HIWIN®
Motion Control and System Technology

Servo Drive LMDX+

User Manual

www.hiwinmikro.tw

Revision History

Release Date	Version	Applicable Product	Revision Contents
2018-07-06	1.0	LMDX+ drive	First edition.

About this User Manual

Scope

This user manual introduces the hardware of HIWIN LMDX+ drive.

Related Documentation

Users can also refer to other related manuals in the following.

- DspHost2 Operation Manual.pdf
- LMDX+ Command and Parameter Manual.pdf
- LMSP Troubleshoot.pdf

Comments

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Document Validity

The information in this document is subject to change without prior notice.

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1. Introduction

1. Introduction.....1

This manual helps users properly install and set up LMDX+ to drive linear servo planar motors. It is assumed that users have fundamental knowledge of basic electronics, computers, and motion control cards. It is recommended to read through the manual before taking any action. Users can find the basic operational theory in Section 2, the specifications of LMDX+ system and dimensions in Section 3. To help users in wiring, all the connectors, pin assignments, and interfaces can be found in Section 4.

◆ Motor

A linear servo planar motor has a planar stator with tooth structures, and a planar forcer with position sensors. By providing compressed air to the forcer, the air gap between stators is kept to serve as a guide between stators and forcers. There are four electromagnetic modules in an LMSP forcer. Two modules are for one direction, and the other two are for the other direction. Each module is driven by two-phase current, phase A and phase B. They produce a reluctance force to move the forcer to an equilibrium point. Three accuracy position sensors are used to inform the drive of the updated position, one for direction Y, and two for direction X. To detect the position and the yaw error, two sensors for direction X (X1 and X2) are arranged symmetrically to the center. Each encoder sends differential signals in sin and cos.

◆ Amplifier

LMDX+ drive has four PU2 amplifiers, which output Max. current 3A to four force modules in the forcer. LMDX+ drive receives STEP/DIR, CW/CCW, AqB pulses from a motion controller or a programmable logic controller (PLC). It also outputs IN-POS, Servo Ready, ALARM, and inputs HOME and RESET etc.

◆ DspHost

It is easy to set up and tune LMDX+ drive via DspHost. DspHost communicates with LMDX+ drive through RS-232. Initialization could easily be done by DspHost. Users can save the parameter to the hard disk in files and retrieve it later. Data capturing helps users tune the servo gains and look over the internal signals to get the best operation. Compensation values could easily be handled through users' interfaces.

2. Operational Theory

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2.1 Alignment

In LMSP series motors, there are teeth or grids on the surface of the stator (platen). There are also teeth structures on force modules and sensors of the forcer. It is important for the motor to align with grids before servo control (Servo on).

2.2 Operating Mode

- **Monitor mode**

This is for CPU to update firmware.

- **Stand-alone mode**

With the help of high speed DSP, HIWIN's LMDX+ series drive is capable of path planning. It is possible to give motion commands through RS-232 without a motion control card.

- **Pulse mode**

A motion controller or a PLC sends pulses, corresponding to position commands, to the drive. When the drive receives a pulse, the motor moves a specified distance accordingly. Motion controller is responsible for path planning. The frequency of the sending pulses becomes higher in acceleration phase, while it remains the same in constant speed phase.

- **Servo off mode**

This is different from closed loop mode. Since there is no output current in this mode, users cannot move the motor by giving motion commands or sending pulses. Therefore, the motor is free.

- **Open loop mode**

Position feedback is not used in this mode. It is similar to HIWIN LMPP motor, which X axis and Y axis are driven separately. In this case, LMSP becomes step motor.

