# BCN25-700-8

## 3 Phase On-Board Battery Charger

The BCN25-700-8 is a 25 kW on-board battery charger that converts 3-phase AC voltage to DC voltage. The on-board battery charger is liquid cooled.

Features include very high efficiency, high reliability and compact dimensions.

RoHS Compliant

### Key Features & Benefits

- Up to 25 kW Output Power
- 93% Typical Efficiency
- AC 3-phase input 460 - 575 VAC +/-10% (Line-Line)
- DC Output 250 - 800 VDC, 37.5 ADC
- J1939 Compliant CAN Control and Monitoring
- Over-temperature, Output Over-voltage and Over-current Protections
- SAE 1455 Complaint Environmental Standards
- IP65 and IP67 Rating, Stackable Chassis
- Agency approved to UL2202 - Standard for Electric Vehicle (EV) Charging System Equipment

### Applications

- Charging of Hybrid / Full Electric Vehicles operating in Mining Environment and in Industrial Environment.



Please read our datasheet & drawing disclaimer here.

## 1. INPUT SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|
| Input Line-Line Voltage | Nominal Operating Range<br>Absolute Operating Range | 460<br>414 | | 575<br>632 | VAC |
| Input Current | | | | 40 | Arms |
| Frequency | | 47 | 50 / 60 | 63 | Hz |
| Input Line Under-voltage | | 390 | 400 | 410 | VAC |
| Leakage Current | @ 3x632 VAC, 60 Hz | | | 10 | mA |
| Inrush Current | Active Limiter Included | | | | |
| Power Factor | @ Vin = 3x460 VAC, Po = 25 kW | 0.9 | | | |
| Line Harmonic Current (THD) | @ Vin = 3x460 VAC, Po = 25 kW [1] | | | 32 | % |
| Signal Battery DC Input | VBAT_IN | 10.5 | | 32 | V |

## 2. OUTPUT SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|
| Output Type | DC current source | | | | |
| Output Voltage | Not regulated; depends on battery voltage | 250 | 666 | 800 | VDC |
| Output Current | Average output current adjustable via CAN | | | 37.5 | ADC |
| Output Power | | | | 25 | kW |
| Efficiency | @ Vin = 3x460 VAC, Vo_nom, Po_nom | | 93 | | % |
| Static Regulation | Charge Mode: Set Point Accuracy @ Idcset = 30 A,<br>Tcoolant = 25°C<br>Thermal Drift after 15 min warm up period | - 1<br>- 0.05 | | + 1<br>+ 0.05 | ADC<br>%/°C |
| Turn-On/Off Delay | Turn-On Delay / Ramping<br>Turn-Off Delay | | | 3 / 12<br>1 | s |

## 3. PROTECTION SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|
| Output Over-Current Protection | CAN adjustable | 1 | | 37.5 | Arms |
| Short Circuit Survival - Operating | Self-protecting; Hiccup mode | | | | |
| Output Over-Voltage Protection | CAN adjustable | 200 | | 840 | VDC |
| Output Under-Voltage Protection | Hiccup mode, CAN adjustable treshold | 200 | | 840 | VDC |
| Over-Temperature Protection | Converter shutdown at T_coolant higher than<br>CAN: CHG_BB_TEMP (chassis temperature) shutdown<br>CHG_AMB_TEMP (ambient inside temp) shutdown | 65 | <br>84<br>94 | | °C |
| Input Overvoltage Protection | | 635 | | 650 | VAC |

[1] The charger is not intended to be connected directly in public grid, because it does not meet EN61000-3-12 for harmonics current emissions. According to EN 55011, part 6, it can be used only in industrial environment, input connected to a dedicated power transformer or generator, at locations where there is a distance greater than 30 m between this equipment and third party sensitive radio communications.



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## 4. MONITORING AND CONTROL SIGNALS

| PARAMETER | DESCRIPTION / CONDITION |
|---|---|
| KEY_SWITCH_IN | CAN communication enable<br>Level High = Enable |
| Control Pilot | Function and levels according to SAE J1772 *not implemented in current SW |
| Proximity Detection | Function and levels according to SAE J1772 *not implemented in current SW |
| LED_OUT | PWM current source max 50mA. Supplied from battery voltage input (VBAT 12V) PWM controlled with CAN bus. |
| VBAT_IN | 12V or 24V battery input. Used to supply also CAN bus communication. Max. standby current < 8mA@24V |
| EVSE_WAKE_OUT | Energy taken from VBAT. Voltage level is approximately 1.5V below connected VBAT. High side output wake VCU and other vehicle control modules and/or relay coils. Wake output goes high when control pilot is active (or simulated by CAN) and goes low when CAN command from VCU is received or in sleep Mode. |
| HVIL_IN | Input to supply of HVIL loop |
| HVIL_OUT | Output from HVIL loop |
| ADR0_IN, ADR1_IN | 4 address possibilities |
| CAN_BAUD_RATE_IN | CAN bus speed; Open – 500 kbps / Grounded – 250 kbps |

