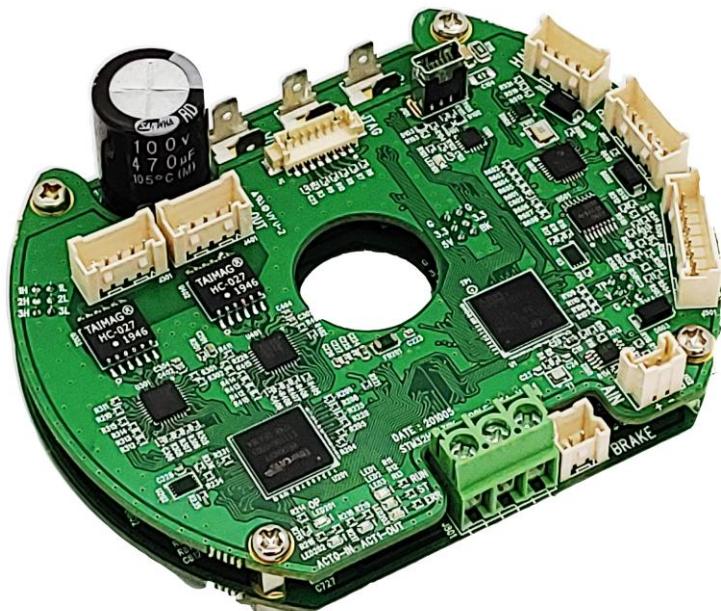


WELCON

Circle Servo Drive

Hardware Manual



WEC-D048/25-FS0025-E

welcon
SYSTEMS

2025-02-21



Precautions

- Please read this manual carefully before installing and commissioning.
- WELCON SYSTEMS assumes no responsibility whatsoever for any loss or damage arising out of use for any purpose.

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Product Name for welcon Drive

WE2S-D024/01-FS0057-E

Product Type

WE WELCON Standard

** User Code (only for customized order)

Drive Shape

R Rectangle Type Board

C Circle Type Board

M Miniature Board

2S 2-Axis Slot Type (Backboard necessary)

2A 2-Axis Stand-Alone Type

Power

D DC

A AC

Voltage

024 12~24V

048 12~48V

310 12~310V

Continuous Current

P3 0.3A rms

P5 0.5A rms

01 1A rms

03 3A rms

10 10A rms

25 25A rms

Feedback Sensor (Hexadecimal)

Bit0	Incremental Encoder	Bit4	Sin/Cos Encoder	Bit8	Potentiometer
Bit1	Dual Incremental Encoder	Bit5	BISS/SSI Interface Encoder	Bit9	SPI
Bit2	Separated Digital Hall Sensor	Bit6	Analog Hall Sensor	Bit10	EnDat
Bit3	Shared Digital Hall Sensor	Bit7	Tamagawa/Panasonic Encoder	Bit11	PWM

Ex) 0057= 0000 0000 0101 0111

Incremental(Bit0) + Dual Incremental (Bit1) + Separated Digital Hall (Bit2) + Sin/Cos (Bit4) + Analog Hall (Bit6)

Communication

E EtherCAT

C CAN

R RS-485

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Question : www.welconsystems.com

1. Safety Information

- Safety accidents and damage to the product may occur, so be sure to read the safety instructions before use and use it correctly.

1.1. Attention Symbols

In the course of the present document, the following symbols and signs will be used.

Type	Symbol	Description
Safety Alert	 Caution Attention	Indicates a probable hazardous situation or calls the attention to unsafe practices. If not avoided, it may result in injury .
	 Warning Avertissement	Indicates an imminent hazardous situation . If not avoided, it will result in death or serious injury .
Information		Indicates an activity you must perform prior continuing, or gives information on a particular item you need to observe.



1.2. Warnings

- Do not connect/disconnect the main power of the servo drive while the power is on.
- Do not connect/disconnect the servo drive encoder cable and I/O while the power is on. Motor and servo drive may be damaged.
- The power cable can carry high voltage even when the motor is not moving.
- The main power of the servo drive must be accurately input according to the drive specifications. It may cause damage to the drive.
- Do not connect power directly to the servo drive U, V, W output terminals.
- After turning off the servo drive power, disconnect the power after the capacitor is completely discharged.



1.3. Cautions

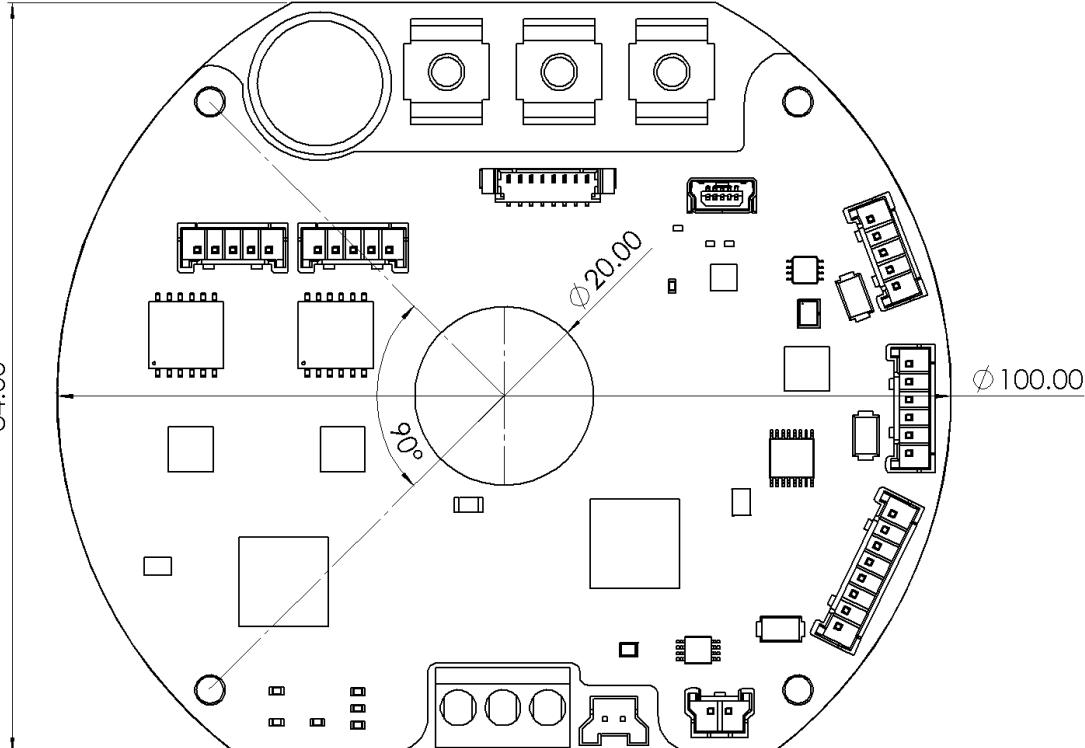
- Be sure to separate U, V, W cables and encoder cables before wiring.
- After turning off the power, proceed with wiring the U, V, W cables and encoder cables.
- Do not drop it or subject it to strong impact.
- Do not install near flammable substances or water.
- Make sure that no sheath or copper wire gets inside the servo drive.
- It is recommended to use shielded cables for encoder cables.
- For EtherCAT cables, it is recommended to use CAT.6 cables.
- Check the U, V, W and encoder cables of the motor before turning on the power.
- It is recommended to connect the encoder cable and U, V, W and power FG to prevent noise.
- Be careful not to separate the connector from the board when connecting or disconnecting the cable.
- Additional cooling and/or heatsink may be required to achieve rated performance.

