CD Series (C04) Brushless Motor Drive Specification

Rev3.0 — 31 July 2017

Model: DBL-C04C

PGN-SS-020-00

(SS-01-S0073)

TRUMMAN TECHNOLOGY CORP

5F., No.95, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan, ROC

TEL: +886-2-2225-9655 · FAX: +886-2-2225-9656 · E-mail: sales@trumman.com.tw

* Contents in this document are subject to change without notice.

Table of Contents

1. PRODUCT OVERVIEW

DESCRIPTION

The CD (C04) is a compact DC power supply input BLDC drive. The CD (C04) model has stable speed output with slow acceleration and deceleration functions. The drive is fully protected against over-voltage, under-voltage, over-current, and feedback signal fault (halls fault).

FEATUES

- Stable Speed and Torque Output
- 3 Digital Input
- 2 Digital Output
- 1 Analog Input
- Over-current and Over-Load Protection
- Dynamic Brake Instant Stop (only with specific motor and load)

APPLICATION

- General Industry and Automation Equipment
- Simple Compressor
- Small Power Fan
- Other Simple Industry Application

PRODUCT PART NUMBER

DBL - C04 C D24 016 - C00

① ② ③ ④ ⑤ ⑥

Description		
①	Category	**DBL** : BLDC Motor Drive
②	Model Series	**C04** : CD Series
③	Version	**C** Version C
④	Supply Volage	**D24** : 24VDC
⑤	Max. Current	**016** : 16A
⑥	Customized No.	-

MODEL POWER

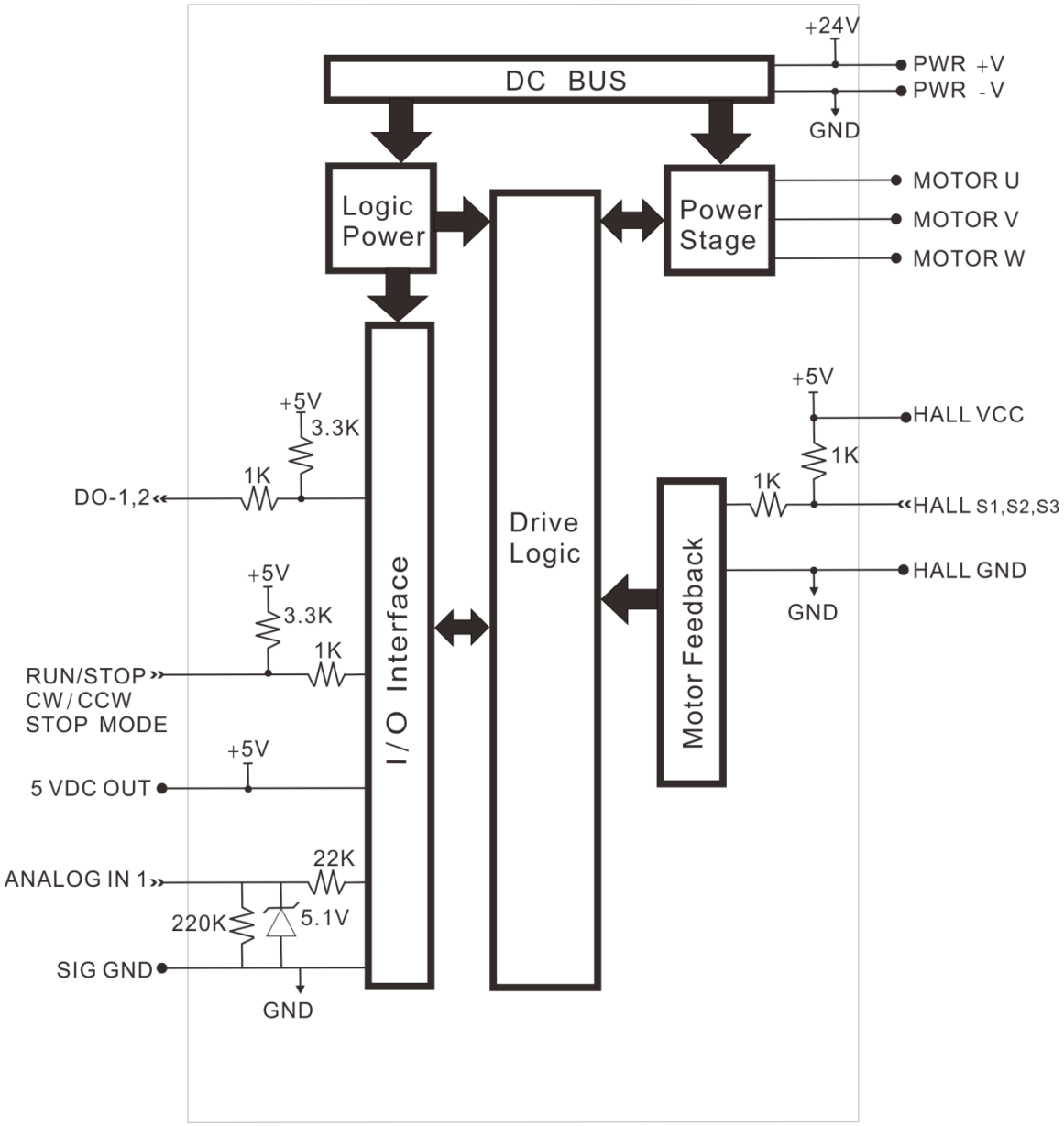
Drive Model	**DBL-C04D24016-☐**
Max. Output Current	16 A
Cont. Output Current	8 A
Max. Input Current	6 A
Supply Voltage	24 VDC
Rated Output Power	110 W
I/O Voltage	5 VDC

