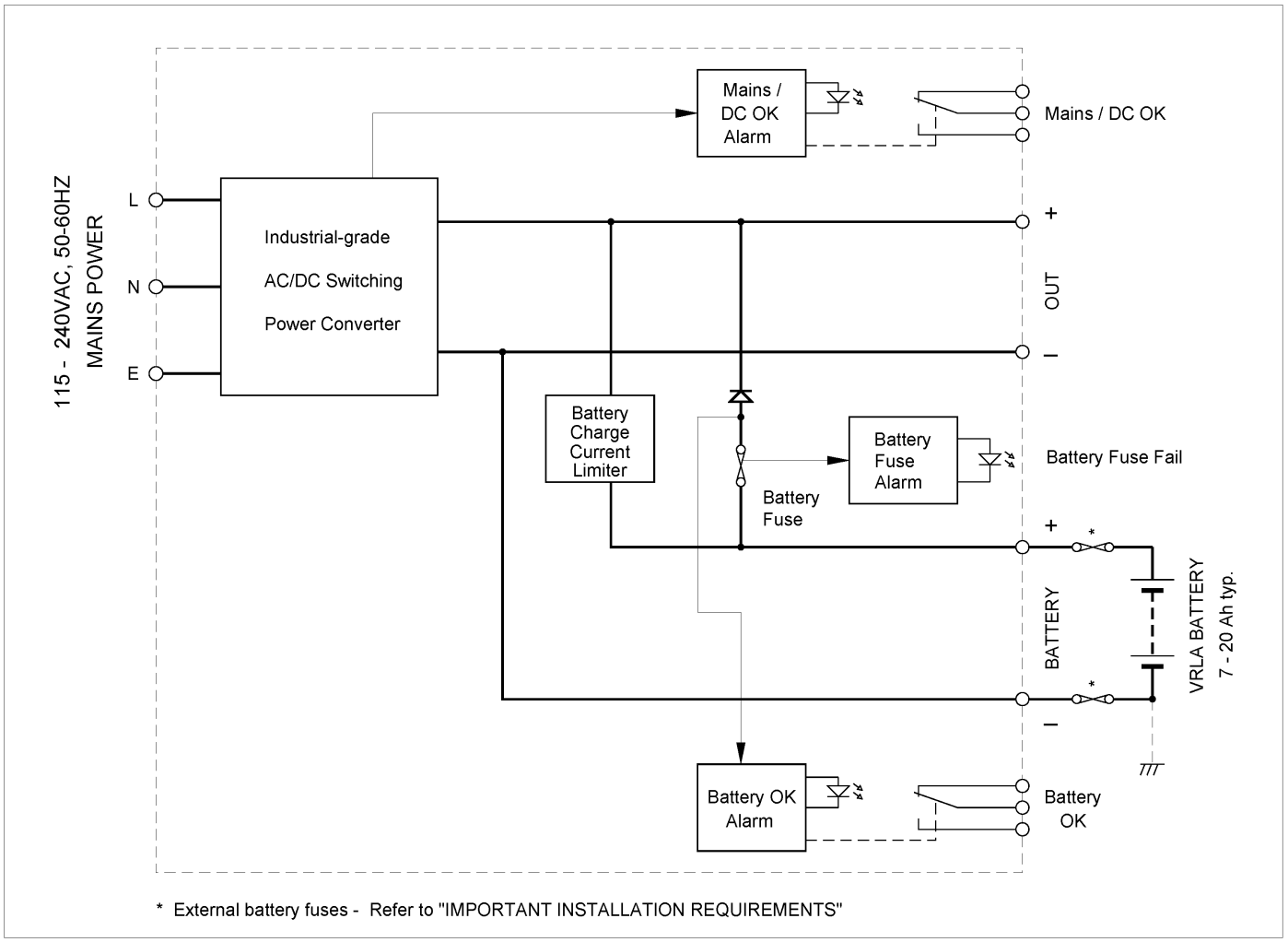
The PBB2S MK II is protected against output overcurrent and short circuit, it includes a current-limited charger for the external battery, output and battery overvoltage protection, a self-resetting battery fuse, overtemperature protection and mains/DC OK, battery OK and battery fuse fail alarms.

The PBB2S MK II is available in a light weight corrosion-resistant aluminium chassis-mount enclosure. All models employ natural convection cooling. The PBB2S MK II is for indoor use only.

