



BCL25-700-8

22/25 kW Battery Charger

The BCL25-700-8 is a 22 kW liquid cooled on-board battery charger that converts 3-phase AC voltage to DC voltage in hybrid or full electric vehicles.

Key Features & Benefits

- Input power up to 22/25 kW @ 400/480 VAC
- Typical efficiency 95%
- AC input range:
 - Three phases: 330 - 528 VAC (L-L)
 - Single phase: 190 – 264 VAC (L-N)
- DC output 240 - 800 VDC
- Bi-directional operation:
 - AC-DC charge mode
 - DC-AC export mode
- Parallelable up to 4 units in charge mode
- Over-temperature, output over-voltage and over-current protections
- Operating temperature -40°C to 60°C at full load
- SAE J1939 compliant CAN bus communication interface
- SAE J1772 & EN 61851 compliant
- Active HVDC interlock monitoring
- IEC 61851-21-1 compliant immunity requirements
- SAE J1455 compliant environmental standards
- IP67, IP6K9K protection
- J1939 compliant CAN Control and Monitoring



Applications

- Hybrid and Electric Vehicles
- Medium through heavy duty, on and off highway vehicles



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1. MODEL SELECTION

MODEL	DESCRIPTION
BCL25-700-8	Converter System

2. INVERTER CHARGER SUBSYSTEM

2.1 AC SIDE CHARGE MODE INPUT

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Voltage 3-phase	Nominal Operating Range		400/440		V_{AC}
	Absolute Operating Range	330		528	V_{AC}
Input Voltage 1-phase	Nominal Operating Range		230		V_{AC}
	Absolute Operating Range	190		264	V_{AC}
Input Current	Charge Mode			32	A_{AC}
Frequency		47	50 / 60	63	Hz
Leakage Current	@ 528 V _{AC} , 63 Hz; 3-phase			3.5	mA
	@ 264 V _{AC} , 63 Hz; 1-phase			10	mA
Power Factor	$V_{AC_IN} = 400 V_{AC}$, 3-phase, $P_{IN} > 11kW$	0.99			
Input Inrush Current	Pre-charge Mechanism				
Efficiency	$V_{AC_IN} = 400 V_{AC}$, 3-phase, $P_{IN} > 11kW$		95		%

2.2 AC SIDE EXPORT MODE OUTPUT

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT	
Output Voltage	3 phase		3x400 3x480		V_{AC}	
Output Current	Export Mode:		3x32		A_{RMS}	
Output Power	@ 400 V _{AC}			20.5	kVA	
	@ 480 V _{AC}			23.5	kVA	
Frequency	CAN selectable 50 or 60 Hz	Mode: 50 Hz	49.9	50	50.1	Hz
		Mode: 60 Hz	59.9	60	60.1	
Efficiency	@ $V_{HV} = 350 V_{DC}$ (Nom), $P_{IN} > 11kW$		95		%	
Load Step Response	Load Step 1					
	3 A_{AC} to 15 A_{AC} and back	Voltage deviation	- 10%	0	+ 10%	
	Load Step 2					
15 A_{AC} to 30 A_{AC} and back					V_{AC}	
Voltage Total Harmonic Distortion	Load 0 – 32 A_{AC}			3	%	
Turn-On/Off Delay	Export Mode:	Turn-On Delay		5	s	
		Turn-Off Delay		0.1		

2.3 HV DC SIDE CHARGE/EXPORT MODE

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Type	DC current source with 100/120 Hz sine wave ripple component				
Output Voltage	Not regulated; depends on battery voltage	250		800	V_{DC}
Output Current	Average output charging current adjustable via CAN			60	A_{DC}
	Including AC ripple component (AC + DC)			66	A_{AC}
Output Current Ripple	100/120 Hz 3 phase			6	Apk-pk
	100/120 Hz 1 phase			60	
Input Capacitance			50		μF
Inrush Current	Use external pre-charge resistor 500Ohm			20	A