SUPPORT MOTOR

Drive Model	**DBL-C04D24016-C00**
Number of Motor Poles	8
Rated Speed	3000 RPM
Supply Voltage	24 VDC
Recommended Motor Power	100 W
Support Motor Part No.	BL2K080☐☐ BL2K120☐☐

2. BLOCK DIAGRAM

Fig 1 Drive Block Diagram



3. SPECIFICATIONS

3.1. Power Specifications

Model			DBL-C04D24016-☐
Description			Value
Rated Output Power		W	110
Power Source	Rated DC Supply Voltage	VDC	24
	Permissible Voltage Range	%	±20%
	DC BUS Over Voltage Limit	VDC	42
	DC BUS Under Voltage Limit	VDC	16
Maximum Peak Output Current*1		A	16
Rated Continuous Output Current (rms)		A	8
Maximum Continuous Input Current		A	6
Maximum Continuous Output Power		W	130
Recommended Motor Power		W	100
Maximum Output PWM Duty Cycle		%	100

*1. Hardware Protection Limit

NOTE The power specification is by the drive its self only.

3.2. Signal and Control Specifications

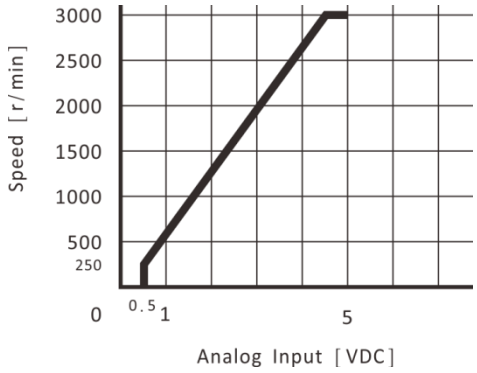
Model			DBL-C04D24016-☐
Description			Value
Operation Data Command Source		-	■ External Analog Setting: • External Potentiometer (5kΩ, 1/4W B Type) • External DC Voltage (0 – 5VDC)
Feedback Supported		-	Halls
Mode of Operation		-	Hall Velocity
Digital Inputs	Number of Digital Inputs	-	3 (TTL)
	Digital Input Electric Spec.	-	Internal Power Supply: Voltage: 5 VDC Current: 5mA
Digital Outputs	Number of Digital Outputs	-	2 (TTL)
	Digital Output Electric Spec.	-	Internal Power Supply: Voltage: 5 VDC Current: 5mA maximum
Analog Inputs	Number of Analog Inputs	-	1
	Analog Input Voltage Range	VDC	0 – 5
Protect Function		-	■ Over Voltage Protection ■ Under Voltage Protection ■ Over Current Protection ■ Over Load Protection ■ Hall Signal Fault