Figure 2 is a block diagram of the PBB2S MK II detailing its various functions as follows:

- A high-efficiency and high reliability industrial-grade switching AC/DC converter provides 13.8Vdc at 5.0A/7A or 27.6Vdc at 3.6A directly to the load output and to charge the battery. This converter provides a constant output voltage set at the float voltage of the battery. It also incorporates hiccup overcurrent and short circuit protection, output overvoltage shutdown and overtemperature protection.
- The battery is connected across the output of the AC/DC converter via a current limited battery charger circuit which is in parallel with a self-resetting battery fuse and blocking diode. As a result, the battery is available to supply power to the load instantaneously if AC mains power fails.
- The battery charger circuit operates as a taper charger. If the battery is discharged and mains voltage is applied, the PBB2S MK II will provide a constant 13.8Vdc or 27.6Vdc output voltage to the load output and limited charging current to the battery.

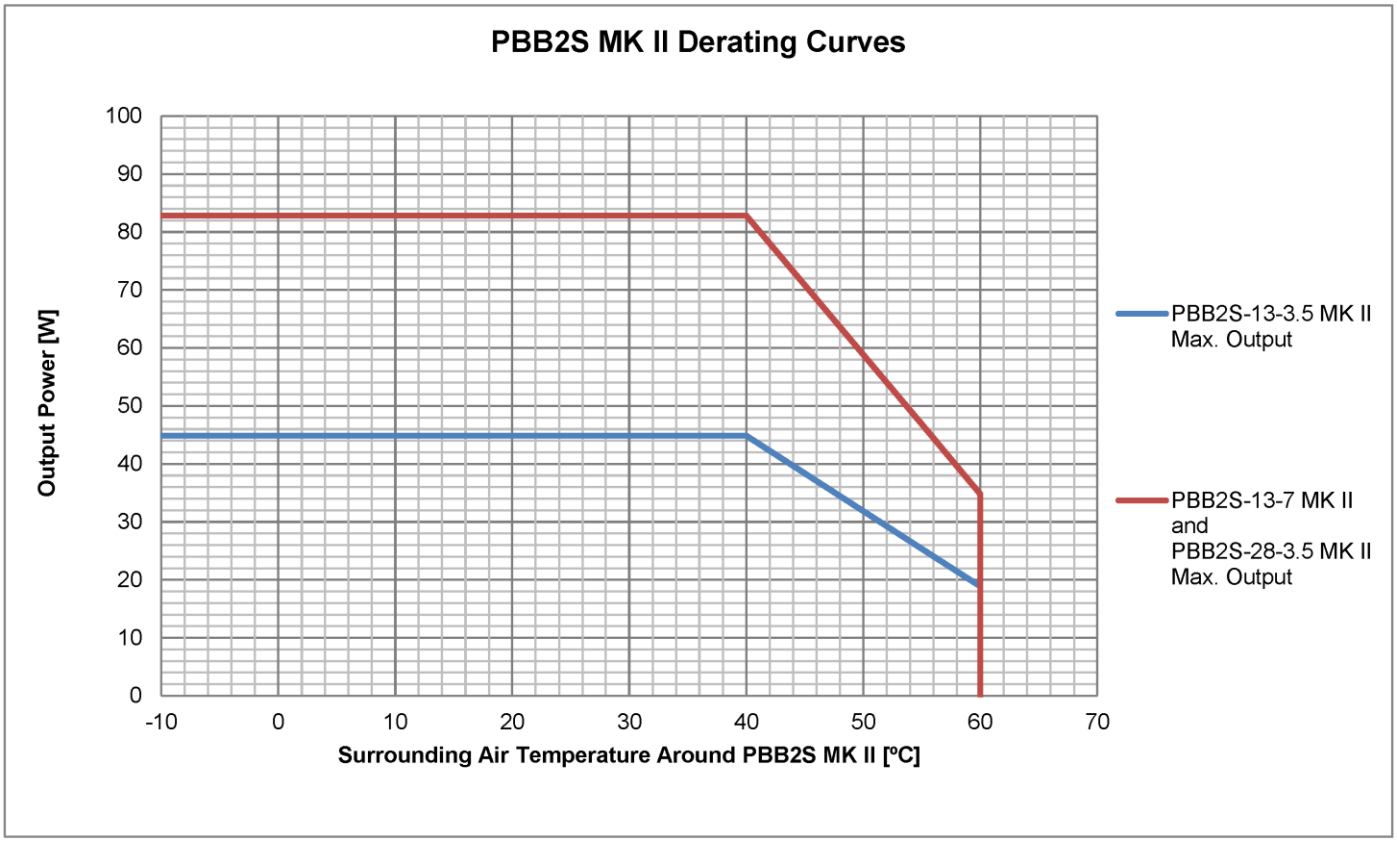
Figure 2: PBB2S MK II Block Diagram



- Output overcurrent protection and short circuit protection are provided by the AC/DC switching power converter and by the self-resetting battery fuse.
- The unit is protected indefinitely against battery reverse polarity by the blocking diode.
- Two alarms with separate voltage free changeover contacts and green LED's are provided.
    - MAINS/DC OK indicates loss of AC mains power, failure of the off-line AC/DC converter, tripping of the overtemperature protection and tripping of the overvoltage protection.
    - BATTERY OK is a battery low voltage alarm which indicates that the battery is becoming discharged. This alarm is also asserted if the battery fuse has tripped due to overload.
- A RED Battery Fuse Fail LED is also provided. This illuminates if the battery fuse trips due to overload.

PBB2S MK II Derating Curves

Figure 3: PBB2S MK II Derating Curves