2.3 Status Indicator

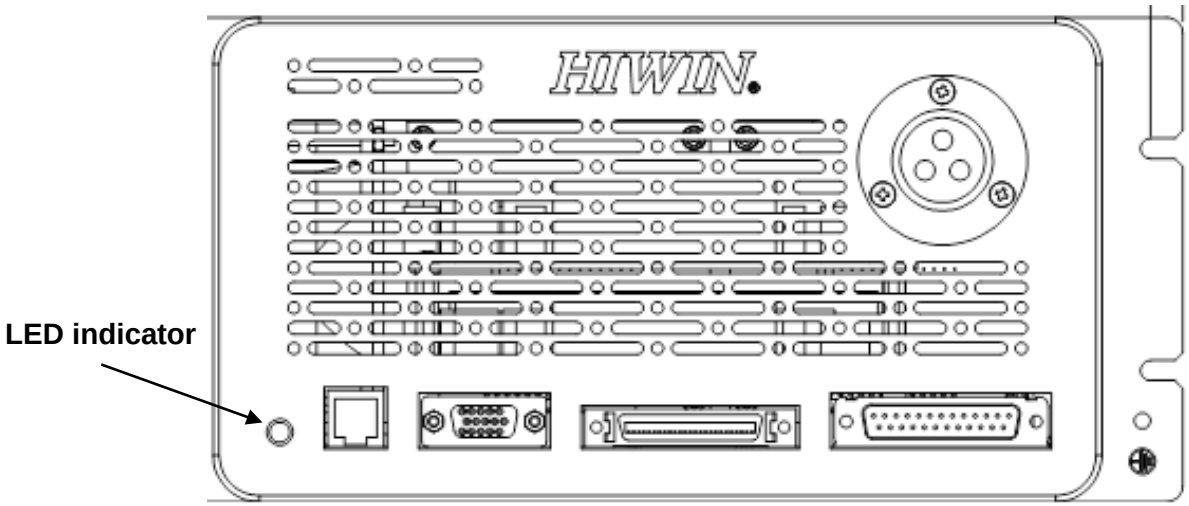


Figure 2.3.1 DSP Status Indicator

DSP Status Indicator

There are two LEDs in DSP Status Indicator. Red is for LDE, and green is for LDS. There are three ways of twinkle. Each twinkle indicates a different motion mode or monitor mode. About motion modes, please refer to command ‘FX’ of “LMDX+ Command and parameter manual.pdf ”.

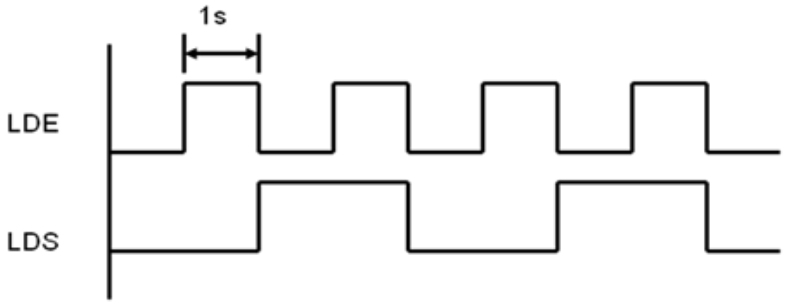
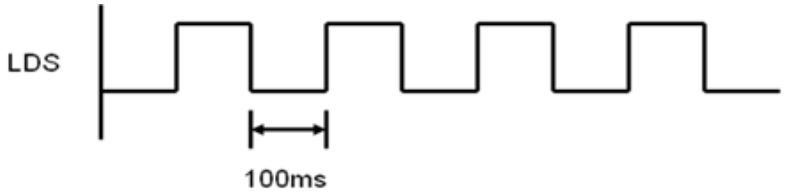
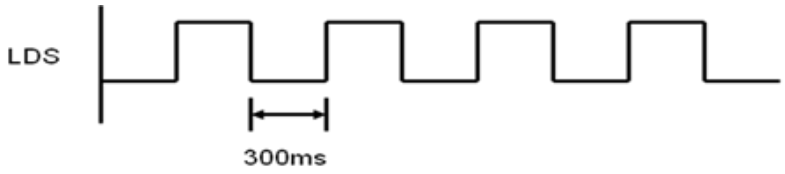
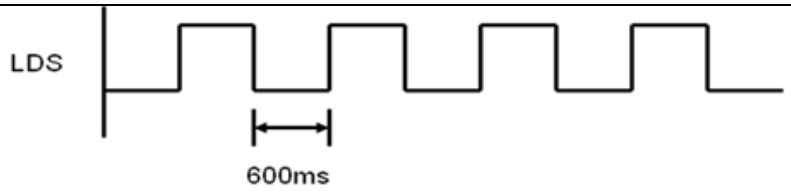
Mode	Diagram for blinking code
Monitor Mode	
Servo off	
Closed Loop	
Open Loop	