## 5. SAFETY, REGULATORY AND EMI SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION | CRITERION |
|---|---|---|
| Safety Standards | ANSI / UL 2202 | |
| Insulation | Signals to Primary<br>Signals to Secondary<br>Primary to Secondary<br>Signals RTN to PE<br>Primary to PE<br>Secondary to PE | Basic 2250 VDC<br>Basic 2250 VDC<br>Basic 2250 VDC<br>Electrically connected together[2]<br>Basic 2250 VDC<br>Basic 2250 VDC |
| Radiated Emission | EN 55011 | Class A, Group 1 |
| Conducted Emission | EN 55011 | Class A, Group 1 |
| Electrostatic Discharge | IEC 61000-4-2 | Performance Criterion B |
| Radiated Electromagnetic Field | IEC 61000-4-3, SAE J1113/21 | Performance Criterion B, Status 2 |
| Electrical Fast Transient (EFT) /Burst | IEC 61000-4-4; Level 2 (+/-2 kV, 5 kHz) | Performance Criterion B |
| Surge Immunity | IEC 61000-4-5; Level 3 surge (+/-1 kV CM and +/-2 kV DM) | Performance Criterion B |
| RF Conducted Immunity | IEC 61000-4-6; Level 3 (10V, 0.15-80 MHz,AM 80%, 1 KHz) | Performance Criterion A |
| Flicker Tests | IEC 61000-3-3 | |
| Electrical Transient Conduction along Supply Lines | ISO 7637-2, ISO 16750-2 | |

## 6. ENVIRONMENTAL SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION | | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| Altitude | Non-Operating: 18.6 kPa absolute pressure<br>Operating: | | | | 12200<br>2000 | m |
| Operating Temperature | Liquid cooled: | T_coolant<br>T_ambient | -40<br>-40 | | +65<br>+65 | °C |
| Storage Temperature | | | -40 | | +85 | °C |
| Humidity | SAE J1455 | | | | | |
| Shock | SAE J1455, GMW-3172 | | | | | |
| Vibration | SAE J1455, GMW-3172 | | | | | |

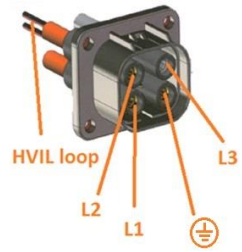
[2] Due to referencing of Control Pilot and Proximity against PE/chassis (SAE J1772)

| | |
|---|---|
| Protection | IP65 and IP67 *when all mating connectors are installed |

## 7. CONNECTORS

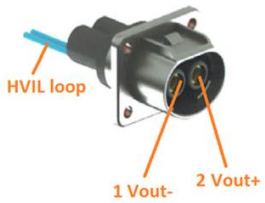
### AC INPUT CONNECTOR

Amphenol PL4 with HVIL pins, MPN: PL084 X 41-6;
Mating part PL184 X 41-6




### DC OUTPUT CONNECTOR

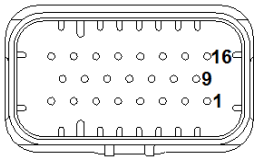
DC side connector with HVIL Amphenol PL 082 X-61-6
Mating part PL 182 X-61-6




### SIGNAL CONNECTOR

Tyco 776087-1; Mating part: 770680-1 + 770520-1

Max. 2 Amps per pin (wire AWG 20)