2.4 PROTECTIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
AC Over-Current Protection	Export Mode: 10 s Current limit Phase - L1, L2, L3			32	A _{RMS}
AC Over-Voltage Protection	3 phase @ 528 V _{RMS} 1 phase @ 264 V _{RMS}	528 264		535 275	V _{RMS}
AC Under-Voltage Protection	3 phase @ 330 V _{RMS} 1 phase @ 190 V _{RMS}	320 180		330 190	V _{RMS}
HV DC Over-Current Protection	CAN adjustable			60	A
HV DC Over-Voltage Protection	Latch type, CAN adjustable, max. OVP Duration 1 ms	250		800	V _{DC}
HV DC Under-Voltage Protection	UVP Duration 1 s	230		250	V _{DC}
Input and Output Fuse Protection	AC input fuse internal, EVSE external circuit breaker Type C		32		A
	HV external input fuse (800 V _{DC} minimum): Aux_Supply_12/24 V fuse: external Automotive (Car) fuse		80 5		A A
Over-Temperature Protection	Converter shutdown at T_coolant higher than		75		°C

3. MONITORING AND CONTROL SIGNALS

PARAMETER	DESCRIPTION / CONDITION
IGN (Key Switch)	CAN communication enable Level High = Enable (connected to +VBAT)
Control Pilot	Function and levels according to SAE J1772 Duty cycle accuracy +/-2% in range 20 – 96%. Duty cycle accuracy -2/+5% in range 10 – 20%.
Proximity Detection	Function and levels according to SAE J1772
VBAT	12/24 V battery voltage input. Used to supply internal aux converter. Input protected against reverse connected. Energy taken from VBAT.
EVSE_WAKE_OUT	High side switch to wake VCU (Vehicle Control Unit) and other vehicle control modules. Output is protected by resettable PTC fuse.
CAN_BAUD_RATE	CAN bus speed; CAN speed settings is detected only at start up when 12/24 V voltage is applied. 500 kbit/s – signal not connected / left floating 250 kbit/s – signal grounded; connected to -VBAT

4. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Altitude	SAE J1455, Non-Operating: 18.6 kPa absolute pressure			12200	m
	Operating: T_coolant @ full load	-40		+60	m
Operating Temperature	T_coolant @ 50% power derating	+60		+75	°C
	T_ambient @ full load	-40		+80	
Storage Temperature		-40		+85	°C
Humidity	SAE J1455			95	%
Thermal Shock	SAE J1455, T _{amb} = -40°C to +85°C (no coolant cycling)				
Vibration	SAE J1455				
Protection	IP67 and IP6K9K, when all matting connectors are installed				

5. SAFETY, REGULATORY AND EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	CRITERION
Radiated Emission	IEC 61851-21-1:2017	According norm.
Conducted Emission	IEC 61851-21-1:2017	According norm.
Emission of voltage changes, voltage fluctuations & flicker on AC power lines	IEC 61851-21-1:2017	According norm.
Harmonic Input Current	IEC61000-3-2:2014 and IEC 61000-3-12:2011	According norm.
Electrostatic Discharge	IEC 61204-3:2014 level 3	Performance Criterion B
Radiated Electromagnetic Field	ISO 11452-2:2004, SAE J1113/21	Performance Criterion B, Status 2
Electrical Fast Transient (EFT) /Burst	IEC 61000-4-4; Level 2 (+/-5 kHz)	Performance Criterion B
Surge Immunity	IEC 61000-4-5; Level 3 surge (+/-1 kV DM and +/-2 kV CM)	Performance Criterion C
RF Conducted Immunity	IEC 61000-4-6; Level 3 (10 V, 0.15...80 MHz, AM 80%, 1 kHz)	Performance Criterion A
BCI (Bulk Current Injection)	ISO 11452-4-5, 20-200 MHz, 60 mA, 80% AM	Class B
CCC (Capacitive Coupling Clamp)	ISO 7637-3, -60 V, +40 V,	Class A
Electrical Transient Conduction Along Supply Lines ISO 7637-2:2011	Pulse number 1	C
	Pulse number 2a	A
	Pulse number 2b	C
	Pulse number 3a	A
	Pulse number 3b	A
Starting profile ISO 16750-2		A
Load Dump ISO 16750-2.		A
Insulation (Factory tested)	AC Input to HV output:	2500 V _{DC} *
	AC Input to chassis:	2500 V _{DC} *
	HV Output to chassis:	2500 V _{DC} *

