BDC22-700-8

DC-DC Bi-Directional Converter

The Bel Power Solutions BDC22-700-8 is a 21 kW liquid cooled DC-DC converter that creates HV DC voltages in hybrid and electric vehicles.

BDC22-700-8 converter operates at input voltages from 300 to 850 VDC and delivers up to 21000 W of output power.

Features include very high efficiency and high reliability.

FEATURES

- Very high efficiency up to 95 %
- Input voltage range: 300 – 850 VDC
- Output power up to 21 kW
- Output voltage range 300 – 850 VDC
- Output current 60 ADC max.
- Parallelable up to 4 units
- Full galvanic isolation between input and output
- Liquid cooled
- CAN bus serial interface
- Optional UDS functionality, CAN FD & Cyber security
- Adjustable output voltage and over current protection
- Over temperature, output over voltage and over current protection, input and output reverse polarity protection
- IP rating IP67 & IP6K9K
- E-Mark Certification
- Control and Communication supply voltage 9 – 32 VDC

APPLICATIONS

- Heavy trucks & mining vehicles
- Buses, taxis & light vans
- Hybrid vehicles with refrigeration unit
- Harsh environment applications

1. MODEL SELECTION

MODEL	DESCRIPTION
BDC22-700-8	21 kW, liquid cooled DC-DC bi-directional converter, 300 - 850 VDC voltage range
BDC22-700-CON-KIT *	Mating connector/harness kit: 1 pc Signal connector (housing and pins - spare parts) 1 pc HVDC1 connector (housing and pins - spare parts) 1 pc HVDC2 connector (housing and pins - spare parts)

** The connector kit does not included HV DC cables.*

2. HVDC 1 INPUT/OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Input Voltage		300		850	VDC
Input Current				64	ADC
Efficiency	at V_{IN} = 700 VDC, V_O = 700 VDC, I_O = 30 ADC at V_{IN} = 350 VDC, V_O = 350 VDC, I_O = 60 ADC	97 95			%
Input Line Interruption	Converter shutdown			290	VDC
Input Capacitance			32		µF
Inrush Current				52	ADC
Output Voltage		300		850	VDC
Output Current				60	ADC
Output Power				21	kW
Transient Response	Voltage over/under shoot: Load step 1: 10 to 50 %, 50 to 90% and back Load step 2: 5 to 95 % and back	 -10 -20		 +10 +20	VDC

3. HVDC 2 INPUT/OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Input Voltage		300		850	VDC
Input Current				64	ADC
Efficiency	at V_{IN} = 700 VDC, V_O = 700 VDC, I_O = 30 ADC at V_{IN} = 350 VDC, V_O = 350 VDC, I_O = 60 ADC	97 95			%
Input Line Interruption	Converter shutdown			290	VDC
Input Capacitance			32		µF
Inrush Current				52	ADC
Output Voltage		300		850	VDC
Output Current				60	ADC
Output Power				21	kW
Transient Response	Voltage over/under shoot: Load step 1: 10 to 50 %, 50 to 90% and back Load step 2: 5 to 95 % and back	 -10 -20		 +10 +20	VDC

4. PROTECTION SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Output Over Current Protection	Adjustable via CAN (Default factory set point 0 A)	0		60	ADC
Output Over Voltage Protection	Adjustable via CAN (Default factory set point 300 V)	300		850	VDC
Output Under Voltage Protection	Adjustable via CAN (Default factory set point 290 V)	290		830	VDC
Over Temperature Protection	Converter shutdown at T_coolant	75			°C
HV Input Fuse Protection	HVDC 1 Input: external HV fuse required HVDC 2 Input: external HV fuse required		80 80		ADC
Input Under Voltage Protection	10 V hysteresis; Adjustable via CAN (Default factory set point 290 V)	290		830	VDC
Input Over Voltage Protection	20 V hysteresis; Adjustable via CAN (Default factory set point 300 V)	300		850	VDC

