

Data Sheet

EC-C24-D180

Low voltage inverter

FEATURES

- 2-in-1 design
- IP65 enclosure class to maximize reliability
- Ramp detection and speed limitation

SOFTWARE FEATURES

- Motor speed control via CANbus signal
- Configurable CANbus and Power Map curve

TYPICAL APPLICATIONS

- Scissor lift
- Boom lift
- Wheel hub



GENERAL

The Danfoss EC-C24-D180 motor controller offers excellent hardware and software performance for low-voltage DC input, and high-current output applications. EC-C24-D180 is intended to be used in combination with ED-DT130. Its control strategy for permanent magnet synchronous motors combines Field-Oriented Control (FOC) with Maximum Torque Per Ampere (MTPA) to maximize system efficiency.

The controller features a dual-MCU architecture: MCU1 handles real-time motor control, while MCU2 manages functional safety detection and diagnostics, enhancing both system performance and safety. Isolated CAN circuits are used for communication to minimize the impact of external interference.

To monitor the vehicle's attitude, the controller incorporates an Inertial Measurement Unit (IMU), which combines accelerometer and gyroscope sensors to detect and measure movements in terms of acceleration and rotational speeds.

The controller incorporates advanced motion-control technology, allowing customers to customize control performance to meet their specific driving requirements.

SPECIFICATIONS

General	
Nominal voltage	24 V
Working voltage range	16.5 - 34 V
Nominal current (S2-60 min)	80 A _{RMS}
Maximum current (S2-1 min)	180 A _{RMS}
Maximum power	2.2 kW
Maximum efficiency	> = 97 %
Communication mode	CANopen / analog
Maximum baud rate	500 Kbps
Operating frequency	8 kHz
Maximum output frequency	500 Hz
MCU static power	< = 3 W
Start-up time	< = 3 s
Encoder type	Incremental encoder, sin/cos encoder
Encoder frequency	< = 1 MHz

Mechanical	
Dimensions (W x H x L)	150 x 66 x 240 mm
Weight	2.1 kg ± 10 %
Main materials	Enclosure: aluminum

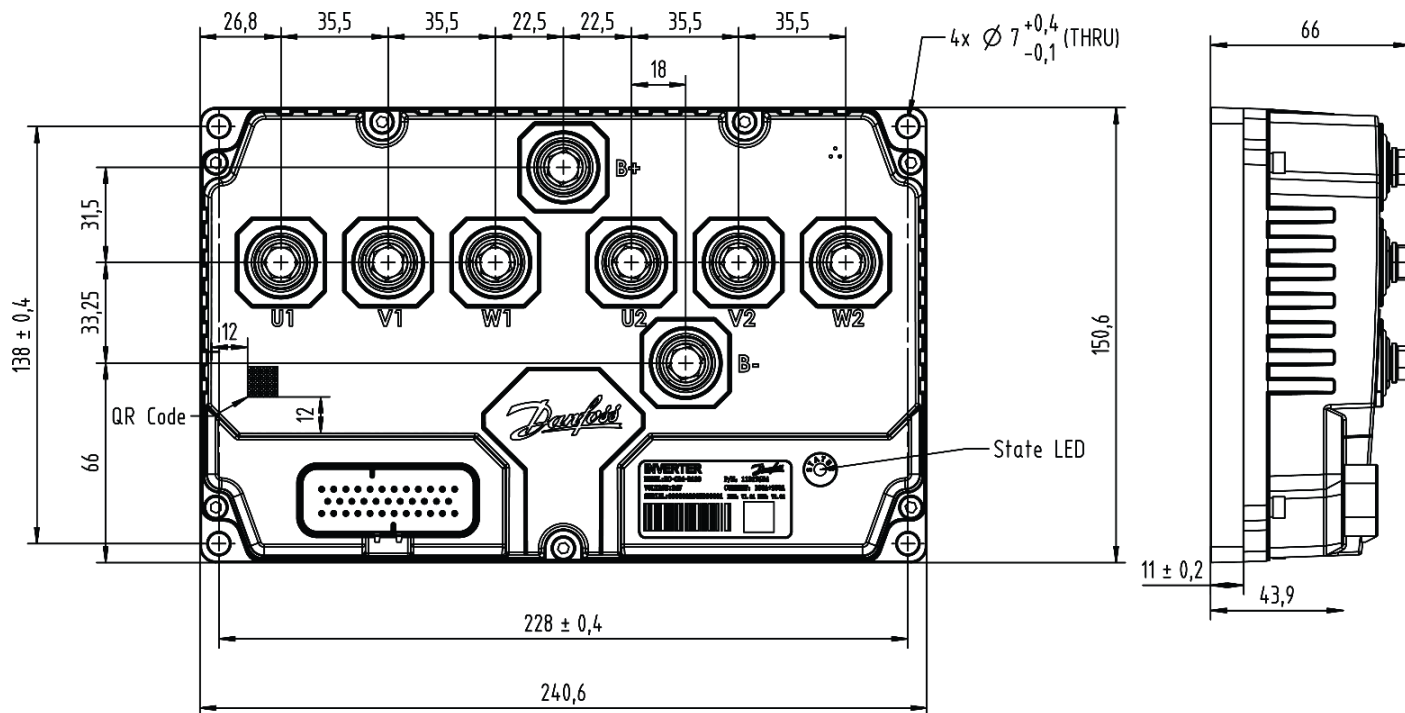
Cooling	
Cooling method	Passive air-cooling