6. COOLING SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION
Cooling Type	Liquid cooling
Maximum Inlet Coolant Temperature	+75°C (50% derating above +60°C)
Maximum Ambient Temperature	+80°C
Coolant Medium / Mixture	50/50 Ethylene Glycol I/ Distilled Water
Coolant Flow	min. 10 LPM @ coolant temperature +20°C
Maximum Coolant Pressure	29 psi (2 bar)
Maximum Pressure Drop	0.8 psi (0.05 bar) @ coolant temperature +20°C, @10LPM
Inlet/Outlet Coolant Connection	M18x1.5 DIN 9974-1
Material of Fittings	Aluminum alloy

7. CONNECTORS

PARAMETER	DESCRIPTION / CONDITION	MANUFACTURER	MPN
AC Side Connector	Inverter Charger side Mating connector	TE CONNECTIVITY	PN: HVA630-5P : 0-2141619-1 PN: HVA630-5P :114-94114-1
HV Power Connector	Inverter Charger side Mating connector	AMPHENOL	PN: HVSL600022A1H6 PN: HVSL600062A125
Signal Connector	Inverter Charger side Mating connector	TE CONECTIVITY	PN: DRC23-40PAN012 PN: DRC26-40SA

8. AC SIDE POWER CONNECTOR

Charger side: MFG: TE CONNECTIVITY; PN: HVA630-5P : 0-2141619-1

Mating connector: MFG: TE CONNECTIVITY; PN: HVA630-5P :114-94114-1

Use copper conductors only with an insulation rating of 120 °C, 6 mm², OD 16.3 mm.

Follow connector MFG instructions for correct connector assembly.

It is highly recommended to use screened connecting cables (e.g. Coroplast, FHRLR2GCB2G 5x6.0mm² T180).

Note: HVIL pins shall be shorted on mating part.

Pin number	Description	3 phase connection	1 phase connect. EU	1 phase connect. US
1.	PE	PE	PE	PE
2.	Phase L3	Phase L3		Phase L2 (120 V)
3.	Phase L2	Phase L2		
4.	Phase L1	Phase L1	Phase L1 (230 V)	Phase L1 (120 V)
5.	Neutral		Neutral	Neutral



AC input connector, Charger side



AC input connector, Cable side

9. DC SIDE POWER CONNECTOR

Charger side: MFG: Amphenol; PN: HVSL600022A1H6

Mating connector: MFG: Amphenol; PN: HVSL600062A125

Use copper conductors only with an insulation rating of 120 °C, 16 mm², OD 11.0 mm.

Follow connector MFG instructions for correct connector assembly.

It is highly recommended to use screened connecting cables (e.g. Coroplast, FHRLR2GCB2G 1x25mm² T180).

Note: HVIL pins shall be shorted on mating part.

Pin number	Description
1.	HV DC negative
2.	HV DC positive



DC output connector, Charger side



DC output connector, Cable side

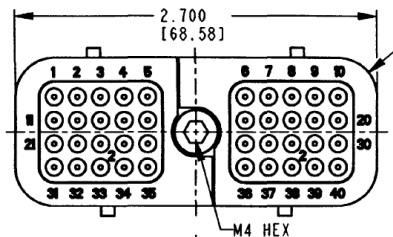
10. SIGNAL CONNECTOR

Charger side: MFG: TE Connectivity; PN: DRC23-40PAN012

Mating connector: MFG: TE Connectivity; PN: DRC26-40SA,
max. 2 Amps per pin (wire AWG 20)

Pin PN: 1062-20-0144

We propose to use screened connecting cables.