5. MONITORING AND CONTROL SIGNALS

PARAMETER	DESCRIPTION / CONDITIONS	CRITERION
CAN BUS SAE J1939	250 kBit/s, 500 kBit/s or 1Mbit/s available	
Address Bits	ADDR 0, 1	Logic Low / Floating
WAKE_UP	Logic input signal	LV BAT VOLTAGE
HVIL Function	HVIL loop monitored internally	HVIL voltage / current
CAN_SPEED	CAN speed selection	Logic Low – 250 kBit/s Logic Floating – 500 kBit/s Logic High – 1 MBit/s

6. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Operating Temperature	$T_{COOLANT}$ / ambient with no derating $T_{COOLANT}$ / ambient with power derating at 11000 W	-40		+60 +75	°C
Storage Temperature		-40		+85	°C
Altitude	Operating Non-Operating			4000 12200	m
Humidity	SAE J1455				
Shock	ISO 16750-3:2012				
Vibration	ISO 16750-3:2012				
IP Rating	IP67, IP6K9K				

7. COOLING SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS
Maximum Inlet Coolant Temperature	+60°C or up to +75°C with reduced output power
Coolant Medium/Mixture	50/50 Propylene or Ethylene Glycol/Water
Min. Coolant Flow	2.64 GPM (10 LPM)
Max. Coolant Flow	5.28 GPM (20 LPM)
Max. Coolant Pressure	29 psi / 2 bar
Pressure Drop @ 10 L/min, $T_{COOLANT}$ = 20°C	2.9 psi (0.2 bar)

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8. SAFETY, REGULATORY AND EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	CLASS / LEVEL / CRITERION
Approval Certification	E-Mark	UN ECE R10.6
Radiated Emission	UN ECE R10 6th Edition	ESA level
Conducted Emission	UN ECE R10 6th Edition	ESA level
Electrostatic Discharge	IEC 61000-4-2	Performance Criterion B
Radiated Electromagnetic Field	IEC 61000-4-3 (10 V/m), SAE J1113/21 (100 V/m)	Performance Criterion B Class B
Electrical Fast Transient	ISO 7637-2; ISO 7637-3, ISO 16750-2	Performance Criterion A
RF Conducted Immunity	Level 3 (10 V, 0.15…80 MHz, AM 80%, 1kHz)	Performance Criterion A
RF Disturbances Immunity	SAE J1113-41 ISO 11452-4 BCI (1-400 MHz, 60 mA)	Class A Class A
Staring Profile	ISO 16750-2:2012	Performance Criterion A
Load Dump	ISO 16750-2:2012	Performance Criterion C
Insulation (EN IEC 62368-1 3rd Edition)	HVDC 1 to Protective Earth HVDC 2 to Protective Earth HVDC 1 to HVDC 2 Signals to Protective Earth Signals to HVDC 1 and HVDC 2	Basic 1500 VDC Basic 1500 VDC Reinforced 2500 VDC Basic 500 VDC Basic 2500 VDC

9. CONNECTORS

9.1 HVDC 1 INPUT/OUTPUT

PSU side: MFG: AMPHENOL; PN: HVSLS600022A1H6
Mating connector: MFG: AMPHENOL; PN: HVSLS600062A125

Use copper conductors only with an insulation rating of 120°C, 25 mm², OD 11.9 mm
Follow connector MFG instructions for correct connector assembly.

It is highly recommended to use screened connecting cables. (e.g. Coroplast, FHLR2GCB2G 1x 25 mm² T180).

Note: HVIL pins shall be shorted on mating part (cable side).

PIN	FUNCTION
1	HVDC negative
2	HVDC positive

Figure 1. HVDC 1 IN/OUT connector, Converter side

Figure 2. HVDC 1 IN/OUT connector, Cable side

9.2 HVDC 2 INPUT/OUTPUT

PSU side: MFG: AMPHENOL; PN: HVSLS600022B1H6
Mating connector: MFG: AMPHENOL; PN: HVSLS600062B125

Use copper conductors only with an insulation rating of 120°C, 25 mm², OD 11.9 mm
Follow connector MFG instructions for correct connector assembly.