1.4. Use environment

Feature	Details
Operating Temperature	0 °C to 50 °C
Maximum Humidity	90[%] RH
Pollution Degree	2
Operating Place	A place free of iron, flammable gas, dust, etc.

2. Technical Information

2.1. Mechanical Data



Item	Unit	Description
Weight	g	88
Diameter	Outer	mm 100
	Inner	mm 20
	Height	mm 32.6
Fastener	M3	

*For details, please refer to the 3D Modelling on the homepage.

2.2. Electrical Data

WEC-D048/25-FS0025-E		
Ratings	25	
Continuous Output Current A	25	
Peak Output Current A	58	
Basic Specifications		
Feature	Specification	
Motors	DC/BLDC/PMSM/VCM	Rotary servo motors, Linear servo motors
Current(Torque) Control	Control Periodic	24KHz
Velocity & Position Control	Control Loop	PI + Feed-forward
	Control Periodic	2KHz
	Control Loop	Cascade P/PI + Feed-forward
	Filters	First order low pass filter, Four notch filters, First order adaptive windowing filters
Reference Command	Current/Velocity/Position	USB, EtherCAT(CoE)
Auto Tuning	Method	Automatic self-configuration and optimization of motor phasing, wires, current loop, velocity control loop
GUI	User Interface	WELSS(WelconServoStudio), Setting, Drive, Motor, Feedback, I/O, Motion
Input Voltage	Motor Voltage: 12~48VDC, Control Voltage: 24VDC	
Current Consumption	\approx 70mA without encoder or other peripheral	
Protective Functions	Under- and over-voltage, Over-current, Over-load(with I^2T), Drive over-temperature	
Environment	Ambient temperature: Operation 0-50°C, Storage 0-70°C Humidity: 10-90%, Vibration: 1.0g	
Compliance Standard	CE, KC	

Communication		
Feature	Specification	
USB	Baud rate: up to 3Mbps, Maximum cable length: 3m	
EtherCAT	100Mbps Communication cycle time: up to 500µs(CSV, CSP mode), up to 250us(CST mode)	
I/O		
Feature	Specification	
Analog Input	Quantity	1
	Voltage Range	Analog ±10 VDC differential
	Input Resolution	14 bit
Brake	Several Dynamic brake and Active disable options	
Motor Feedback		
General	Supply Voltage	5VDC
Incremental Encoder	Signal	A-quad-B with or without index, RS422, Differential
	A-quad-B Max Input Frequency	10MHz (before quadrature)
Digital Hall Sensor	Signal	Single-ended
	Type	Separated hall sensor
Serial Encoder	Type	SSI, BiSS-C
	Bite rate	0.5Mbps, 1Mbps, 2Mbps, 2.5Mbps, 5Mbps

2.1. Protections & Limitations

Protection Functionality	Switch-off threshold	Recovery threshold
Under Voltage	DC Link Voltage Minimum Limit	DC Link Voltage Minimum Limit + 0.5V
Over Voltage	DC Link Voltage Maximum Limit	DC Link Voltage Maximum Limit – 0.5V
Over Current	Exceeding H/W Current Limit(58A) or 110% of Maximum Current	-
Over Temperature	100 °C	95 °C
Protection		
Motor overload and over-temperature	110% (at rated current)	



- Under Voltage and Over Voltage are related to the value set in DC Link Voltage Limit (Index: 0x5012).
- DC Link Voltage Minimum Limit (Subindex: 0x01) can only be set to a value of 10V or above.
- DC Link Voltage Maximum Limit (Subindex: 0x02) can only be set to a value of 60V or below.

3. Wiring

3.1. Wiring Legend

Wiring Symbol	Description
	Ground
	Frame Ground
	Protective Earth Connection
	Twisted-pair wires
	Shielded Cable
	Power Supply

3.2. Wire Size

When selecting the wire gauge for the motor power wires, power supply wires, and ground wires, it is better to err on the side of larger diameter wire rather than too thin. This becomes more critical as the cable length increases. The following table provides recommendations for selecting the appropriate wire size for a specific current. These values should be used as reference only.

Use 24-28AWG for control wires(I/O, Feedback, Communication Wire) excluding main wires such as motor power.

Current(A)	Minimum Wire Size (AWG)	mm ²	Current(A)	Minimum Wire Size (AWG)	mm ²
10	20	0.518	45	12	3.31
15	18	0.823	60	10	5.26
20	16	1.31	80	8	8.37
35	14	2.08	120	6	13.3

3.3. Wiring Precautions

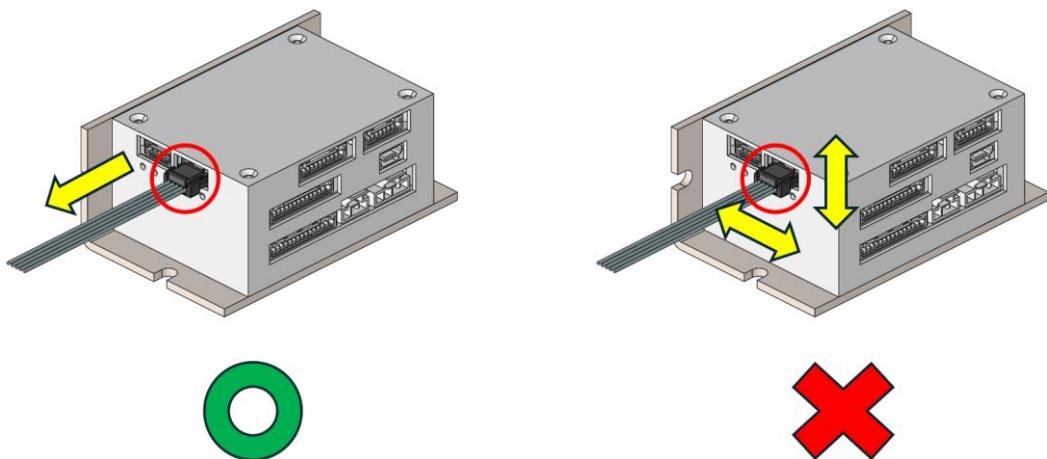
⚠ Cautions

Precautions when connecting connectors

- Before connecting the connector, ensure that the pins and sockets are free of dust, debris, or damage.
- If the pin is bent or damaged, replace or repair it immediately.
- Do not force insertion.
- Make sure the connector is fully inserted and the lock is locked in place.
- When inserting the connector, use even force and be careful not to apply excessive force.