| PIN | NAME | SIGNAL REFERENCE | FUNCTION | LOW LEVEL<br>HIGH LEVEL | Vmax<br>Imax |
|---|---|---|---|---|---|
| 1 | LED_OUT | 24V_RTN | Charger status LED | Current source | VBAT_IN-1.5 V<br>50 mA |
| 2 | VBAT_IN | 24V_RTN | 24V battery voltage input | 10.5-32 Vdc | 32 V<br>2 A |
| 3 | CANH_1 | | CAN Bus H | - | -27 to 40 Vdc<br>15 mA |
| 4 | CANL_1 | | CAN Bus L | - | -27 to 40 Vdc<br>15 mA |
| 5 | HVIL_OUT | | HVIL output from AC and DC connector | Open loop | 32 V<br>60 mA |
| 6 | HVIL_IN | | Input for HVIL loop | Power by 10.5-32 Vdc | 32 V |
| 7 | Control Pilot | 24V_RTN | SAE J1772 | | SAE J1772 compatible |
| 8 | Proximity Detection | 24V_RTN | SAE J1772 | | SAE J1772 compatible |
| 9 | 24V_RTN | - | Return for 24V battery and signals | - | - |
| 10 | ADR0_IN | 24V_RTN | Address bit 0 | Pulled-up to H<br>L: connect to 24V_RTN | 3.3 to 32 Vdc |
| 11 | ADR1_IN | 24V_RTN | Address bit 1 | Pulled-up to H<br>L: connect to 24V_RTN | 3.3 to 32 Vdc |
| 12 | EVSE_WAKE_OUT | 24V_RTN | Signal to wake up Vehicle Control Unit (VCU module) | 0<br>VBAT_IN-1.5 V | VBAT_IN-1.5 V<br>200 mA |
| 13 | KEY_SWITCH_IN | 24V_RTN | Power supply of CAN and Bias converter Enable | OFF: <3.5 V<br>ON: 7.7 - 32 V | 32 V<br>0.5 mA |
| 14 | CAN_BAUD_RATE_IN | 24V_RTN | Open – 500 kbps; Grounded – 250 kbps | Pulled-up to H<br>L: connect to 24V_RTN | 3.3 to 32 Vdc |
| 15 | NA | | | | |
| 16 | NA | | | | |
| 17 | NA | | | | |
| 18 | CANH_2 | | CAN Bus H | - | -27 to 40 Vdc<br>15 mA |
| 19 | CANL_2 | | CAN Bus L | - | -27 to 40 Vdc<br>15 mA |



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| | |
|---|---|
| 20 - 23 | NA |

## 8. COOLING SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION |
|---|---|
| Cooling Type: | Liquid cooling |
| Coolant Medium/Mixture: | 50/50 Glycol/Water |
| Coolant Flow: | Min. 5 LPM |
| Max. coolant pressure: | 15 psi |
| Max. pressure drop: | 3 psi |
| Inlet/Outlet Coolant Connection: | SAE fittings with outer thread 1-14UNS for internal hose size >=5/8" (e.g. Parker p/n: 10F5OMLOSS) |
| Material of fittings: | Stainless steel |
| Fittings provided with inverter charger: | 2pcs Parker p/n: 10F5OMLOSS or equivalent |

## 9. MECHANICAL SPECIFICATIONS

| PARAMETER | DESCRIPTION / CONDITION |
|---|---|
| Dimensions (L x W x H) | 524 x 340 x 84 mm |
| Weight | 19.4 kg |
| Enclosure Material | Aluminum alloy |

