

350DNC40-12 SERIES

4 kW DC-DC Down Converter

The Bel Power Solutions 350DNC40-12 Series is a 4 kW DC/DC converter that converts HVDC voltages in hybrid and electric vehicles to LVDC voltages suitable to power low voltage (12/24 VDC) accessories.

Liquid or convection cooled DC/DC converter operates at input voltages from 240 to 430 VDC and delivers power range up to 4000 W / 3300 W (liquid / convection cooled model).

Features include very high efficiency, high reliability, low output voltage noise, and excellent dynamic response to load/input changes.



KEY FEATURES & BENEFITS

- Input voltage range: 240 – 430 VDC (300 – 450 VDC)
- Typical efficiency up to 93 %
- Up to 4 kW power (max. 16 kW)
- Full galvanic isolation between input and output
- Liquid or convection cooling
- CAN bus serial interface
- Adjustable output voltage
- Over temperature, output overvoltage and overcurrent protection, input and output reverse polarity protection
- Protection degree IP65 and IP67
- E-Mark approval no.: E13*10R00*10R05*13824*00

APPLICATIONS

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



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1. MODEL SELECTION

MODEL	DESCRIPTION
350DNC40-12-8G	Liquid cooled model
350DNC40-12-8S103G	Liquid cooled model
350DNC40-12-CG	Convection cooled model
350DNC40-CON-KIT-8G	Mating connectors kit – Signal connector housing and pins, HV connector assembled with 3 m cable
350DNC40-CON-KIT-9G	Mating connectors kit - housing and pins

2. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Voltage	350DNC40-12-8G / 350DNC40-12-CG 350DNC40-12-8S103G	240 300	350	430 450	VDC
Input Current	350DNC40-12-8G / 350DNC40-12-CG 350DNC40-12-8S103G			19 16	ADC
Efficiency	@ Vin = 350 VDC, Vo = 14.4 V, I _{nom} = 278 A	92			%
Input Line Interruption	Converter shutdown 350DNC40-12-8G / 350DNC40-12-CG 350DNC40-12-8S103G			240 300	VDC
Input Capacitance			30		μF
Inrush current	External pre-charging circuit required				

3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Voltage	Vo trimmed via CAN BUS, 10 bit res 350DNC40-12-8G / 350DNC40-12-CG 350DNC40-12-8S103G	9	14.4 13.0	16	VDC
Output Current	Liquid cooled model Convection cooled model		278 229		ADC
Output Power	Liquid cooled model Convection cooled model			4000 3300	W
Line Regulation	V _{inmin} - V _{inmax} , @ 139 A, T _{coolant} = 70°C	- 0.1		+ 0.1	VDC
Load Regulation	I _{out} 10 to 90% load, T _{coolant} = 70°C	- 0.075		+ 0.075	VDC
Output Voltage Set Point	@ 139A, T _{coolant} = 25°C	14.35	14.4	14.45	VDC
Thermal Drift		- 0.05		+ 0.05	%/°C
Periodic and Random Deviation	@ 14.4 VDC / Nominal load (Differential Mode 20 MHz) CAN high / low (Differential Mode 20 MHz)			280 * 300 *	mVp-p
Transient Response	Load step 1: 10 to 50 % and back Load step 2: 50 to 100 % and back Voltage over/under shoot: Response time within 1 % of VoSET:	-1000		+1000 1000	mV μs
Turn-on Overshoot	V _{onom} , <100 ms	5			%
Redundant Parallel Operation	Up to 4 converters operating in parallel			16	kW
Remote Sense	Cable Drop (V) @ Maximum Load			0.5	V
Turn-On Delay	Rise time (C _{ext} = 0 μF) Power-on-delay (From applying DC input voltage to Vo = 90 %) Power-on-time from PS_WAKE UP (From PS_WAKE UP ON to Vo = 90% of nom)			200 1 3	ms s s
Turn-Off Timing	PS_WAKEUP delay; (monotonic Vo fall)	0		100	ms
Capacitive Load	@ 14.4 VDC		0	7200	μF

* With external capacitors 47 μF (Electrolytic cap) & 1 μF (X7R Ceramic cap) connected to measuring point



4. PROTECTION SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Over-Current Protection	Constant current Liquid cooled model Convection cooled model		285 235		A
Output Over-Voltage Protection	Latch type, max. OV duration 1ms	17		18	V
Output Under-Voltage Protection	Max. UV duration 1s, than hiccup	6		8	V
Over-Temperature Protection	Converter shutdown Liquid cooled model Convection cooled model	80 50			°C
Input and Output Reverse Polarity Protection	Protective elements connected in series				
Input Fuse Protection	DC Input: internal primary fuse		25		A
Input Low Line Protection	Turn ON threshold Turn OFF threshold	250 235	255 240	260 245	VDC
Input Overvoltage Protection	Recovery: Vin re-cycling or PS_WAKEUP 350DNC40-12-8G / 350DNC40-12-CG 350DNC40-12-8S103G	435 455		450 465	V