Precautions when disconnecting the connector

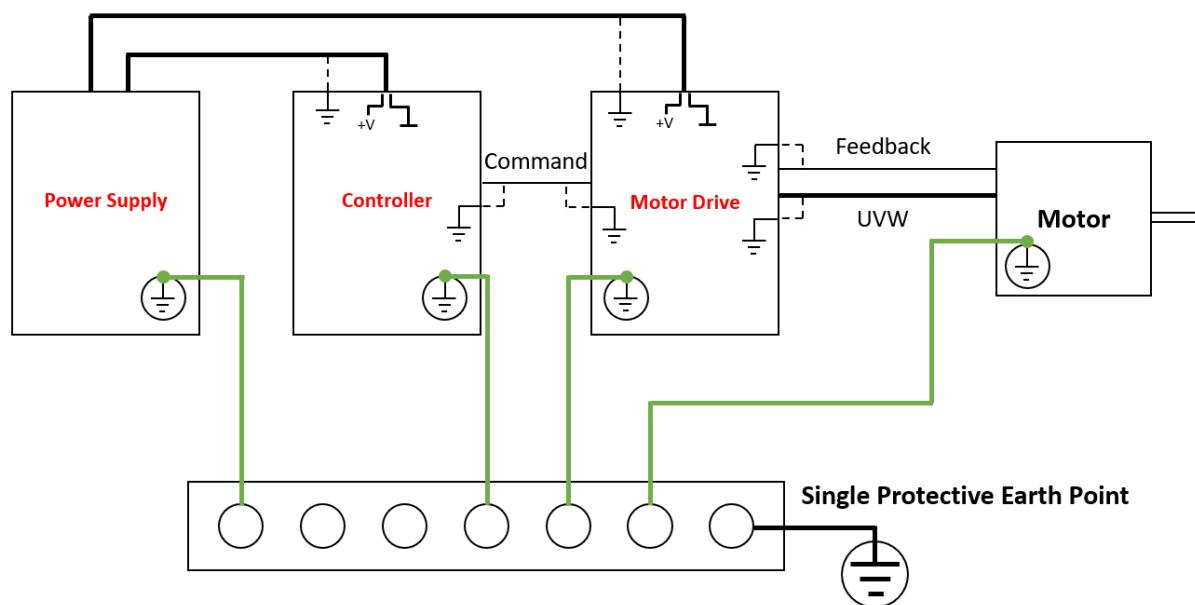
- If there is a locking tab or clip, unlock it by hand and then disconnect the connector.
- Do not forcefully pull on the connector without unlocking it.
- Disconnect the connector by pulling it straight in the designed direction.
- Do not shake it up and down or side to side.
- Separate slowly and gently, without applying too much force.
- After disconnection, check that the connector pins and socket are not damaged.



3.3.1. Grounding

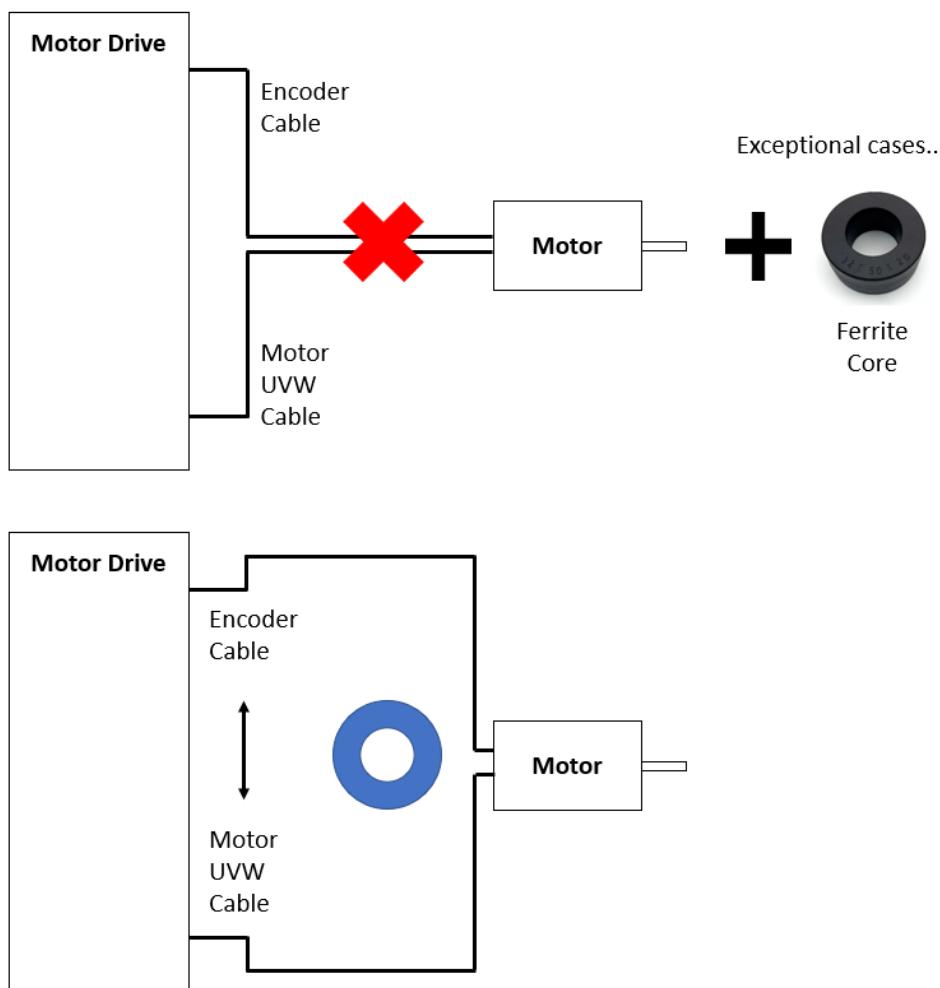
The case grounds of all the system components should be connected to a single Protective Earth (PE) ground point.

Grounding the case grounds at a central PE ground point through a single low resistance wire reduces the chance for ground loops and helps to minimize high frequency voltage differentials between components. All ground wires must be of a heavy gauge and be as short as possible.



3.3.2. Feedback and Motor UVW Wires

Use of a twisted, shielded pair for the feedback wires is recommended. Ground the shield at one end only to the drive chassis ground. Also make sure that the feedback connector and D-sub shell preserve the shield continuity. Route cables and/or wires to minimize their length and exposure to noise sources. The Motor UVW wires are a major source of noise, and the Motor Feedback wires are susceptible to receiving noise. This is why it is never a good idea to route the Motor UVW wires with the Motor Feedback wires, even if they are shielded. Although both of these cables originate at the drive and terminate at the motor, try to find separate paths that maintain distance between the two.



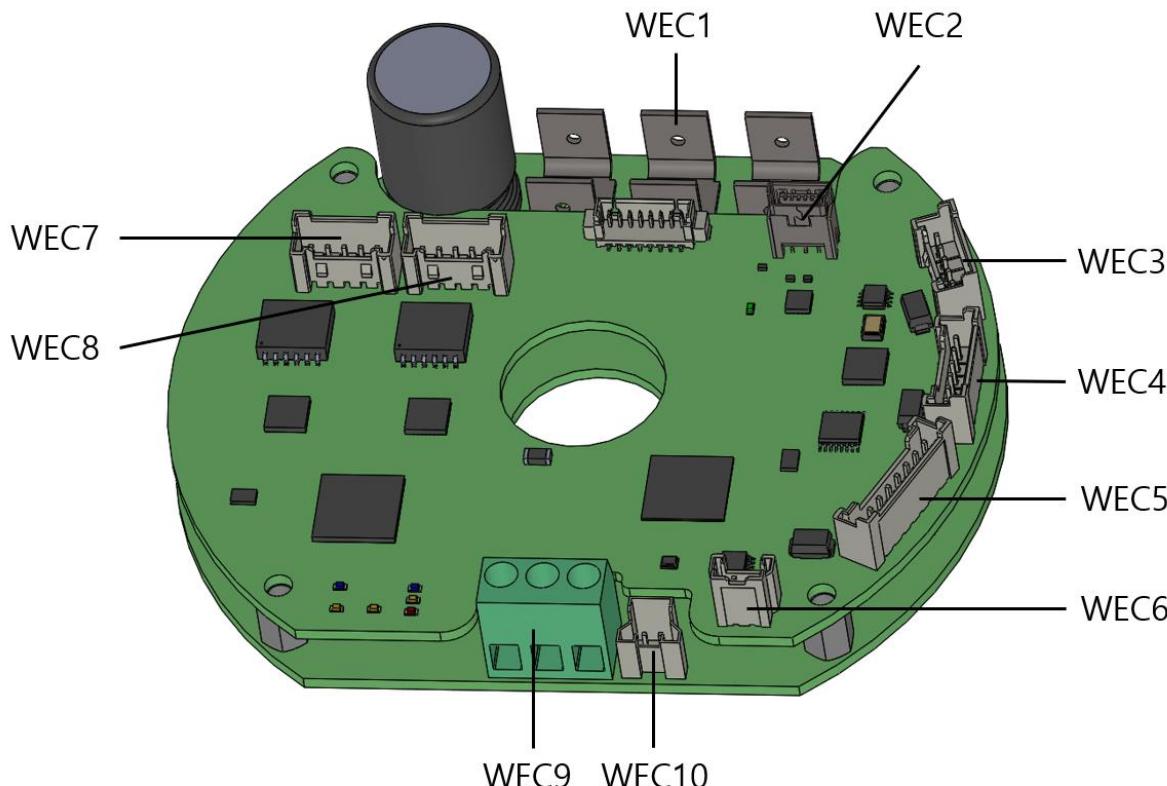
If the two wires cannot be separated from each other, install a ferrite core to attenuate noise. For best results, wind the wire as much as possible, and always in the same direction. When winding the ferrite core around the motor UVW wire, the ground(FG) wire must not pass through the ferrite core.