Table 2.3.1 Diagram for blinking code

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3.1 AC Power Supply

Main AC Voltage: 95 to 264VAC, single-phase

3.2 Motor Power Output

Model: PU2 Max.current: 3A

3.3 Pulse Command Input

Max. command pulse frequency: 2Mpps

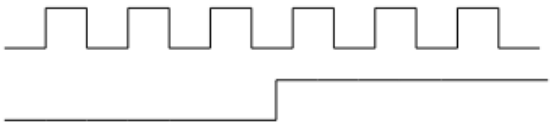
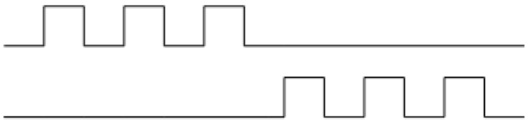
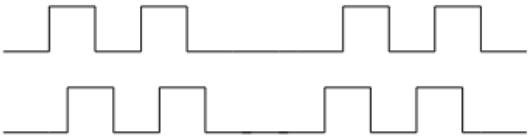
Pulse command	Pulse waveform
Step Direction	
CW CCW	
A B	

Table 3.3.1 Pulse Command Input

3.4 Digital Inputs／Outputs

	Inputs	Outputs
Channels	8 (2 dedicated)	8 (5 dedicated)
Function	I1 : Home I8 : Reset	O1 : Homing O2 : Homed O3 : Alarm O4 : Servo Ready (SVON) O6 : In-Position

Table 3.4.1 Digital Inputs／Outputs

3.5 Environmental Condition

Ambient temperature(T_A)	0~50°C (non-freezing, air-cooled)
Storage temperature	0~80°C
Ambient humidity	0 to 95%RH (non-condensing)
Altitude	Below 1,000M