It is highly recommended to use screened connecting cables. (e.g. Coroplast, FHLR2GCB2G 1x 25 mm² T180).

Note: HVIL pins shall be shorted on mating part (cable side).

PIN	FUNCTION
1	HVDC negative
2	HVDC positive

Figure 1. HVDC 2 IN/OUT connector, Converter side

Figure 2. HVDC 2 IN/OUT connector, Cable side

9.3 SIGNAL CONNECTOR

PSU side: MFG: TYCO ELECTRONIC; PN: 776087-1
Mating connector: MFG: TYCO ELECTRONIC; PN: 770680-1,
Pin: MFG: Pin PN: 1062-20-0144
Max. 5 Amps per pin (wire AWG 16, 1.0 mm^2)
It is highly recommended to use screened connecting cables.
Plastic plug PN: 770678-1
Ampseal backshell PN: 776464-2 (optional)

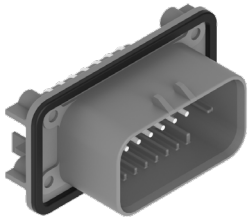

Figure 5. Signal connector, Converter side

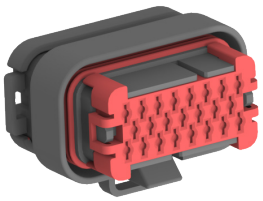

Figure 6. Signal connector, Cable side

PIN	NAME	FUNCTION	VOLTAGE/CURRENT LIMIT OR CONSUMPTION	REFERENCE PIN
1	+VBAT	LV battery input positive	Input Voltage: 32 V max, Input Current: 2.5 A max	-VBAT
2	HVIL_IN	Input pin for HVIL loop. (To detect if connectors are properly inserted.)	Input Voltage: 32 V max, Input Current: 50 mA max	HVIL_OUT
3	-	-		
4	TEMP_EXT+	External temperature sensor +		TEMP_EXT-
5	TEMP_EXT-	External temperature sensor -		
6	ADDR_0	Inputs to set addresses of 4 parallel units. Internally pulled-up for logic level Hi. Connection to SGND.		SGND
7	ADDR_1	Inputs to set addresses of 4 parallel units. Internally pulled-up for logic level Hi. Connection to SGND.		SGND
8	CAN_SPEED	Setting of the CAN baud rate (no connected 500 kB, connect to SGND 250 kB, connected to +VBAT custom speed)	Input Voltage: 32 V max, Input Current: 1 mA max	SGND
9	WAKE_UP	This is signal for CAN communication enable (Level HIGH = enable), connect to +VBAT	Voltage: 32 V max, Current : 1 mA max	SGND
10	-	-		
11	SGND	Signal ground, internally connected to -VBAT		
12	BUTTON_A			SGND
13	BUTTON_B	Unit Shutdown		SGND
14	CAN_L_INT	CAN communication diagnostic		
15	CAN_H_INT	CAN communication diagnostic		
16	-VBAT	LV battery input negative		
17	HVIL_OUT	Output pin for HVIL loop		
18	PARALLEL	Connect to SGND for parallel combination		SGND
19	LED_A	LED signal output	Output Voltage: 5 V max, Output Current: 20 mA max	SGND
20	LED_B	LED signal output	Output Voltage: 5 V max, Output Current: 20 mA max	SGND
21	LED_C	LED signal output	Output Voltage: 5 V max, Output Current: 20 mA max	SGND
22	CAN_L_EXT	CAN communication for customer		
23	CAN_H_EXT	CAN communication for customer		

10. MECHANICAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITIONS	MIN	NOM	MAX	UNIT
Dimensions	W x H x D		660.6 x 378 x 103.4 26.01 x 14.88 x 4.07		mm in
Weight				22	kg
Enclosure	Aluminum alloy				