We have experience solving noise problems in systems with a cable length of 4-5m using King Magnetic's KMN-503220 product. The specifications of the ferrite core must be appropriately selected depending on the system.

3.4. Tools

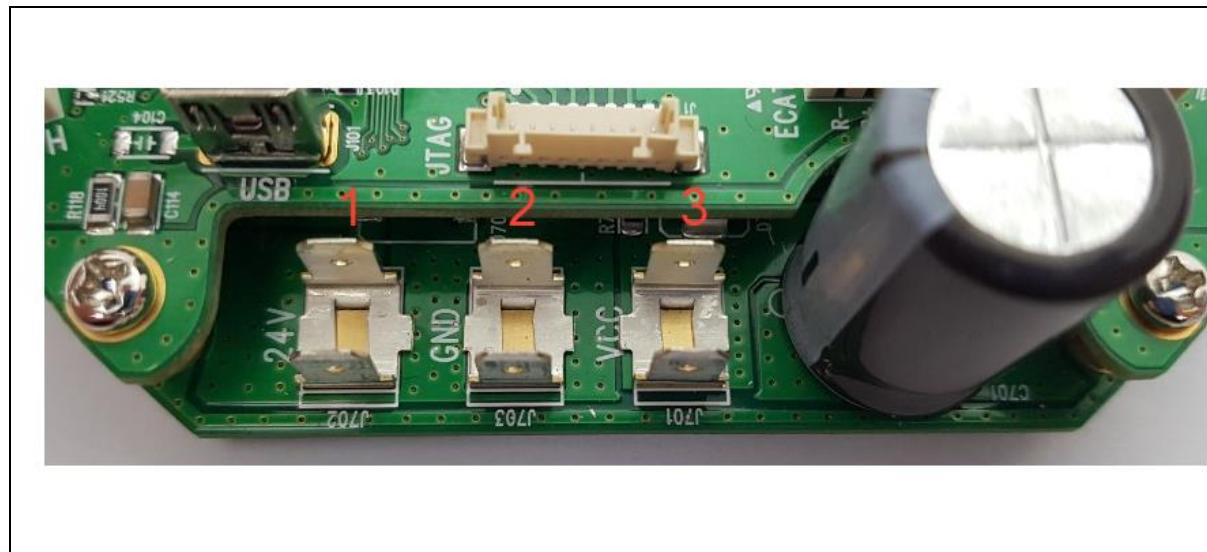
Tool	Manufacturer	Part Number
Hand crimp Tool	MOLEX	638190500

3.5. Connections



Connector	Function	Connector	Function
WEC1	Power	WEC6	Analog Input
WEC2	USB	WEC7	EtherCAT IN
WEC3	Hall Sensor	WEC8	EtherCAT OUT
WEC4	Serial Encoder	WEC9	Motor UVW
WEC5	Incremental Encoder	WEC10	Brake

3.6. Power



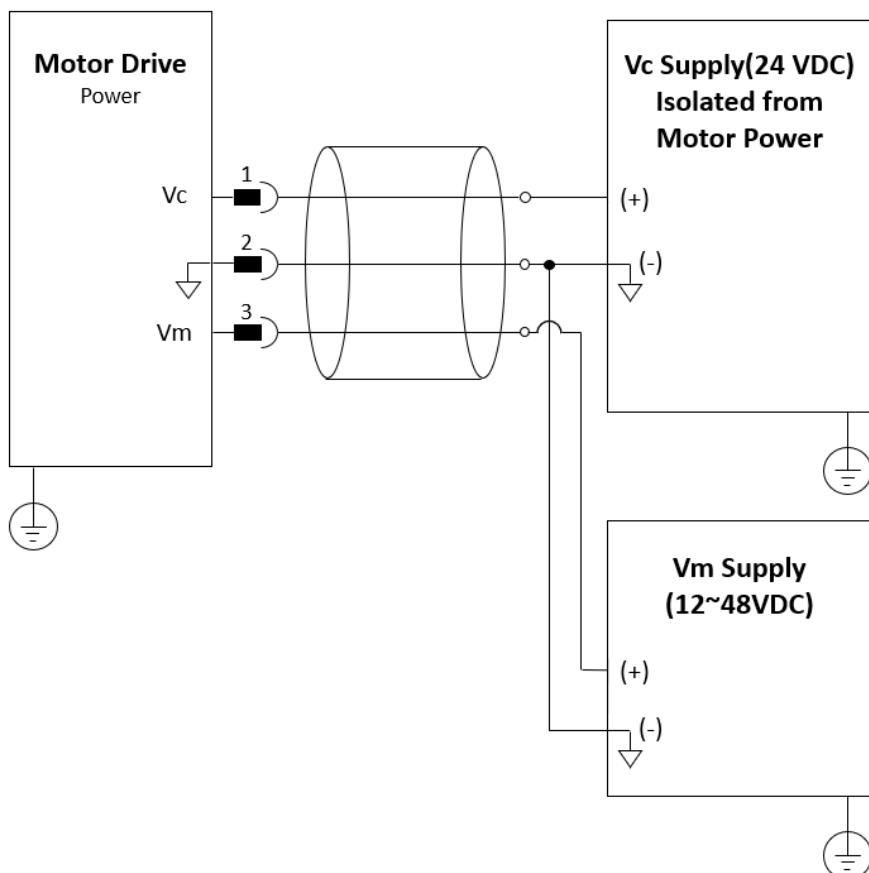
A100452CT-ND		J701~706
Pin	Signal	Input Power
1	Vc(Control Power)	24VDC * Over voltage Caution (Only 24V)
2	GND	GND
3	Vm(Motor Power)	12~48VDC



Warning
Avertissement

- Do not connect/disconnect the servo drive while the power is on.
- Before applying power, make sure that the DC supply is within the specified range.
- make sure the proper plus and minus connections are in order.