Table 3.5.1 Environmental Condition

3.6 Serial Communication Interface

Channels	1
Type	RS-232
Baud Rate	115,200
Data Bits	8
Parity	Odd
Stop Bits	2

Table 3.6.1 Serial Communication Interface

3.7 Dimensions

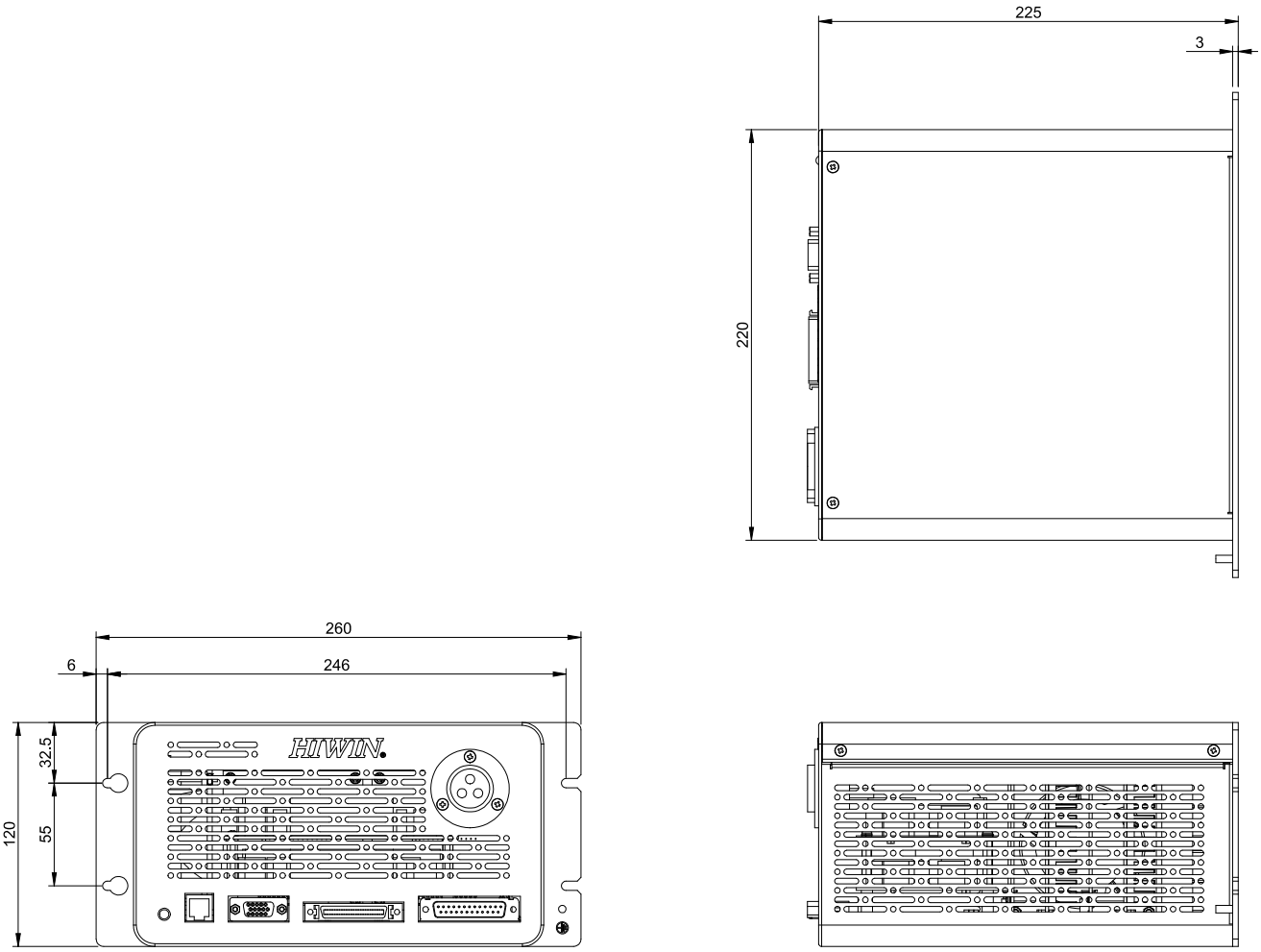


Figure 3.7.1 Dimensions

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4.1 Connector Locations

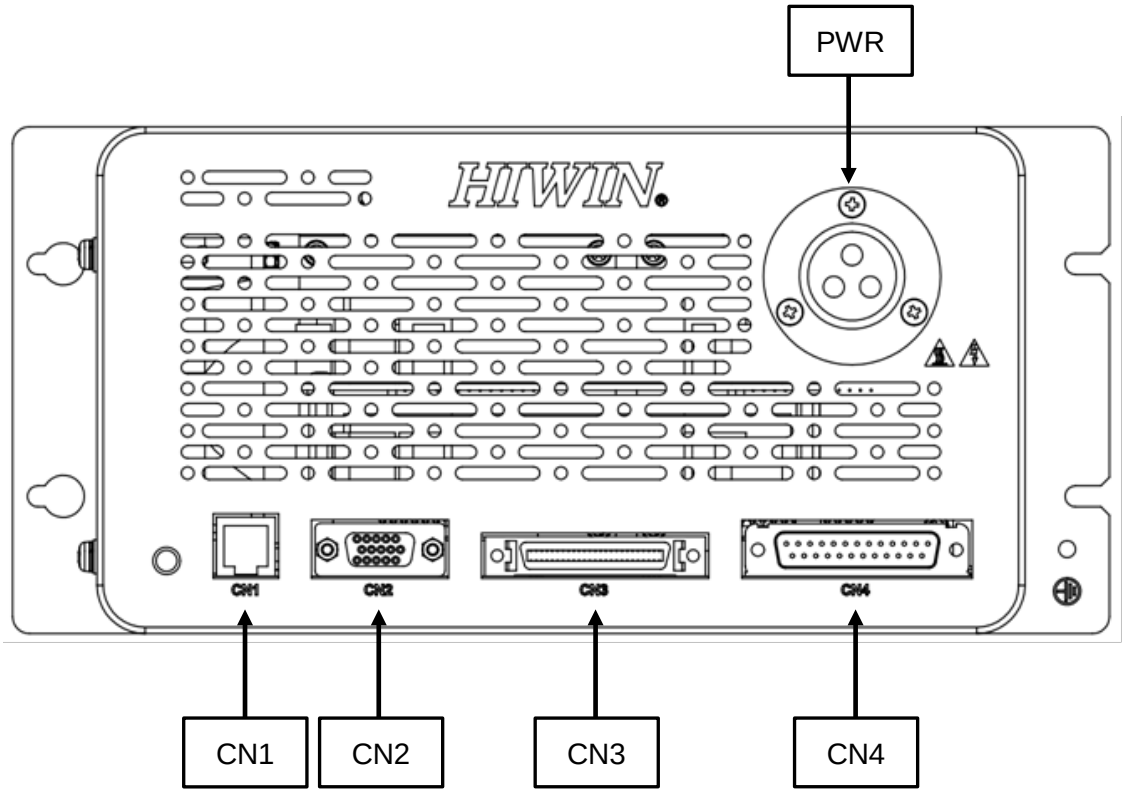


Figure 4.1.1 Connector Locations

PWR: AC Main Power Input

CN1: RS-232 Serial Communication

CN2: Encoder feedback input

CN3: Pulse Command & I/O

CN4: Motor

4.2 AC Power Supply

■ Mating Connector

Figure 4.2.1 Industrial Circular Connector (Male)

Description	Industrial Circular Connector (Male)
Type	Plug Connector
P/N	PLT-253-P

Table 4.2.1 AC Power Supply Mating Connector

■ Pin Assignment

Drive side (Female)		User side (Male)	
Pin	Name	Pin	Name
1	L	**1**	L
2	N	**2**	N
3	PE	**3**	PE

Table 4.2.2 AC Power Supply Pin Assignment

4.3 Motor

■ Mating Connector