3.3. Speed Control Specifications

Description		Value
Speed Control Range*1	r/min	250 – 3000
Speed Fluctuation*2	r/min	± 30
Speed Control Method	-	External Analog Setting (ANALOG IN 1).
Acceleration Time	-	0 – 3000 r/min < 0.5 sec (free load)
Deceleration Time	-	Free to Stop or Instant Brake (set by STOP MODE input function)
Brake Function	-	Dynamic Brake Instant Stop (only with specific motor and load)

*1. Other speed control range is possible for customized order.
*2. Operation Condition: 0 – Rated Load、Rated Voltage、25℃.

Fig 2 Analog Input to Speed Characteristic (Schematic)



Model	DBL-C04D24016-C00	
Description	Min	Max
Analog Input DC Voltage (VDC)	0.5	4.5
Motor Target Speed (r/min)	250	3000

*1. Motor will stop when the command voltage is under 0.5VDC.

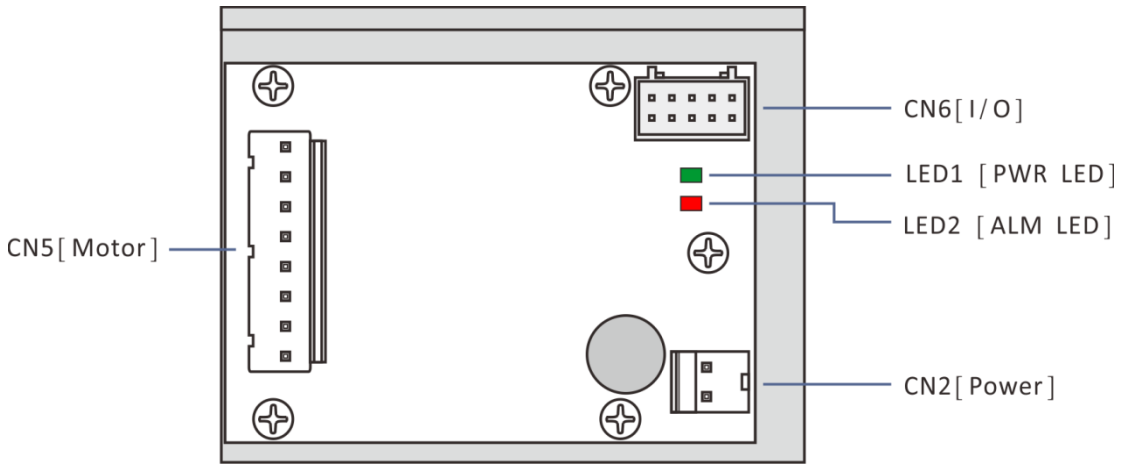
NOTE The Analog input to speed characteristic might be different between models.

3.4. General Specifications

Description			Value
Operating Environment Condition	Ambient Temperature	-	-10℃ - +60℃ (*External cooling fan is required when the environment temperature is over 40℃)
	Humidity	-	< 85 % RH (non-condensing)
Dimension		mm	77 * 60 * 35

4. CONNECTOR & INTERFACE

Fig 3 Connector and Interface



4.1. Connector & Interface Functions

NOTE Do NOT use NC (Reserved) points.

CN2 [Power] Power Supply Input			
Pin	**Name**	**Description**	**I/O**
1	DC-V / PWR GND	DC Power Ground Input	PGND
2	DC+V	DC Power Supply Input	I

CN5 [Motor] Motor Power and Signals			
Pin	**Name**	**Description**	**I/O**
1	HALL GND	Signal Ground	SGND
2	HALL VCC	+5VDC output for Hall Sensor. Reference to HALL GND.	O
3	HALL S3	Hall Sensor S3 Input (Single-ended)	I
4	HALL S2	Hall Sensor S2 Input (Single-ended)	I
5	HALL S1	Hall Sensor S1 Input (Single-ended)	I
6	MOTOR W	Motor Phase W	O
7	MOTOR V	Motor Phase V	O
8	MOTOR U	Motor Phase U	O