3.6.1. Control Power Wiring



[Control Power Connection Diagram]

3.7. EtherCAT IN/OUT



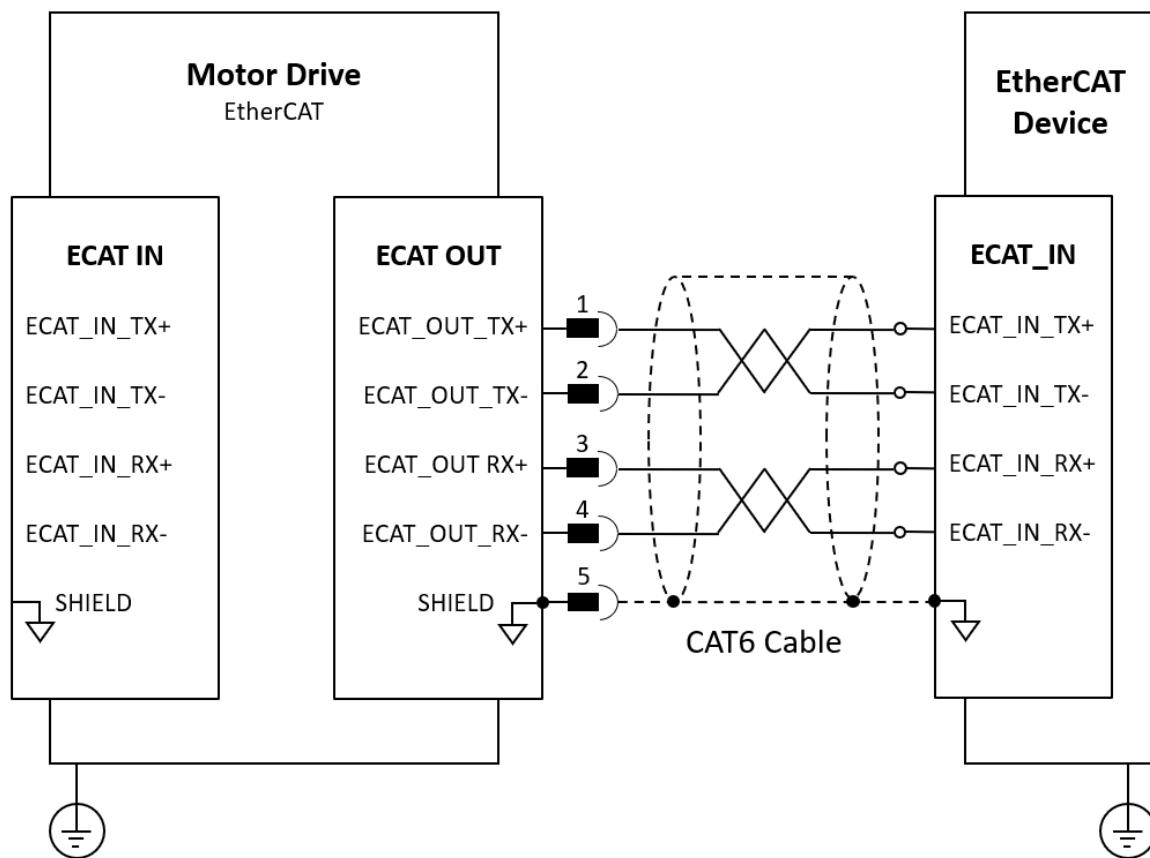
MOLEX_35507_0500



502128000

MOLEX_35362-0550		J301, J401
Pin	Signal	
ECAT IN		
1	EtherCAT Rx-	
2	EtherCAT Rx+	
3	EtherCAT Tx-	
4	EtherCAT Tx+	
5	FG	
ECAT OUT		
1	EtherCAT Rx-	
2	EtherCAT Rx+	
3	EtherCAT Tx-	
4	EtherCAT Tx+	
5	FG	

3.7.1. EtherCAT Wiring



[EtherCAT Connection Diagram]

3.8. Analog Input



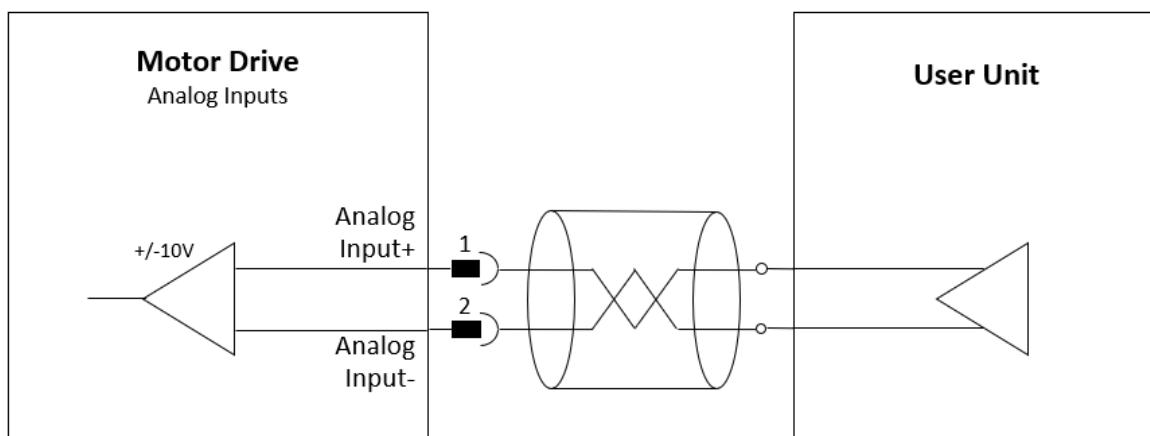
MOLEX_35507_0200



502128000

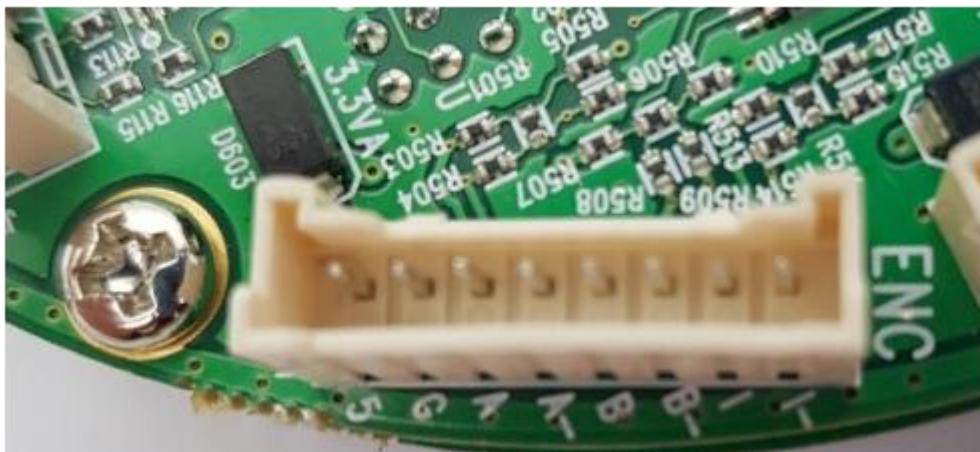
MOLEX_35362-0250		J701
Pin	Signal	
1	Analog Input+	
2	Analog Input-	

3.8.1. Analog Input Wiring



[Analog Input Connection Diagram]