Signal connector, Charger side



Signal connector, Cable side

PIN	NAME	FUNCTION	REFERENCE PIN
1	PROXIMITY	Function and levels according SAE J1772	PE
2	SGND	Internally connected with pin 12	-
3	EVSE_WAKE_OUT	Wake Output goes high when Control Pilot is active (max delay 100ms) and goes low when CAN command from VCU is received or when goes into sleep mode or delayed sleep mode.	Pin 2
4	HVIL_IN	Input pin for HVIL loop. (To detect if connectors are properly inserted.)	Pin 5
5	HVIL_OUT	Output pin for HVIL loop	Pin 4
6	+VBAT	Internally connected with pin 16, connect both pin	Pin 26, Pin 36
7	LOCK_LOOP_A	Plug motor interlock signal	Pin 8
8	LOCK_LOOP_B		-
9	LOCK_ACTUATOR_A	Plug motor lock A	Pin 10
10	LOCK_ACTUATOR_B	Plug motor lock B	Pin 9
11	CONTROL PILOT	Function and levels according SAE J1772	PE
12	SGND	Internally connected with pin 2	-
13	KEY_SWITCH	This is signal for CAN communication enable (Level HIGH=enable)	Pin 6
14	TEMP_EXT+	External temperature sensor +	Pin 15
15	TEMP_EXT-	External temperature sensor -	Pin 14
16	+VBAT	Internally connected with pin 6, connect both pin	Pin 26, Pin 36
17	SYNC_I/O	Signal for synchronization of the units working in parallel	Pin 18
18	SGND		-
19	CAN_SPEED	Setting of the CAN baud rate (float 500kB)	Pin 20
20	SGND		-
21	SGND	Internally connected with pin 22 and 23	-
22	SGND	Internally connected with pin 21 and 23	-
23	SGND	Internally connected with pin 21 and 22	-
24	BUTTON_A		Pin 23
25	BUTTON_B		Pin 23
26	-VBAT	Internally connected with pin 36, connect both pin	-
27	ADDR_0	Inputs to set addresses of 4 parallel units. Internally pulled-up for logic level H. Connection to 12/24V_RTN = logic level L.	Pin 28
28	SGND	Internally connected with pin 38	-
29	CAN_H_INT	Diagnostic line	-
30	CAN_L_INT	Diagnostic line	-
31	LED_A		Pin 21
32	LED_B		Pin 22
33	LED_C		Pin 23
34	BUTTON_LED_A		Pin 23
35	BUTTON_LED_B		Pin 23
36	-VBAT	Internally connected with pin 26, connect both pin	-
37	ADDR_1	Inputs to set addresses of 4 parallel units. Internally pulled-up for logic level H. Connection to 12/24V_RTN = logic level L.	Pin 38
38	SGND	Internally connected with pin 28	-
39	CAN_H_EXT	CAN communication	Pin 40
40	CAN_L_EXT	CAN communication	Pin 39

11. MECHANICAL SPECIFICATIONS

PARAMETER	CONDITIONS / DESCRIPTION
Dimensions (W x H x D)	705 x 106 x 359 mm 27.75 x 4.17 x 14.13 inch
Weight	19 Kg
Enclosure Material	Aluminum alloy