Description	D-sub 25-pin (Male)
Type	Plug Connector
P/N	20NA-21W110-2-071

Table 4.3.1 Motor Mating Connector

■ Pin Assignment

Motor side (D-sub 25pin) (Male)		Drive side (D-sub 21pin) (Female)	
Pin	Name	Pin	Name
1	AX1-B	**2**	AX1-B
2	BX1-B	**11**	BX1-B
3	AX2-B	**14**	AX2-B
4	BX2-B	**4**	BX2-B
5	AY1-B	**7**	AY1-B
6	BY1-B	**16**	BY1-B
7	AY2-B	**19**	AY2-B
8	BY2-B	**9**	BY2-B
14	AX1-E	**3**	AX1-E
15	BX1-E	**1**	BX1-E
16	AX2-E	**15**	AX2-E
17	BX2-E	**5**	BX2-E
18	AY1-E	**8**	AY1-E
19	BY1-E	**6**	BY1-E
20	AY2-E	**20**	AY2-E
21	BY2-E	**10**	BY2-E
25	Frame Ground	Case	
Case	Shield		

Table 4.3.2 Motor Pin Assignment

4.4 RS-232 Serial Communication

■ Mating Connector

Description	RJ-11 6pin (Male)
Type	Plug Connector
P/N	N/A

Table 4.4.1 RS-232 Serial Communication Mating Connector

■ Pin Assignment

Drive side RJ-11 6pin (Male)		COM Port of PC D-sub 9-pin (Female)	
Pin	Name	Pin	Name
2	RXD	**2**	RXD
3	GND	**5**	GND
4	GND	N/A	N/A
5	TXD	**3**	TXD