3.9. Incremental Encoder



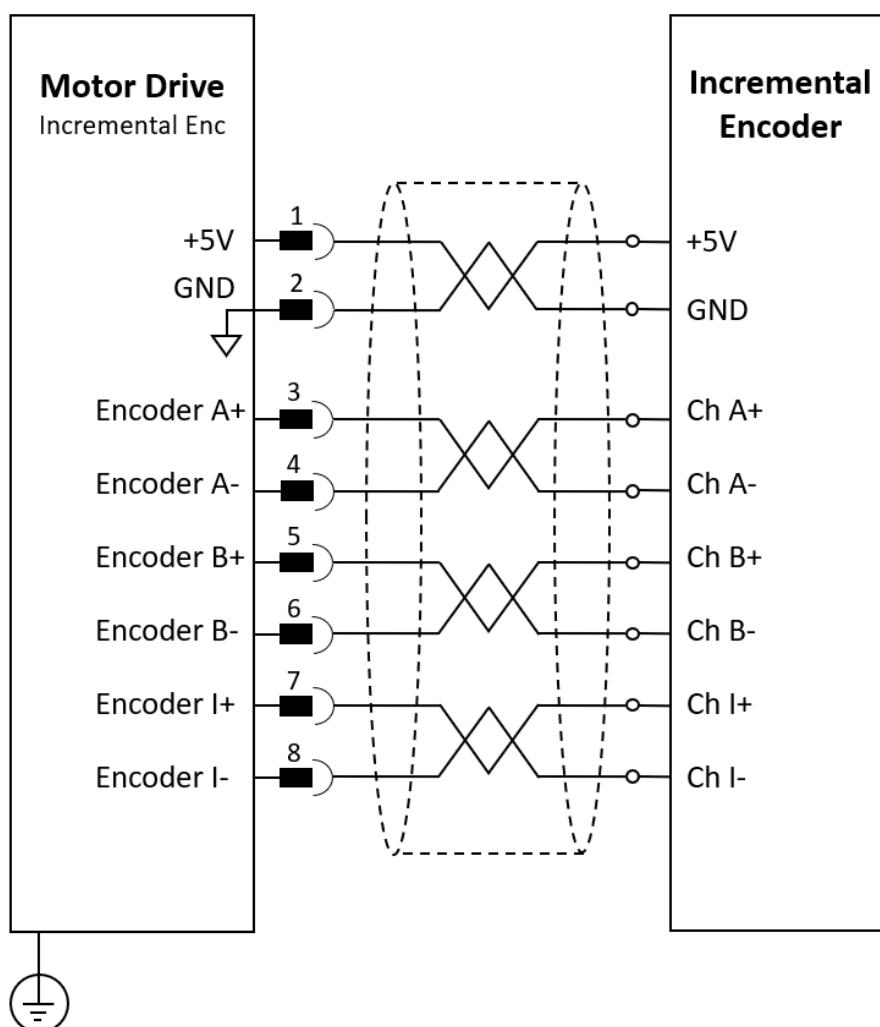
MOLEX_35507_0800



502128000

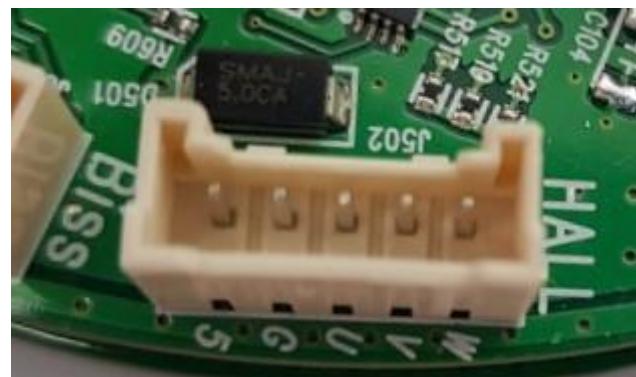
MOLEX_35362-0850		J501
Pin	Signal	
1	5V	
2	GND	
3	Encoder A+	
4	Encoder A-	
5	Encoder B+	
6	Encoder B-	
7	Encoder I+	
8	Encoder I-	

3.9.1. Incremental Encoder Wiring



[Incremental Encoder Connection Diagram]

3.10. HALL Sensor



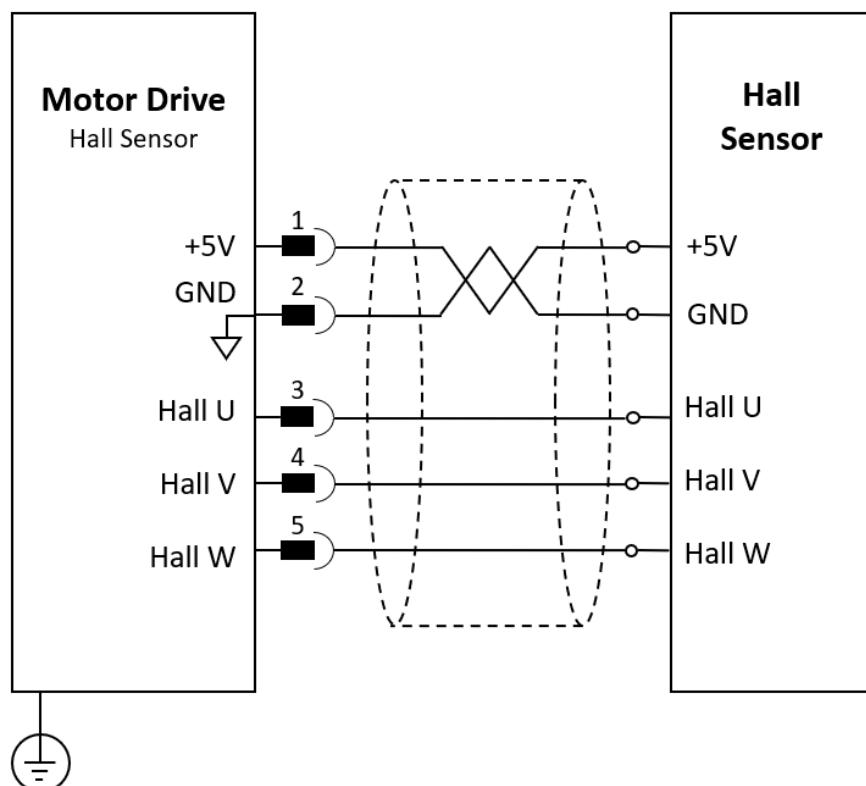
MOLEX_35507_0500



502128000

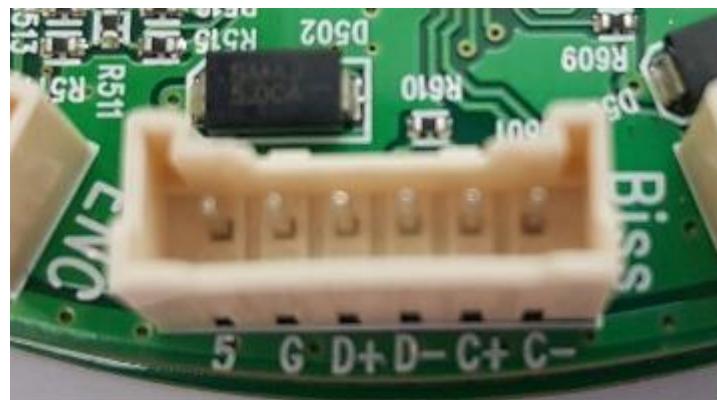
MOLEX_35362-0550		J502
Pin	Signal	
1	5V	
2	GND	
3	Hall U	
4	Hall V	
5	Hall W	

3.10.1. Hall Sensor Wiring



[Hall Sensor Connection Diagram]