CN6 [I/O] Control Signals

Pin	Name	Description	I/O
1	DO-1	ALM-OUT Output. 0 or 5VDC. Output 0 VDC when the motor operation state is normal. Output 5 VDC when the protect function has activated.	O
2	DO-2	SPD-OUT Output 0 or 5 VDC. Send cycles of pulse signal at rate of 12 pulses per revolution of an 8 poles motor.	O
3	CW/CCW	Motor Operation Direction Setup. If CW/CCW is closed circuit with SIG GND, the direction is set to CCW. If CW/CCW is Open circuit with SIG GND, the direction is set to CW.	I
4	SIG GND	Signal Ground.	SGND
5	RUN/STOP	Motor Operation and Stop Control. If RUN/STOP is closed circuit with SIG GND, the motor STOPS If RUN/STOP is Open circuit with SIG GND, the motor will start operation.	I
6	5 VDC OUT	+5 VDC output for Analog input signals. (Imax = 100 mA)	O
7	NC	N.C. (Reserved)	-
8	ANALOG IN 1	Speed Command Input.	I
9	NC	N.C. (Reserved)	-
10	STOP MODE	Determine the motor stop method. If STOP MODE is closed circuit with SIG GND the stop method will be dynamic brake instant stop. If STOP MODE is open circuit with SIG GND the stop method will be free to stop.. *STOP MODE should be set before the stop command. ■ 2 Method to set the stop command: • RUN/STOP is closed circuit with SIG GND. • The Input voltage of ANALOG IN 1 is less than 0.5VDC.	I

LED1 [PWR LED]

LED Status	Description
Green On	DC power input connected. Driver power up.
Off	DC power input disconnected. Driver power off.

LED2 [ALM LED]

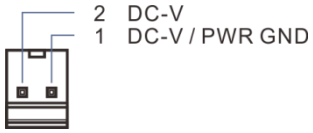
LED Status	Description
Red On	Protection function has activated.
Off	The driver state is normal.
Blinks	Protection function has activated.

4.2. Connector & Terminals Specifications

NOTE The definition of connector gender in this document is by the point of view of metal terminals.

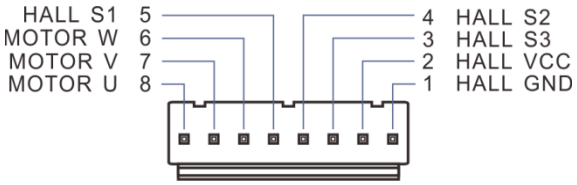
CN2 [Power] Power Supply Input		
Connector Information		2-pin, 3.96 mm pitch wafer, male. Part No. : 3961-WS-2-LF (Please reference to file *EPN-C04-21-03-01_CN2* for more details.)
Mating Connector	Details	-
	Included with Drive	-

Fig 4



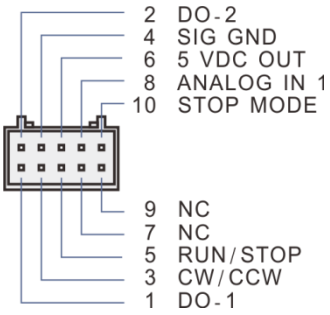
CN5 [Motor] Motor Power and Signals		
Connector Information		8-pin, 3.96 mm pitch wafer, male. Part No. : M8-I39606 (Please reference to file *EPN-C04-21-03-02_CN5* for more details.)
Mating Connector	Details	-
	Included with Drive	-

Fig 5



CN6 [I/O] Control Signals		
Connector Information		10-pin, dual row, 2.54 mm pitch, male. Part No. : SMD25-10WS (Please reference to file *EPN-C04-21-03-03_CN6* for more details.)
Mating Connector	Details	-
	Included with Drive	-

Fig 6



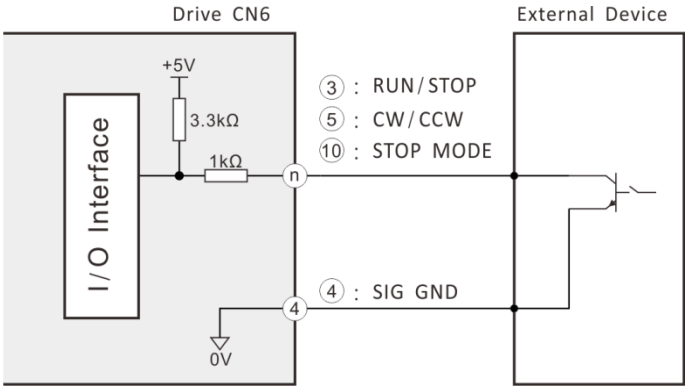
5. IO CONNECTION

5.1. Digital Input Signal

The type of digital input signals is TTL. If the signal terminal is closed circuit with signal ground (SIG GND), its state is “ON”.