Ambient Conditions	
Storage temperature range	-40°C - +85°C
Operating temperature range	-40°C - +65°C
Absolute maximum device internal temperature	+90°C
Altitude	Up to 2000 m
Relative humidity	< 90 %
Enclosure class	IP65

Connections	
Inverter side cable cross section	Up to 10 mm ² (Cu)
Battery / DC-link side cable cross section	Up to 35 mm ² (Cu)
Motor 1 connections	3x M6x16 threaded terminal connection (U1, V1, W1)
Motor 2 connections	3x M6x16 threaded terminal connection (U2, V2, W2)
Battery / DC-link connection	2x M6x16 threaded terminal connection (B+, B-)
Power connections cable lug size	10-6 (U1, V1, W1, U2, V2, W2) 35-6 (B+, B-)
Inverter side recommended cable lug	10 mm ² : Druseidt 03204 (straight), 03822 (right-angled 90°) https://druseidt.de
Battery / DC-link side recommended cable lug	35 mm ² : Druseidt 03221 (straight), 03836 (right-angled 90°)
LV connector	35-pin Tyco electronics AMPSEAL connector https://www.te.com
LV connector type	part no. 776163-1

LV connector pin configuration	See section SIGNAL CONNECTOR PINOUT
LV mating connector type	TE 776164-1
LV mating connector pin type	0.5-1.25 mm ² : TE 770854-3 (gold plated)

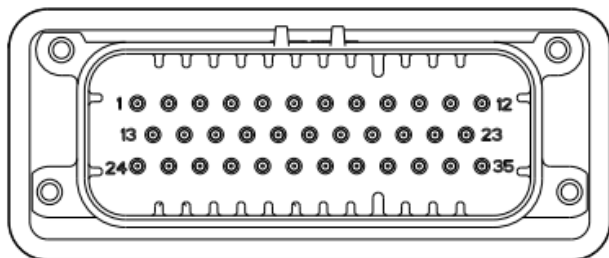
DIMENSIONS



Picture 1 Dimensions for EC-C24-D180

Dimension	Length
L	240 mm
W	150 mm
H	66 mm

Table 1 Dimensions for EC-C24-D180



Picture 2 Connector

SIGNAL CONNECTOR PINOUT

Electrical specification of MCU pin				
Pin number	Pin name	Pin function	Signal type	Function description
1	Reserved			
2	Reserved			
3	KEY-SWITCH	Key switch input	Power Input	1. The minimum starting voltage of the controller is 16.5V, and the turn-off holding voltage is Min=10V. 2. Undervoltage threshold of key switch: 16V (configuration parameters can be modified). 3. Overvoltage threshold of key switch: 34V (configuration parameters can be modified). 4. With anti-reverse connection diode.
4	MOTOR2 POWER_5V	Motor 2 encoder power supply	Power Output	1. Output voltage: 5.5V±5% (without load). 2. Maximum output current: 150mA. 3. With short circuit protection function. (Note: This power output shares a power supply with 12V_ANALOG POWER, and the maximum current output refers to 12V_ANALOG POWER+MOTOR1/2 POWER_5V, which shall not exceed 150mA).
5	MOTOR2 EncZ	Z-phase input of motor 2 ABZ encoder	Digital Input	1. Maximum frequency supported as Z-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on.
6	Reserved			
7	Reserved			
8	Reserved			
9	MOTOR1 EncA/MOTOR1 Sin	Motor 1 ABZ encoder A-phase input/Sin-Cos encoder SIN input	Digital Input	1. Maximum frequency supported as A-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on. 3. Multiplex Sin interface of Sin-Cos encoder, with a cutoff frequency of 15.9kHz.
10	MOTOR1 POWER_5V	Motor 1 encoder power supply	Power Output	1. Output voltage: 5.5V±5% (without load). 2. Maximum output current: 150mA. 3. With short circuit protection function. (Note: This power output shares a power supply with 12V_ANALOG POWER, and the maximum current output refers to 12V_ANALOG POWER+MOTOR1/2 POWER_5V, which shall not exceed 150mA).
11	Reserved			
12	Reserved			
13	EXTERNAL COIL POWER SUPPLY	High-end power supply of valve coil drive module	Power Input	1. EXTERNAL COIL DRIVER_1/2/3, MAIN RELAY COIL DRIVER, COIL POWER SUPPLY. 2. This pin needs to be connected with power supply, and it is recommended to get power from the back end of the main relay. 3. With voltage detection; controller outputs fault if not powered.
14	Reserved			
15	GND	Digital ground/analog ground interface	Power Output	
16	MOTOR1 EncZ/AI IUPUT_5	Z-phase input of motor 1 ABZ encoder	Digital Input	1. Maximum frequency supported as I-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on.
17	MOTOR2 EncA/MOTOR2 Sin	Motor 2 ABZ encoder A-phase input/Sin-Cos encoder SIN input	Digital Input	1. Maximum frequency supported as A-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on. 3. Multiplex Sin interface of Sin-Cos encoder, with a cutoff frequency of 15.9kHz.
			Analog Input	
18	CAN_L	CAN communication bus	CAN Bus Low	1. Supports the maximum baud rate of 500 kbps. 2. The minimum matching resistance of bus communication is 30Ω (tested with a bus length of 1.5M connecting to the upper-level control system).
19	MOTOR2 EncB/MOTOR2 Cos	Motor 2 ABZ encoder B-phase input/Sin-Cos encoder COS input	Digital Input	1. Maximum frequency supported as A-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on. 3. Multiplex Sin interface of Sin-Cos encoder, with a cutoff frequency of 15.9kHz.
			Analog Input	
20	MOTOR1 EncB/MOTOR1 Cos	Motor 1 ABZ encoder B-phase input/Sin-Cos encoder COS input	Digital Input	1. Maximum frequency supported as A-phase signal input of encoder: 1MHz. 2. Built-in 2K pull-up to 5V, software control can be turned off/on. 3. Multiplex Sin interface of Sin-Cos encoder, with a cutoff frequency of 15.9kHz.
			Analog Input	