Sizing Example

The load power must be kept less than or equal to the maximum output power rating of the PBB2S MK II at the maximum ambient air temperature around the PBB2S MK II as per the derating curves above.

For example: An installation must supply a 13.8V load of 4A and charge a 10Ah backup battery in a maximum ambient temperature of 50°C. Multiplying the float voltage by the load current gives a required output power of 13.8V x 4 A = 55.2W. Referring to the derating curve "PBB2S-13-7 MK II and PBB2S-28-3.5 MK II Max. Output", at an ambient temperature of 50°C the maximum output power of Model PBB2S-13-7 MK II is 58.5W so it should be suitable for this application. Note that the ambient temperature in the derating curves is the temperature of the air around the PBB2S MK II with 20mm of clearance on all sides. If the PBB2S MK II is to be mounted inside an external enclosure, this is the temperature of the air ***inside*** the enclosure (50°C) including the temperature rise of this air resulting from the heat dissipated by the PBB2S MK II and other equipment installed in the enclosure.

COMMISSIONING

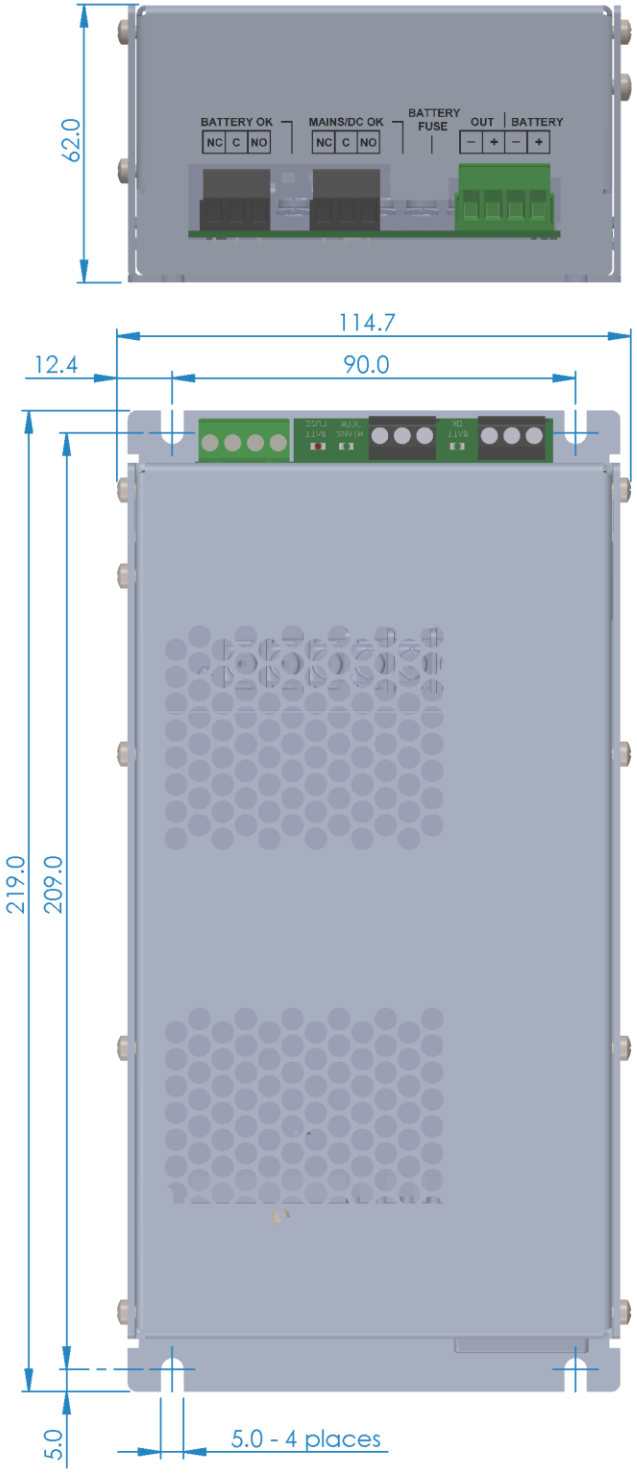
1. Connect the battery and ensure that the external battery fuse in the positive battery lead is not installed and that all loads are either disconnected or turned off.
2. Apply AC mains voltage to the input.
3. Measure the voltage at the OUT terminals. This voltage should be 13.8Vdc or 27.6Vdc.
4. Measure the voltage drop across the fuse holder in the positive battery lead. This voltage should be less than ±2.5Vdc or ±5.0Vdc. If the voltage is above this limit, the battery polarity is reversed and should be corrected before proceeding.
5. Install the fuse in the battery positive lead.
6. Measure the voltage across the battery. This should gradually rise indicating that the battery is charging.
7. Confirm that both green LEDs on the unit are ON indicating no alarms.
8. Turn on loads or connect loads to the unit.