If the signal terminal is open circuit with signal ground (SIG GND), its state is “OFF”.

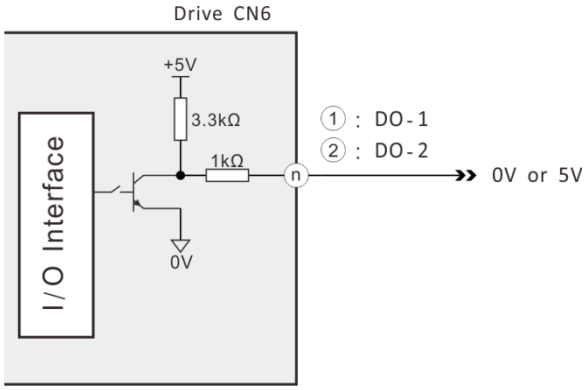
Fig 7 Digital Input Signal Connection



5.2. Digital Output Signal

The type of digital output signals is TTL. The signal terminal can output 0V or 5V.

Fig 8 Digital Output Signal



5.3. Analog Input Signal

The input of analog can be potentiometer (VR) or external DC voltage.

Fig 9 Analog Input with Potentiometer (VR)

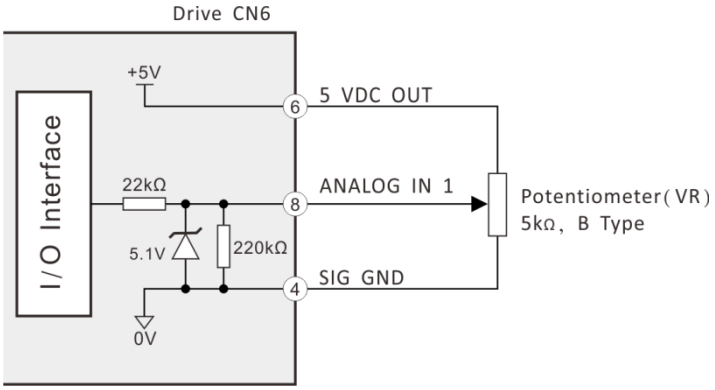
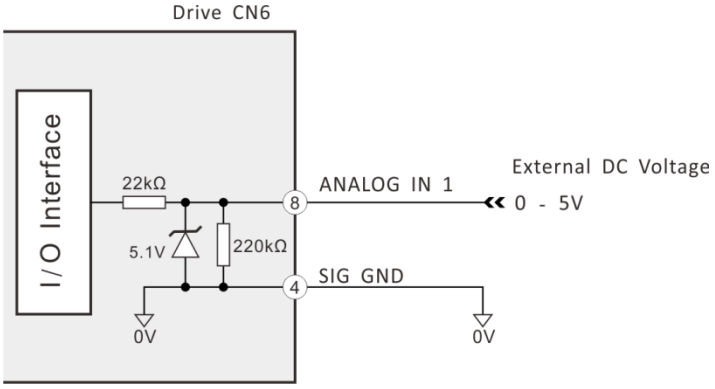
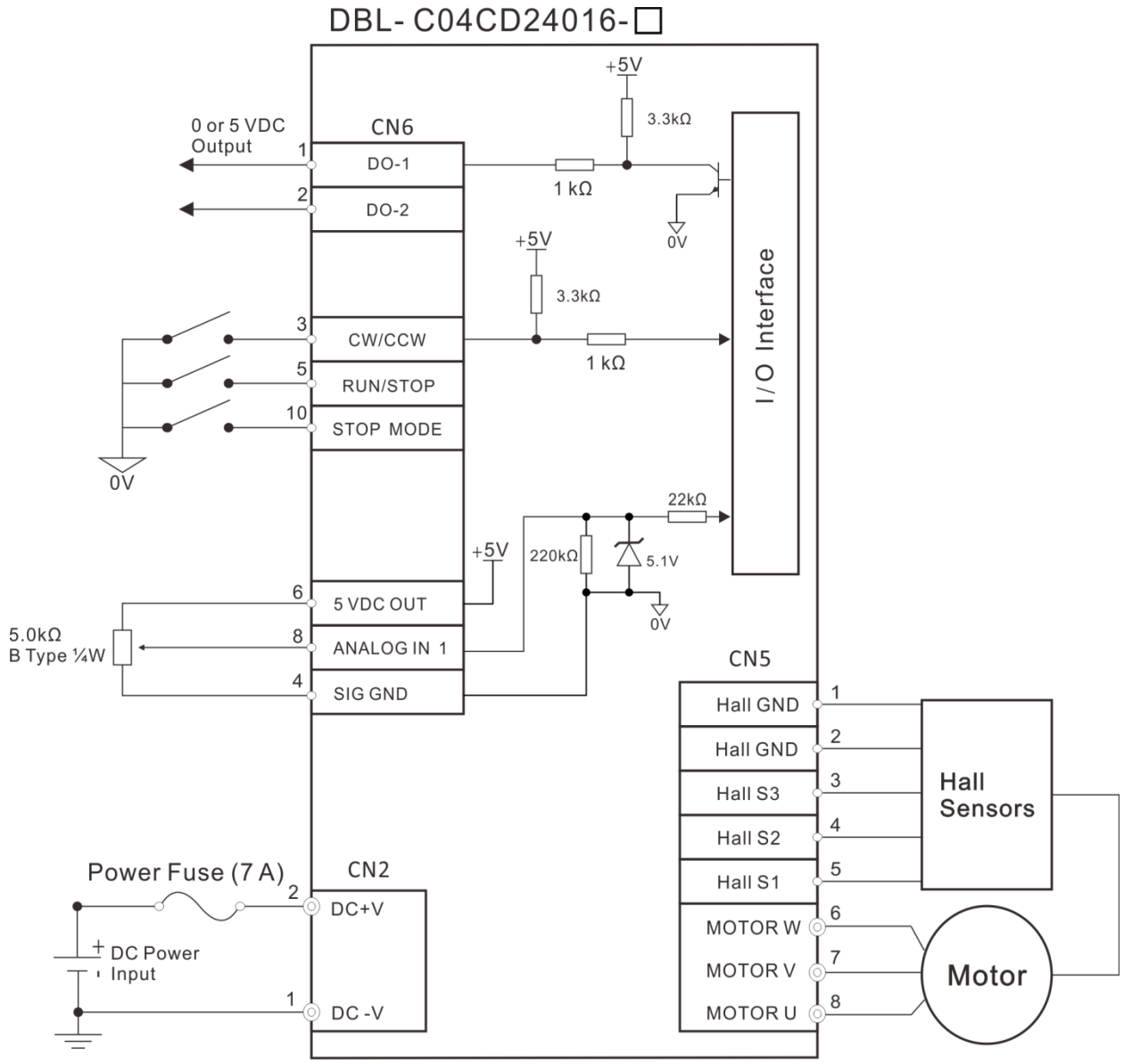


Fig 10 Analog Input with External DC Voltage 0 – 5 VDC



6. WIRING DIAGRAM

Fig 11 Basic Wiring Diagram : Analog Input with Potentiometer (VR)



7. BASIC FUNCTIONS

7.1. Digital Input Functions

Pin No.	Name	Description	Setting	
			0V (ON) (Closed Circuit with SIG GND)	5V (OFF) (Open Circuit with SIG GND)
CN6-3	CW/CCW	Motor operation direction setup. The operation direction of the motor will be CCW when CW/CCW is closed circuit with SIG GND. The operation direction of the motor will be CW when CW/CCW is open circuit with SIG GND.	Reverse direction (CCW)	Forward direction (CW)
CN6-5	RUN/STOP	Motor operation and stop control. The motor stops when the RUN/STOP is closed circuit with SIG GND. The motor runs when the RUN/STOP is open circuit with SIG GND.	Motor Stop	Motor Run
CN6-10	STOP MODE	Determine the motor stop method. If STOP MODE is closed circuit with SIG GND the stop method will be dynamic brake instant stop. If STOP MODE is open circuit with SIG GND the stop method will be free to stop. * STOP MODE should be set before the stop command.	Set to dynamic brake instant stop mode	Set Free to Stop mode

NOTE The default state of IO terminal is 5V when it is float (open circuit with SIG GND).