Electrical specification of MCU pin				
Pin number	Pin name	Pin function	Signal type	Function description
21	GND	Digital ground/analog ground interface	Power Output	
22	Reserved			
23	Reserved			
24	12V_ANALOG POWER	12V external power supply	Power Output	1. Output voltage: 12.5V±5% (without load). 2. Maximum output current: 150mA. 3. With short circuit protection function. (Note: This power output shares a power supply with MOTOR1/2 POWER_5V, and the maximum current output refers to 12V_ANALOG POWER+MOTOR1/2 POWER_5V, which shall not exceed 150mA).
25	GND	Digital ground/analog ground interface	Power Output	
26	Reserved			
27	Reserved			
28	MOTOR1 BRAKE COIL DRIVER	Motor 1 electromagnetic brake coil drive output	PWM	1. Continuous working current: ≤2A. 2. Maximum working current: 3A (hardware overcurrent point). 3. Control type: Voltage-type PWM control. 4. Frequency: 0-2KHz adjustable. 5. Protection function: Short circuit protection, open circuit/online open circuit detection. 6. Output type: Open-drain output, with the load positive terminal connected to COIL POWER SUPPLY, and the load negative terminal connected to this pin. 7. Through the built-in circuit, the high-end COIL POWER SUPPLY can be turned on/off by software control.
			ON/OFF	
29	COIL POWER SUPPLY	Electromagnetic brake coil drives high-end power supply	Power Output	1. Motor battery brake load power supply. 2. Power supply can be turned on/off by software control. 3. Maximum load current ≤ 4A.
30	MOTOR2 BRAKE COIL DRIVER	Motor 2 electromagnetic brake coil drive output	PWM	1. Continuous working current: ≤2A. 2. Maximum working current: 3A (hardware overcurrent point). 3. Control type: Voltage-type PWM control. 4. Frequency: 0-2KHz adjustable. 5. Protection function: Short circuit protection, open circuit/online open circuit detection. 6. Output type: Open-drain output, with the load positive terminal connected to COIL POWER SUPPLY, and the load negative terminal connected to this pin. 7. Through the built-in circuit, the high-end COIL POWER SUPPLY can be turned on/off by software control.
			ON/OFF	
31	CAN_H	CAN communication bus	CAN Bus High	1. Supports the maximum baud rate of 500 kbps. 2. The minimum matching resistance of bus communication is 30Ω (tested with a bus length of 1.5M connecting to the upper-level control system).
32	MOTOR1 TEMP	Motor 1 temperature sensor detection interface	Analog Input	1. Built-in 2mA constant current source. 2. The linearity is good in the resistance range of 200Ω-2KΩ. 3. Protection function: Short circuit to ground.
33	MOTOR2 TEMP	Motor 2 temperature sensor detection interface	Analog Input	1. Built-in 2mA constant current source. 2. The linearity is good in the resistance range of 200Ω-2KΩ. 3. Supports short circuit to ground function.
34	Reserved			
35	Reserved			

PRODUCT CODE AND OPTIONS

Product code	Description
EC-C24-D180	Electric converter with a power module operating at 24 V _{DC} and a dual inverter with a maximum output current of 180 A _{RMS} .

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