3.11. Serial Encoder



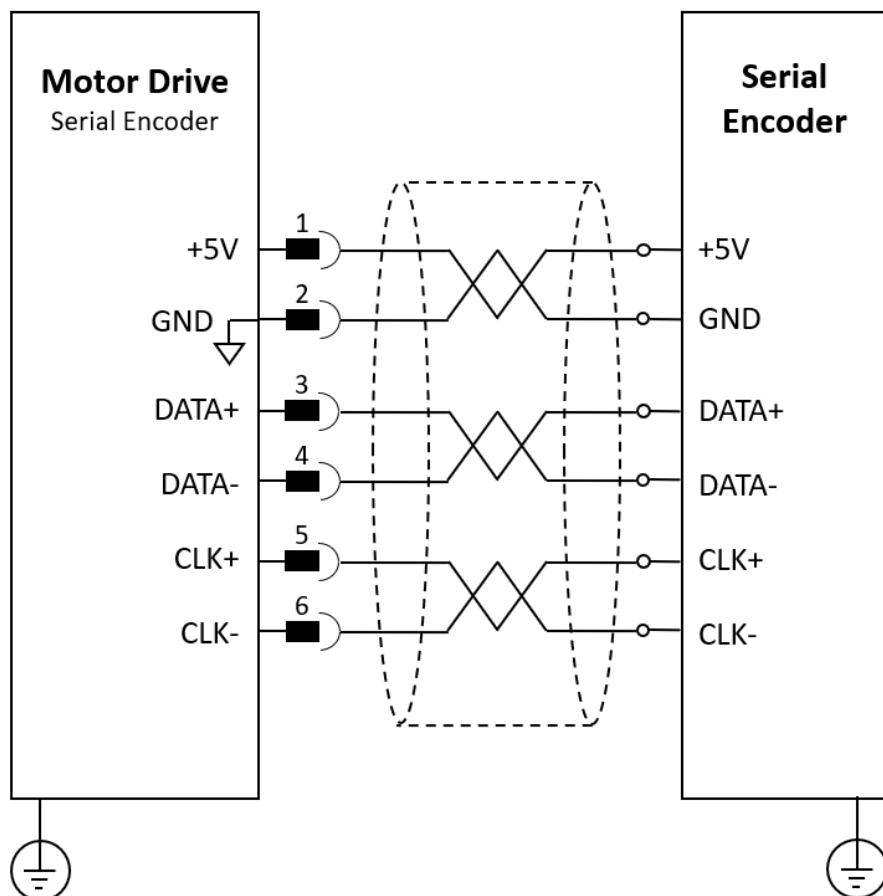
MOLEX_35507_0600



502128000

MOLEX_35362-0650		J601
Pin	Signal	
1	5V	
2	GND	
3	Data+	
4	Data-	
5	CLK+	
6	CLK-	

3.11.1. Serial Encoder Wiring



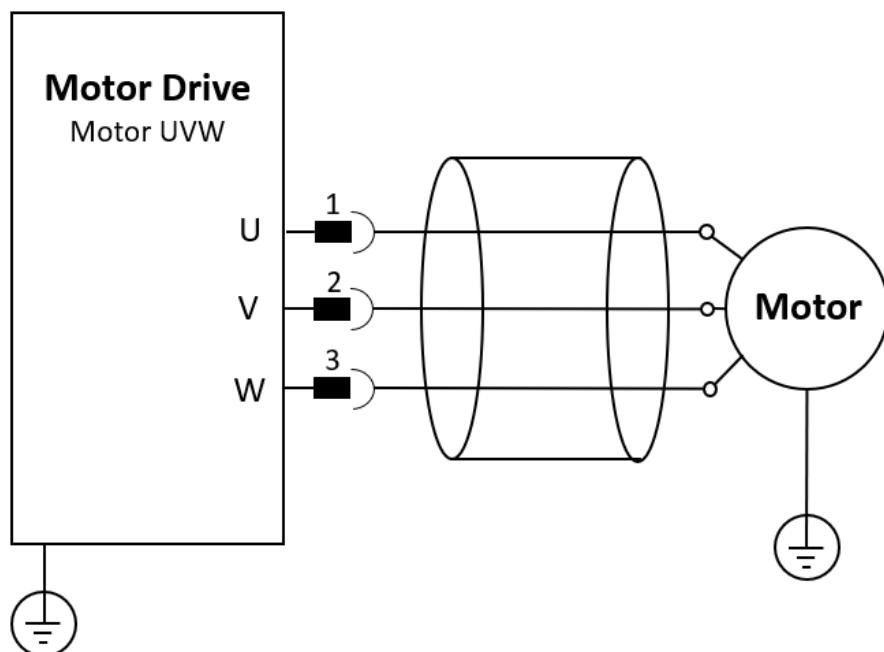
[Serial Encoder Connection Diagram]

3.12. Motor UVW

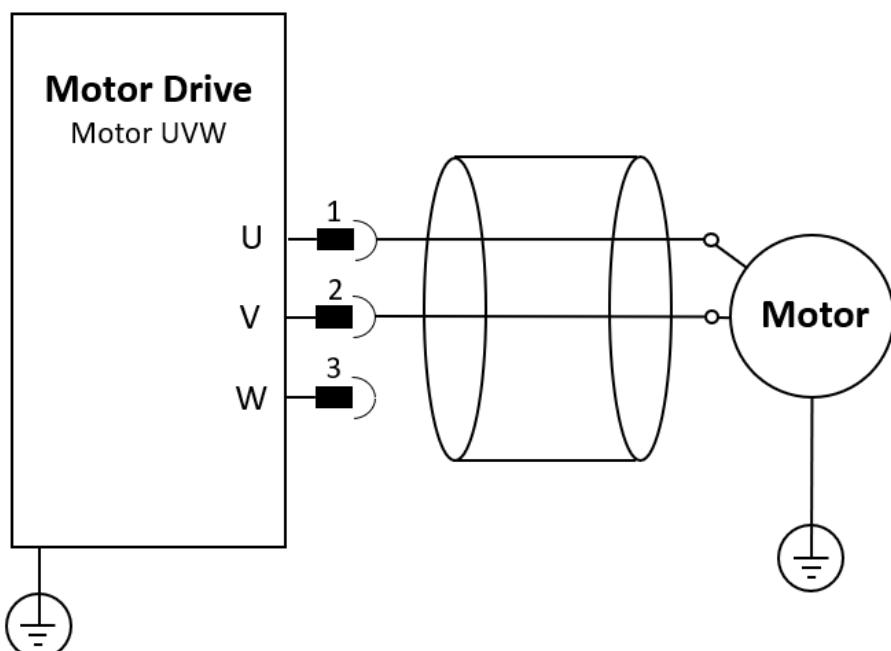


5EHDVC_3P	J101
Pin	Signal
1	U (VCM or DC Motor : +)
2	V (VCM or DC Motor : -)
3	W

3.12.1. Motor UVW Wiring

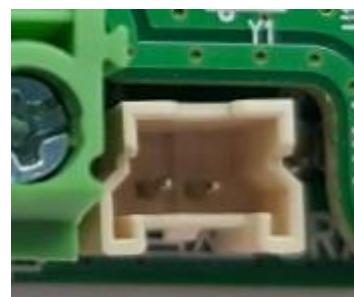


[Brushless / PMSM Motor UVW Connection Diagram]



[Brushed DC / Voice Coil Motor UVW Connection Diagram]