7.2. Digital Output Functions

Pin No.	Name	Description
CN6-1	DO-1 ALM-OUT	ALM-OUT Output. 0 or 5VDC. Output 0 VDC when the motor operation state is normal. Output 5 VDC when the protect function has activated.
CN6-2	DO-2 SPD-OUT	SPD-OUT Output 0 or 5 VDC. Send cycles of pulse signal at rate of 12 pulses per revolution of an 8 poles motor. Motor shaft speed (RPM) = $\frac{\text{SPD-OUT freq}}{\text{motor poles}} \cdot \frac{2}{3} \cdot 60 = \frac{\text{SPD-OUT freq}}{\text{motor poles}} \cdot 40$

7.3. Analog Input Functions

The analog input can be used to set the target speed of the motor.

When the voltage of analog input is less than 0.5V the motor stops.

Please reference to 3.3 Sped Control Specifications for the characteristic of analog input voltage to the setting speed

7.4. Protect Function (Alarm)

There are several protect functions (alarms) of the drive. When any of the alarm is activated, the drive will cut off the power to the motor (the motor will free to stop). Then the ALM LED blinks. It can be reset only after removing the cause of the problem then turning the power off for a sufficient time (at least 1 min or until the PWR LED is off) and back on again.

■ ALM LED Blink

The ALM LED blinks when there is an alarm. The pattern ALM LED blinks is depending on the alarm. The alarm can be determined be the number of ALM LED blinks.

Fig 12 ALM LED Blink Example (Over Load Protect: Blink 2 times)

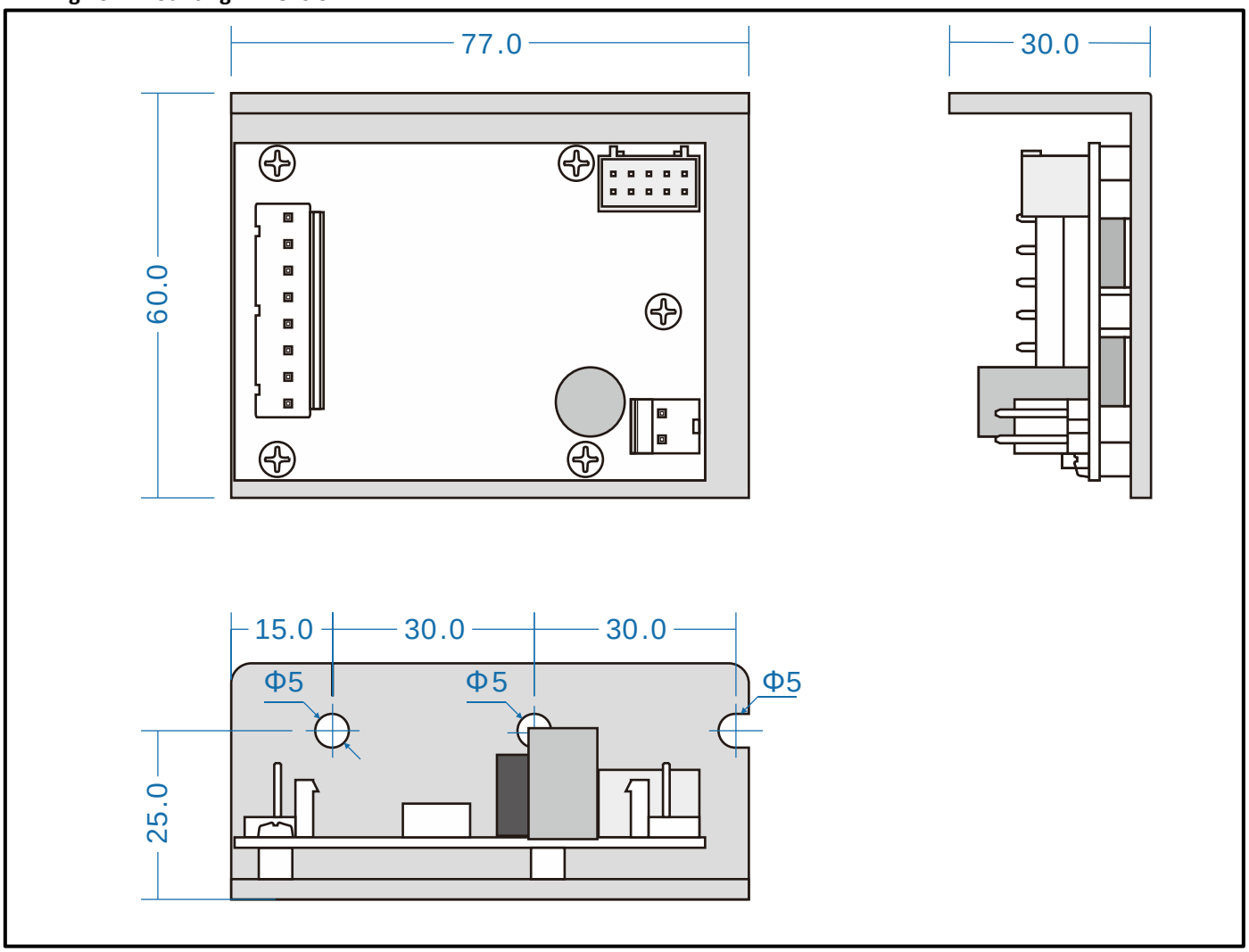
■ ALM LED Blink State and Protect Functions (Alarms)