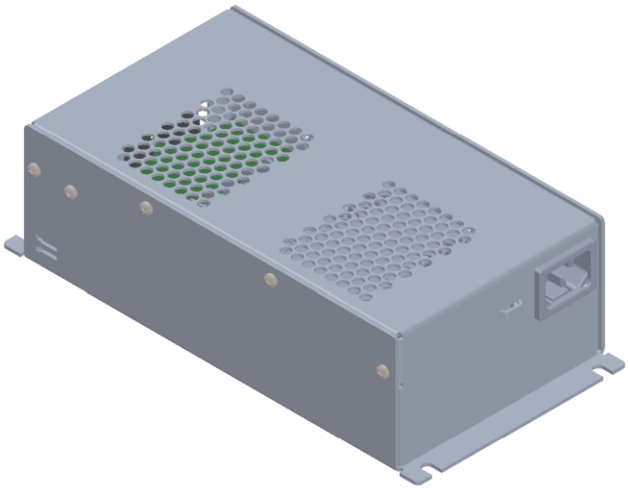
SPECIFICATIONS

MODEL		PBB2S-13-3.5 MK II	PBB2S-13-7 MK II	PBB2S-28-3.5 MK II
INPUT	NOMINAL VOLTAGE [V]	115-240VAC 1ø		
	CURRENT [A]	1.7 max.	2.3 max.	2.3 max.
	NOMINAL FREQUENCY [Hz]	50-60		
	INRUSH CURRENT [A]	55 max. (cold start - 230Vac)	55 max. (cold start - 230Vac)	55 max. (cold start – 230Vac)
	HARMONIC CURRENT EMISSION	Conforms to EN61000-3-2, Class A		
OUTPUT (AC Mains Operation)	OUTPUT VOLTAGE [VDC]	13.8		27.6
	OUTPUT CURRENT [A]	3.25 max.	6.0 max.	3.0 max.
	LINE REGULATION [%]	0.2 typ.		
	LOAD REGULATION [%]	2.0 typ.		
	RIPPLE AND NOISE [mVp-p]*1	120 max.		150 max.
	OVERVOLTAGE SHUTDOWN [V]	16.5 – 21.0 (Hiccup - Auto recovery)		33.0 – 40.5 (Hiccup – Auto recovery)
	OVERLOAD / OVERCURRENT PROTECTION [A]	5.5–8.75 (Hiccup - Auto recovery)	7.7-12.25 (Hiccup - Auto recovery)	3.96–6.3 (Hiccup - Auto recovery)
	SHORT CIRCUIT PROTECTION	Hiccup (Auto recovery when the fault is removed)		
	OVERTEMPERATURE PROTECTION	Shutdown, latching. Cycle AC mains OFF/ON to reset.		
BATTERY (External)	CHEMISTRY	Lead acid		
	BATTERY VOLTAGE [VDC]	13.8 Float (2.3V/cell), (12V Battery, 6 x 2V cells)		27.6 Float (2.3V/cell) (24V Battery, 12 x 2V cells)
	BATTERY CHARGER	Current-limited taper charger		
	BATTERY CHARGING CURRENT LIMIT [A]*2	0.25 typ.	0.5 typ.	0.35 typ.
OUTPUT (Battery Operation)	VOLTAGE DROP BATTERY TO OUTPUT [V]	0.47 typ.	0.55 typ.	0.47 typ.
	OUTPUT OVERLOAD PROTECTION	Self-resetting battery fuse		
	BATTERY REVERSE POLARITY PROTECTION	Indefinite		
DISPLAYS AND ALARMS	MAINS / DC OK	LED (Green) ON=OK, Voltage-free Changeover Contact (30V, 7A) Alarm on loss of mains, failure or overload of AC/DC Converter and tripping of overtemperature protection		