Table 4.4.2 RS-232 Serial Communication Pin Assignment

4.5 I/O Pulse Command

■ Mating Connector

Description	D-sub 50-pin (Male)
Type	Plug Connector
P/N	EUMAX XDR-10350AS

Table 4.5.1 I/O Pulse Command Mating Connector

■ Pin Assignment

Pin	Signal name	Description
1	IF_PulseX+	Differential input (2MHz) pulse command X-axis channel: Pulse / Direction
2	IF_PulseX-	
3	IF_DirX+	
4	IF_DirX-	
5	IF_PulseY+	Differential input (2MHz) pulse command Y-axis channel: Pulse / Direction
6	IF_PulseY-	
7	IF_DirY+	
8	IF_DirY-	
9~25	N/A	N/A
26	Input1	General purpose input 1
27	Input2	General purpose input 2
28	Input3	General purpose input 3
29	Input4	General purpose input 4
30	Input5	General purpose input 5
31	Input6	General purpose input 6
32	Input7	General purpose input 7
33	Input8	General purpose input 8
34	Output1+	General purpose output 1+
35	Output1-	General purpose output 1-
36	Output2+	General purpose output 2+
37	Output2-	General purpose output 2-
38	Output3+	General purpose output 3+
39	Output3-	General purpose output 3-
40	Output4+	General purpose output 4+

Pin	Signal name	Description
41	Output4-	General purpose output 4-
42	Output5+	General purpose output 5+
43	Output5-	General purpose output 5-
44	Output6+	General purpose output 6+
45	Output6-	General purpose output 6-
46	Output7+	General purpose output 7+
47	Output7-	General purpose output 7-
48	Output8+	General purpose output 8+
49	Output8-	General purpose output 8-
50	FG	Frame Ground

Table 4.5.2 I/O Pulse Command Pin Assignment

■ I/O signal wiring

Digital Output Wiring

LMDX+ General Purpose Output pins use an optical coupler Darlington output interface that is suitable for voltage systems less than 24VDC. There are eight general purpose outputs, and the maximum allowable current is 100 mA.

MAX. operating Voltage: 24VDC
MAX. output current: 100mA

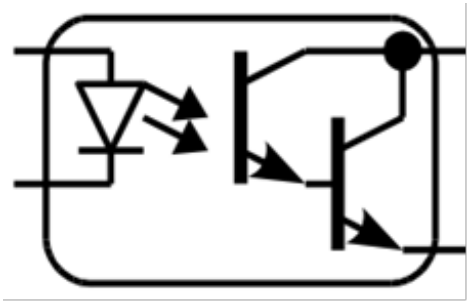
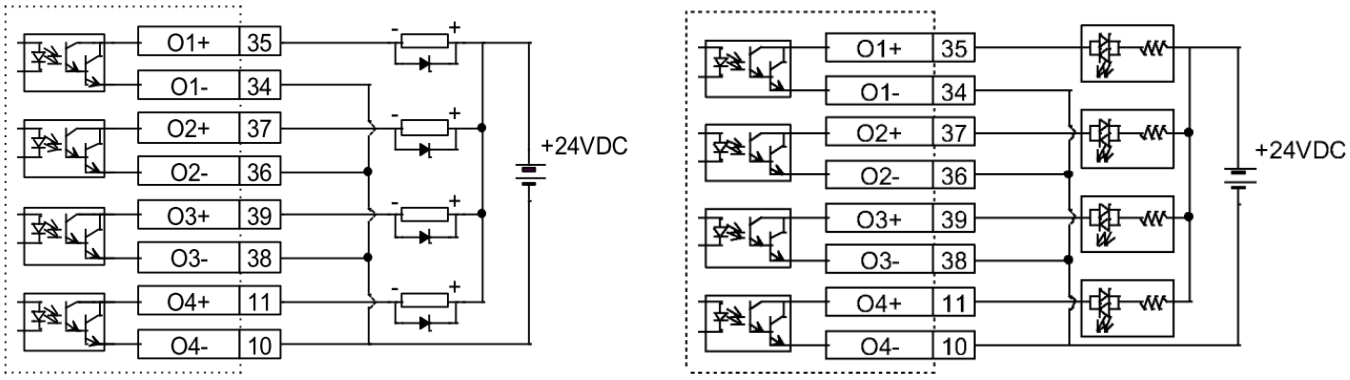