5. MONITORING AND CONTROL SIGNALS

PARAMETER	DESCRIPTION / CONDITION	CRITERION
CAN BUS SAE J1939	250 kBit/s or 500 kBit/s available	
Remote sense signals	Sense positive (+ SENSE) Sense negative (- SENSE)	0.5 V compensation
Address bits	Internally pulled up to LOGIC HIGH (3.3 V, 100 kohm)	Adr. 0 Adr. 1
PS_WAKEUP	Logic input signal	+12 V
HVIL function	HVIL pins shorted internally	Part of HV connector
CAN_SPEED	CAN speed selection Internally pulled up to LOGIC HIGH (3.3 V, 100 kohm)	Logic Low – 250 kBit/s Logic High – 500 kBit/s

6. SAFETY, REGULATORY AND EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	CRITERION
E-Mark Approval	E13*10R00*10R05*13824*00	E-mark**
Insulation	Basic: 3000 VDC, 20 MΩ Basic: 3000 VDC, 20 MΩ	Input-to-Protective Earth Input-to-Output
Radiated Emission	UN ECE R10 4th 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	IEC 61000-4-4, Level 2 (+/-2 kV, 2.5 kHz) ISO 7637-2; ISO 7637-3, ISO 16750-2	Performance Criterion B
RF Conducted Immunity	Level 3 (10 V, 0.15...80 MHz, AM 80%, 1kHz)	Performance Criterion A
RF Disturbances Immunity	SAE J1113-41 ISO11452-4 (1-400 MHz, 60 mA)	Class A Class B

** Excluding 350DNC40-12-8S103G model.



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7. ENVIRONMENTAL SPECIFICATIONS

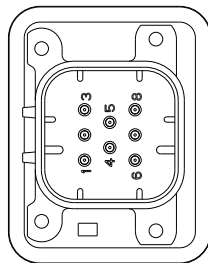
PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Altitude	Operating: 62 kPa absolute pressure			3600	m
	Non-Operating: 18.6 kPa absolute pressure			12200	
Operating Temperature	Liquid cooled: T_coolant with no derating	-40		+70	°C
	T_amb @ full load, with no power derating	-40		+85	
	Convection cooled: T_amb with no power derating	-40		+45	
Storage Temperature		-40		+95	°C
Humidity	SAE J1455				
Shock	SAE J1455				
Vibration	SAE J1455, MIL-STD-202G				

8. CONNECTORS

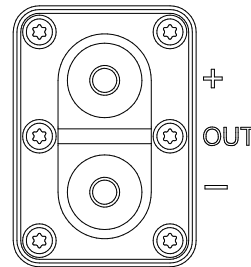
PARAMETER	DESCRIPTION / CONDITION	MANUFACTURER	MPN
Input Connector (IN)	High voltage connector with HVIL function	TYCO	2103124-1, KEY A
Output Connector (OUT)	Male dual terminal thread M8		
CAN BUS and Signal Interface (CTRL)	Panel mounted	TYCO	776276-1