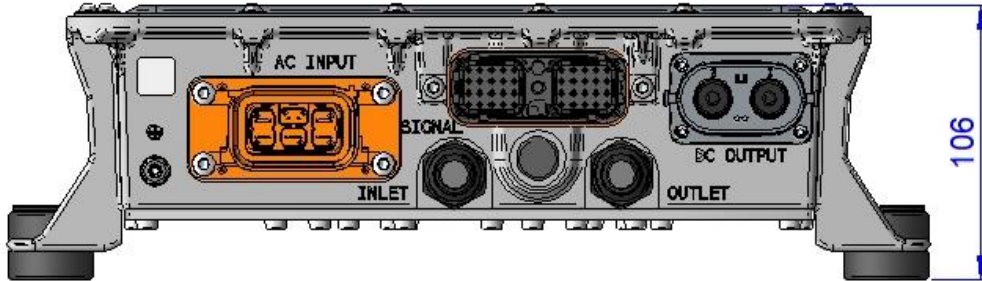


Figure 2. Mechanical Dimensions – Front View

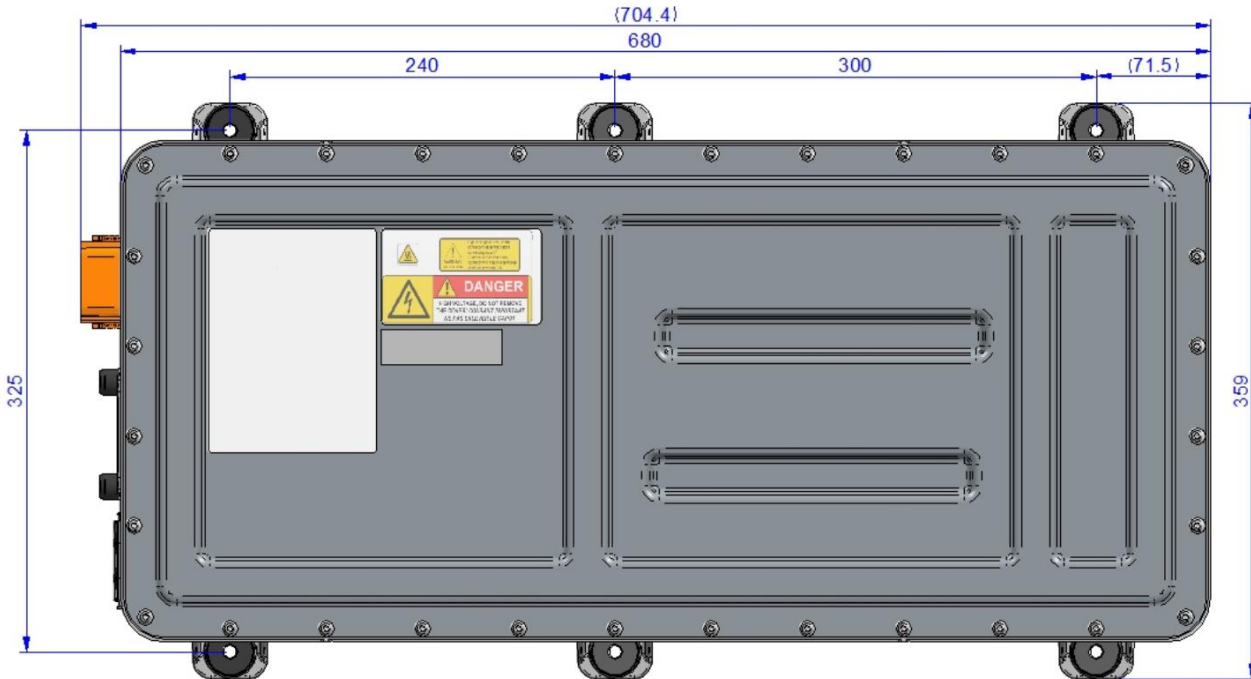
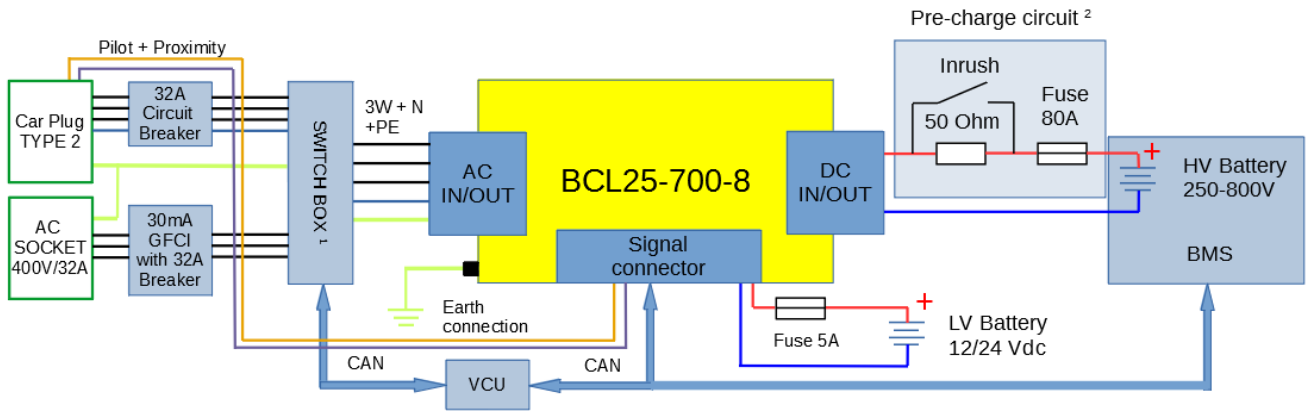