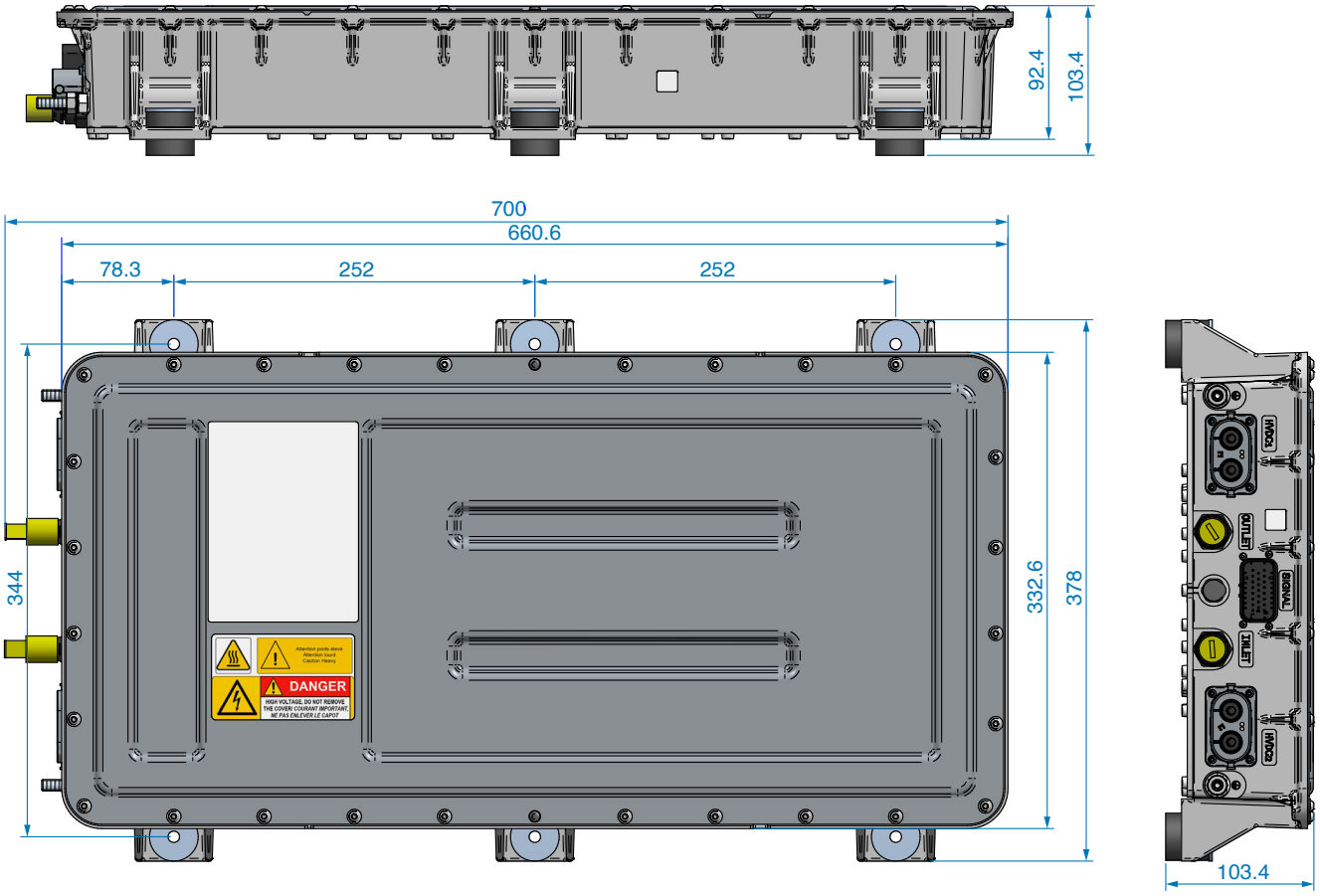

Figure 7. Mechanical Drawing

For more information on these products consult: powersupport@belf.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.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

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