PIN	SIGNAL DESCRIPTION
1	PS_WAKEUP
2	ADR0
3	ADR1
4	CAN_SPEED
5	CAN_H
6	CAN_L
7	+SENSE
8	-SENSE

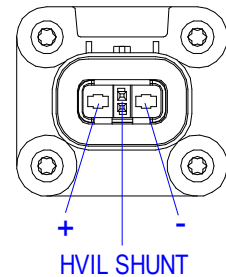
Signal Connector Pin Description



Signal Connector



Output Connector



Input Connector

9. COOLING SPECIFICATIONS

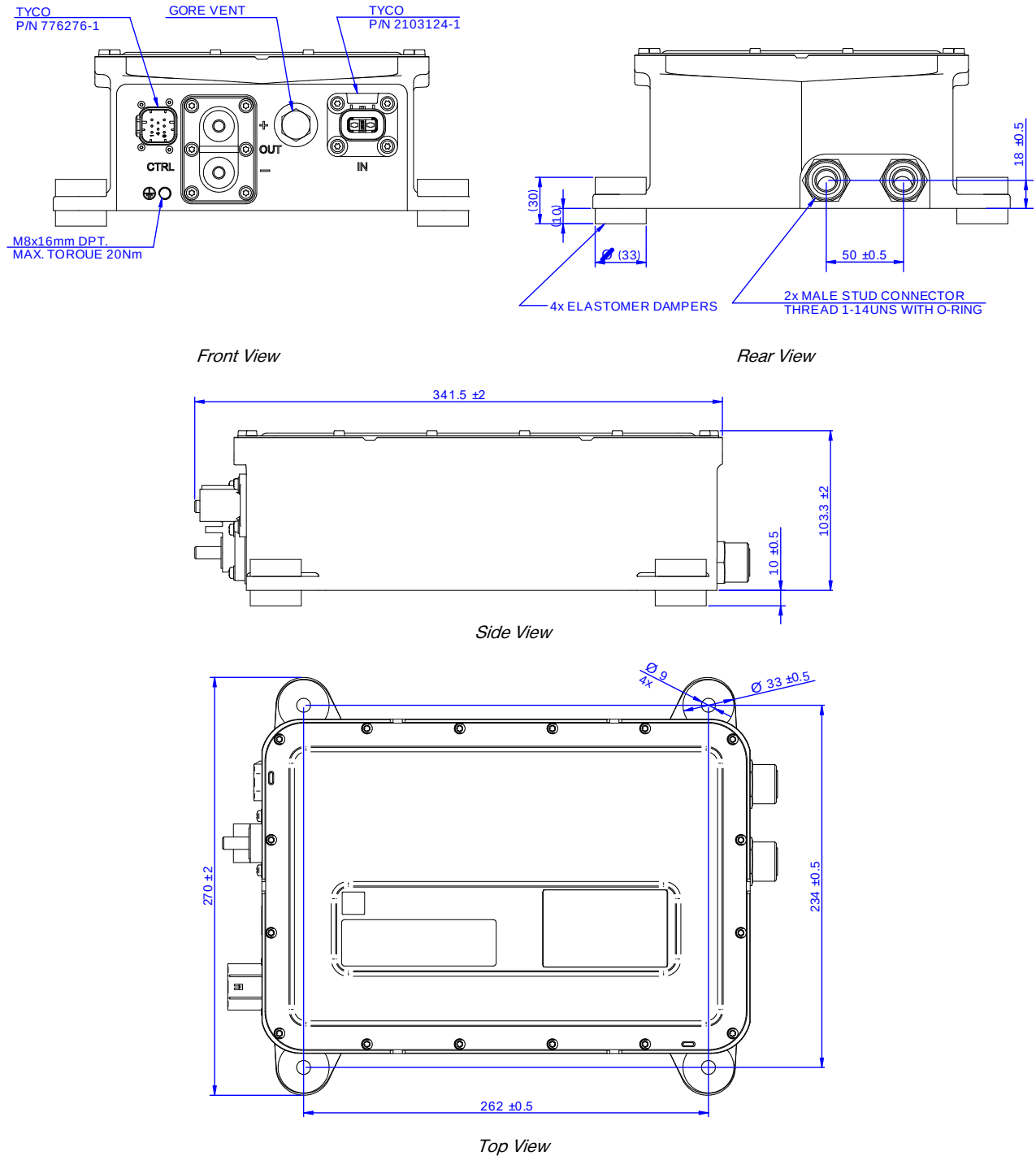
PARAMETER	DESCRIPTION / CONDITION
Maximum Inlet Coolant Temperature	+70°C
Coolant Medium/Mixture	50/50 Propylene or Ethylene Glycol/Water
Min. Coolant Flow	0.0208 l/s (0.33 GPM)
Max. Coolant Flow	0.1166 l/s (1.85 GPM)
Max. Coolant Pressure	20 psi
Max. Pressure Drop	1 psi

10. MECHANICAL SPECIFICATIONS

PARAMETER	LIQUID COOLED MODEL	CONVECTION COOLED MODEL
Dimensions (W x H x D)	270 x 113 x 341.5 mm	350 x 187 x 341.5 mm
Weight	11 kg	22 kg
Enclosure	IP65 and IP67	



MECHANICAL DRAWINGS - LIQUID COOLED MODEL



The technical drawing consists of three orthographic projections of a rectangular electronic enclosure:

- Front View:** Shows the front face of the device. It features a control panel with a "CTRL" button, two circular indicators labeled "+" and "-", a power switch labeled "OUT", and a connector labeled "IN". The overall width is dimensioned as 350 ± 2 .
- Side View:** Shows the side profile of the device. It highlights a large heat sink with multiple vertical fins. The overall height is dimensioned as 187.7 ± 2 , and the depth is dimensioned as 341 ± 2 .
- Top View:** Shows the top surface of the device. It includes four mounting feet at the corners. The overall length is dimensioned as 160 ± 1 , and the overall width is dimensioned as 330 ± 1 . A detail callout indicates four holes with a diameter of $\varnothing 8.5$.

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.