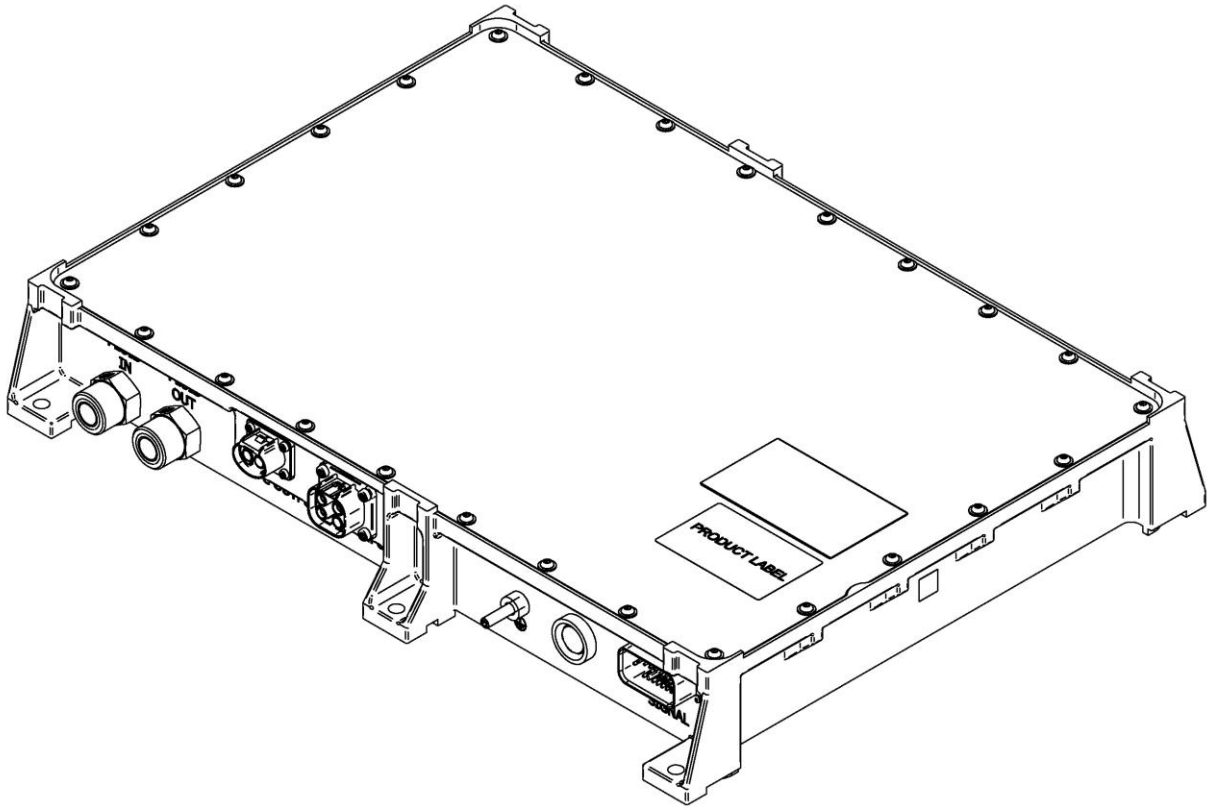


*Figure 1. Mechanical Design – ISO view*

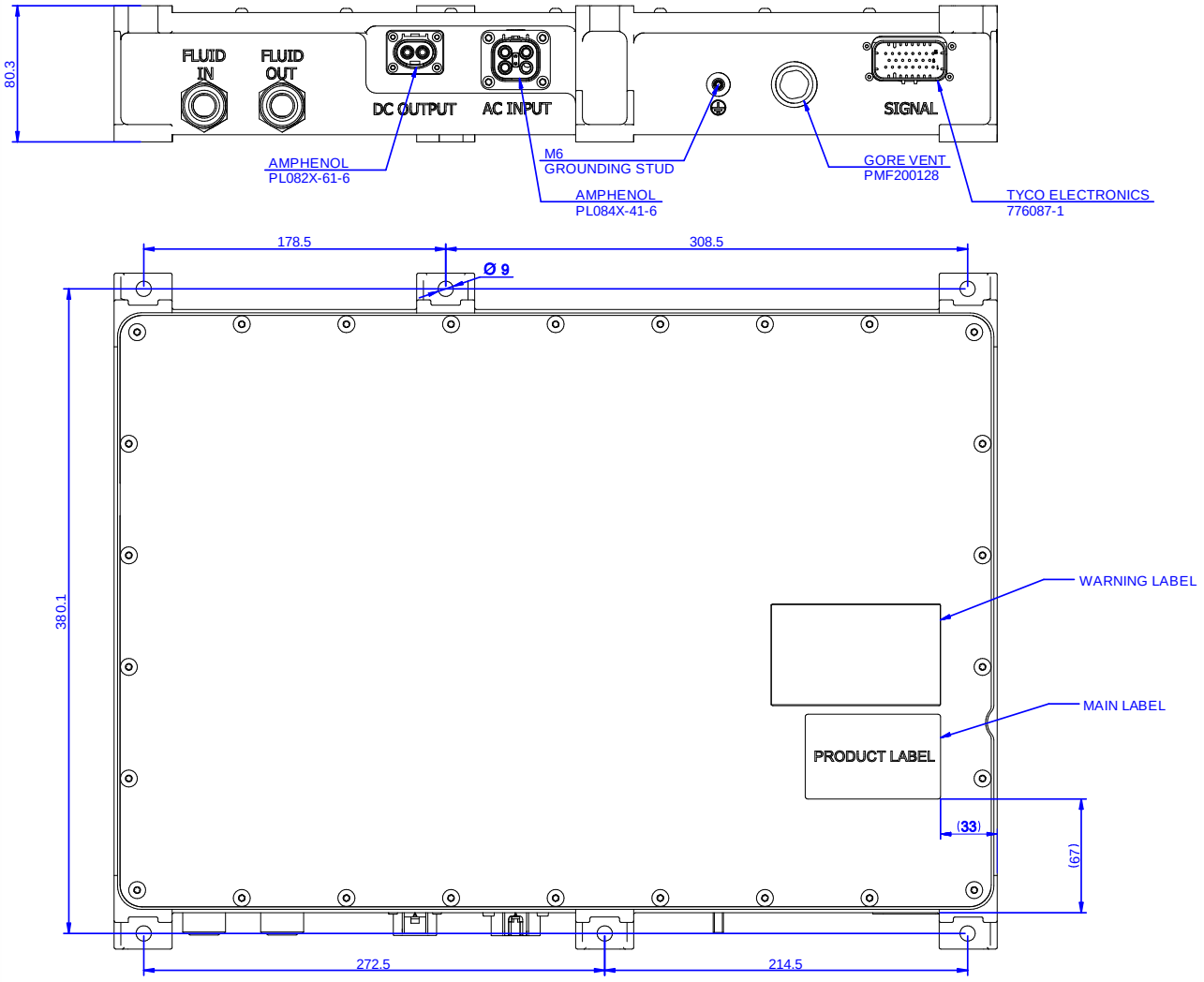


*Figure 2. Mechanical Dimensions*

## For more information on these products consult: tech.support@psbel.com

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