LED State	Protect Function (Alarm)	Possible Explanation	Solution
Red Blink 1 time	Over Current	Excessive current has flown through the driver. Or the load excess of the rated value has applied to the motor.	Check none of the motor cable or motor winding is short circuited. The power of the current model you are using might not enough for your load.
Red Blink 2 time	Over Load	The load excess of the rated value has applied to the motor.	Re-examine the load. The power of the current model you are using might not enough for your load.
Red Blink 3 time	Feedback Signal Fault (Hall Signal Fault)	The hall sensor wiring is bad (or bad shielding). The hall sensor is not connected.	Check the hall sensor cable connection.
Red Blink 4 time	Over Voltage	The input power voltage has exceeded the maximum limit of the driver. The inertia of the load is too large.	If it has occurred during the acceleration/deceleration of the motor, reduce the Inertia or the load.
Red Blink 5 time	Under Voltage	The input power voltage is under the low limit.	Check the DC input power source. Check the cable of DC input power.
Red Blink 6 time	Reserved	-	-
Red Blink 7 time	Startup Failed	The motor failed to start.	Check the Motor UVW cable connection.

NOTE If none of the solution can solve your problem, please contact your distributor.

8. MOUNTING DIMENSION (Unit: mm)

Fig 13 Mounting Dimension



9. Troubleshooting

9.1. Troubleshooting and Remedial Actions

Situation	Possible Explanation	Remedial Action
The motor fails to run. (But none of the alarm occurred.)	The digital input signal failed.	Check the connection and wiring of the digital input signal (e.g. short circuit…).
	The voltage of analog input is too low (less than 0.5VDC).	To start the motor operation, the voltage of analog input (ANALOG IN 1) must be higher than 0.5VDC.
Motor stops after operating for a short duration (about a few seconds).異常警示 ALM LED blinks 3 times or 7 times.	Effect of noise.	If noise influence has been confirmed, replace the signal cable by a shielded cable.
	The hall sensor setup is incorrect.	Contact your distributer for more support.
	The motor UVW cable is not connected well.	Check the motor UVW cable connection.
	The Drive might be damaged.	Contact your distributer for more support.

NOTE If none of the solution can solve your problem, please contact your distributor.

REVISION HISTORY

REV	Date	Remark
2.0	20150720	1st Release.
3.0	20170731	Mounting dimension change.