Figure 3. Mechanical Dimensions – Top View

12. ACCESSORIES

ACCESSORIES	DESCRIPTION
BCL25-700-CON-KIT	Connector Kit (AC connector with the 6m cable, HV DC connector, Signal Connector)

13. POWER WIRING DIAGRAM



- 1 -Switch box is required only when the customer is using the BCL25-700-8 in both charge mode and inverter/export mode in an electric vehicle.
- 2- External pre-charge circuit is required only when is not part of BMS

Figure 4. Power Wiring Diagram

14. SIGNAL WIRING DIAGRAM

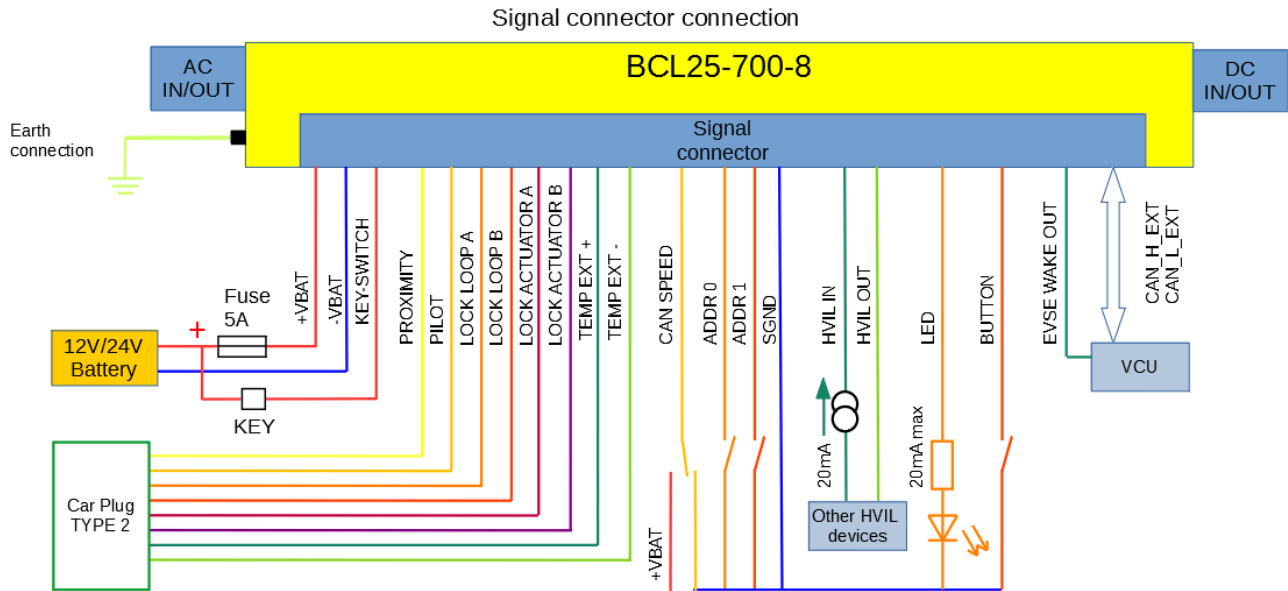


Figure 5. Signal Wiring Diagram

For more information on these products consult: tech.support@psbel.com
 For communication manual (BCA.00290) consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

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