3.13. BRAKE



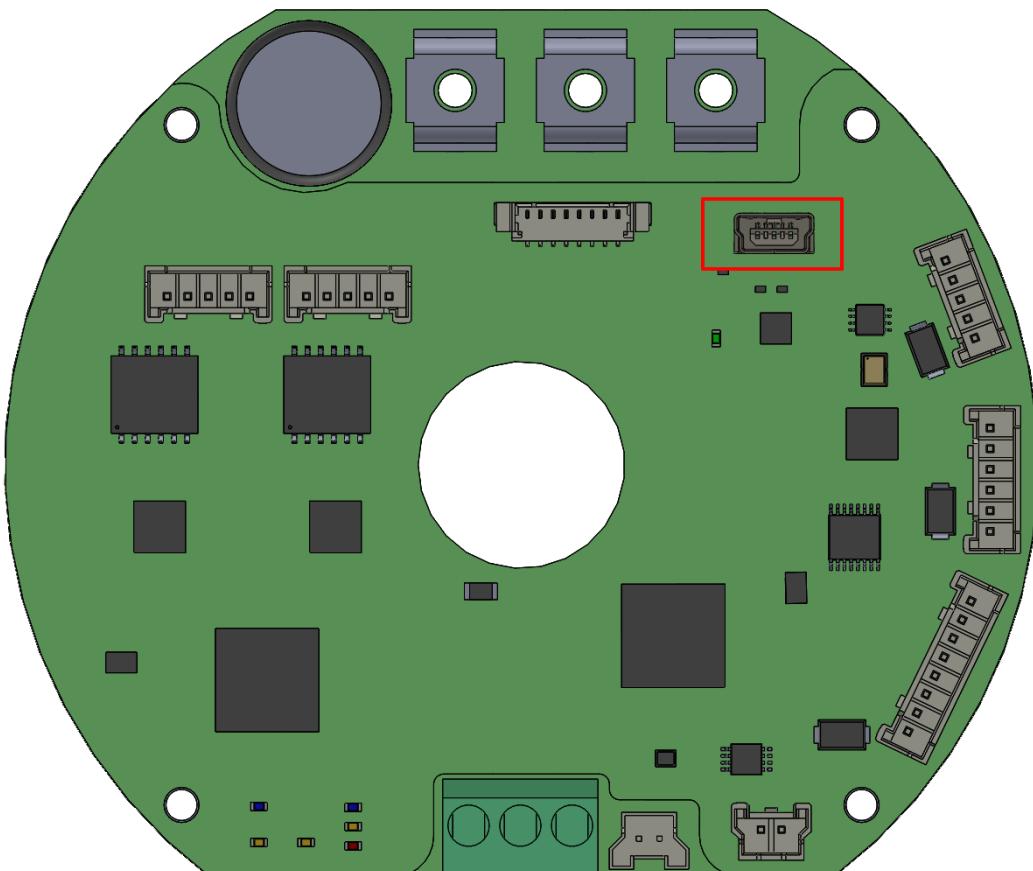
MOLEX_35507_0200



502128000

MOLEX_35362-0250		J7
Pin	Signal	
1	24V	
2	GND	

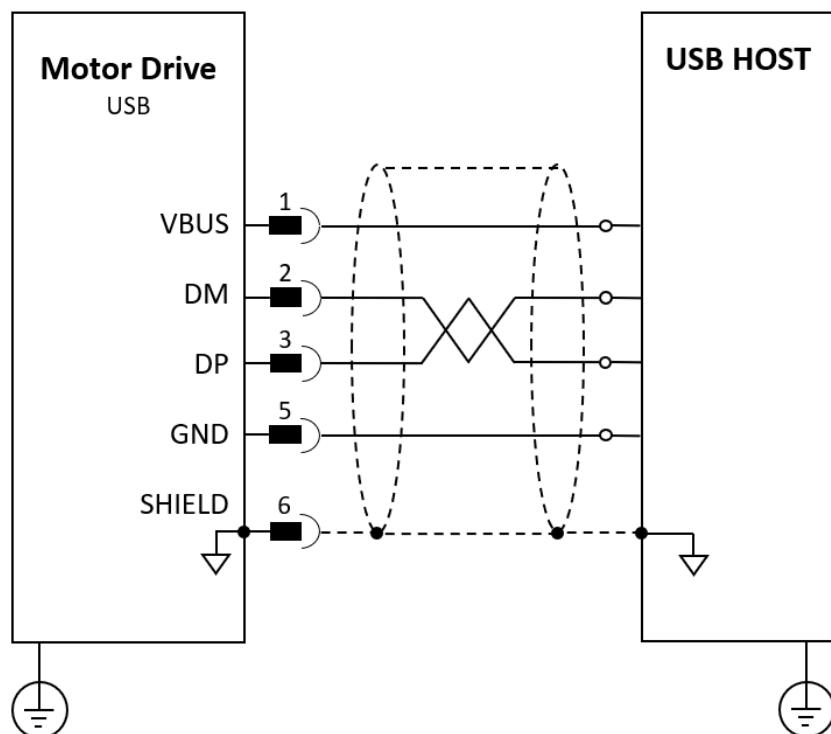
3.14. USB



USB-Mini Type B (10119313-301TLF)

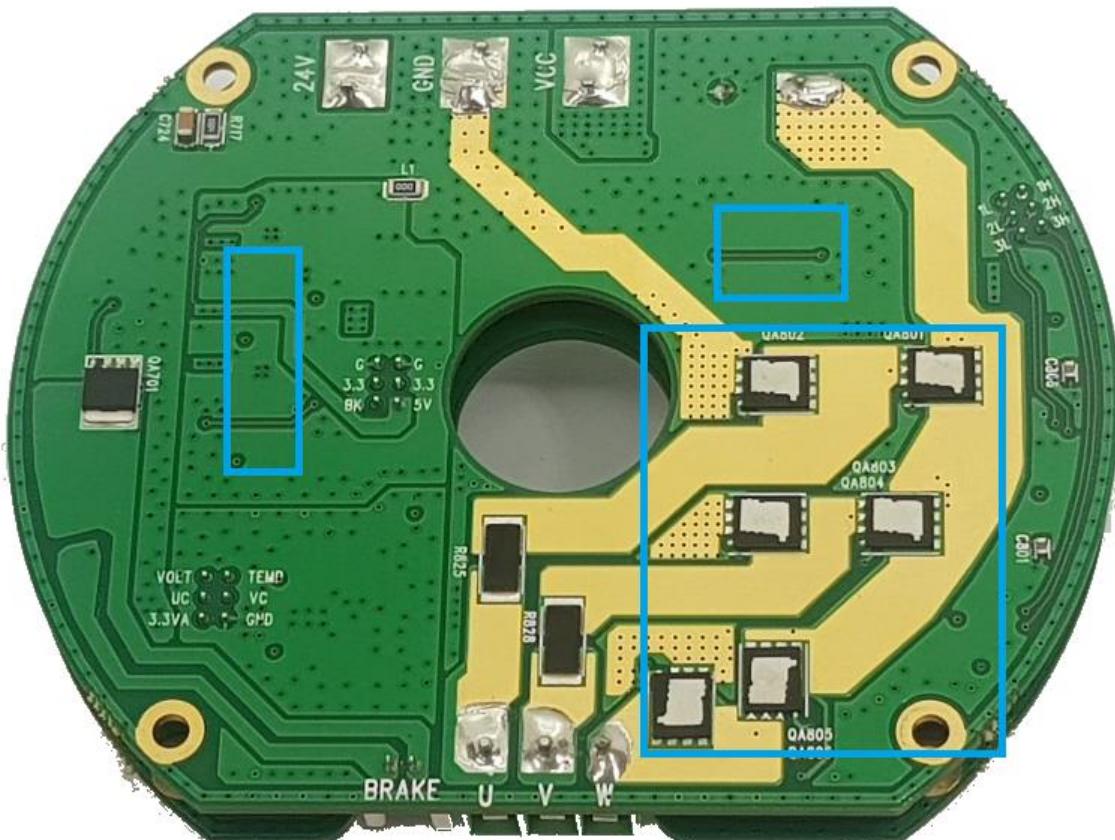
Pin	Signal
1	VBUS
2	DM
3	DP
4	Not Used
5	GND
6	Shield

3.14.1. USB Wiring



[USB Connection Diagram]

4. Thermal Pad



Attach the thermal pad (5mm) to the marked location.



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