	BATTERY OK	LED (Green) OFF=$V_{BATTERY}$<10.5V/21.0V ON=$V_{BATTERY}$>11.5V/23.0V Voltage-free Changeover Contact (30V, 7A) Alarm on battery low voltage or on tripping of self-resetting battery fuse.		
	BATTERY FUSE FAIL	LED (RED) ON=FAIL, Alarm on tripping of self-resetting battery fuse.		
ISOLATION	INPUT – OUTPUT	4000VAC 1 minute		
	INPUT - GROUND	2000VAC 1 minute		
	OUTPUT - GROUND	500VAC 1 minute		
	ALARMS – OUTPUT & GROUND	500VAC 1 minute		
STANDARDS	SAFETY	AS/NZS 61558.1/.2.16 AS/NZS 62368.1		
	SHORT-CIRCUIT PROTECTION	SMPS incorporating a short-circuit-proof safety isolating transformer		
	ELECTRIC SHOCK PROTECTION	Class I		
	OVERVOLTAGE CATEGORY	II		
	POLLUTION DEGREE	2		
	EMC	AS/NZS CISPR 32 Class B		
MECHANICAL AND ENVIRONMENT	CASE SIZE [mm]	219 x 115 x 62 (LxWxH)		
	WEIGHT [kg]	0.60	0.67	0.67
	SURROUNDING OPERATING AIR TEMPERATURE	-10°C ≤ T ≤ 60ºC, Output power derating -2.9%/°C for T ≥ 40°C (Refer to Figure 3: PBB2S MK II Derating Curves)		
	OPERATING HUMIDITY	20 - 90% RH (Non-condensing)		
	COOLING	Natural convection		
	CASE MATERIAL	Aluminium		
	PROTECTION INDEX	IP20		
	ENVIRONMENT	For indoor use only		

*1 Using a 20MHz oscilloscope at OUT terminals, AC coupled, measured in parallel with a 0.1µF ceramic capacitor and a 47µF electrolytic capacitor.
*2 Measured at 10.0V or 20.0V (12V or 24V battery), T=25°C.

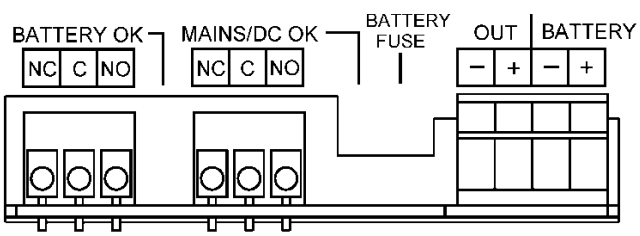
PBB2S MK II MECHANICAL OUTLINE





NOTES:
1. AC Mains Termination:
   10A IEC 60320 C14 Appliance Inlet.
2. Output and Battery Terminations:
   4W Pluggable Screw Terminal Block
   Suitable for up to 2.5 sq. mm wire.
3. Alarm Teminations: 3W Screw Terminal Blocks
   Suitable for up to 1.5 sq. mm wire.

TERMINATIONS



Note: Alarm terminations show state in normal non-alarm conditions.

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