Figure 4.5.1 Digital Output Wiring

Wiring example



Output wiring via relays Output wiring via optical

Figure 4.5.2 Digital Output Wiring example

■ I/O signal wiring

Digital Input Wiring

LMDX+ General Purpose Input pins use an optical coupler input interface that is suitable for 12 to 24VDC voltage systems. There are eight general purpose inputs in total, with a COM port suitable for Sink and Source connections.

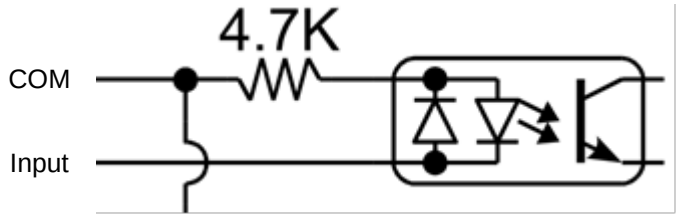
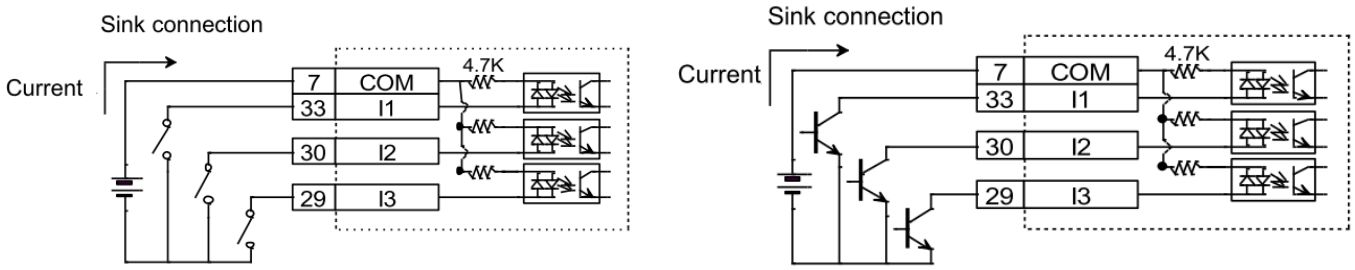


Figure 4.5.3 Digital Input Wiring

Wiring example



Input via a switch or relay

Input via a transistor

Figure 4.5.4 Digital Input Wiring example

4.6 Encoder Feedback Input

■ Mating Connector

Description	D-sub 50-pin (Male)
Type	Plug Connector
P/N	N/A

Table 4.6.1 Encoder Feedback Input Mating Connector

■ Pin Assignment

Motor side (Male)		Drive side (Female)		Description
Pin	Name	Pin	Name	
1	GND	**13**	GND	Signal GND
2	AD_AX+	**1**	AD_AX+	Phase A+ output of X1 Sensor
3	AD_BX+	**2**	AD_BX+	Phase B+ output of X1 Sensor
4	AD_AY+	**3**	AD_AY+	Phase A+ output of X2 Sensor
5	AD_BY+	**4**	AD_BY+	Phase B+ output of X2 Sensor
6	AD_AZ+	**5**	AD_AZ+	Phase A+ output of Y Sensor
7	AD_BZ+	**11**	AD_BZ+	Phase B+ output of Y Sensor
8	GND	**15**	GND	Signal GND
9	AD_AX-	**6**	AD_AX-	Phase A- output of X1 Sensor
10	AD_BX-	**7**	AD_BX-	Phase B- output of X1 Sensor
11	AD_AY-	**8**	AD_AY-	Phase A- output of X2 Sensor
12	AD_BY-	**9**	AD_BY-	Phase B- output of X2 Sensor
13	AD_AZ-	**10**	AD_AZ-	Phase A- output of Y Sensor
14	AD_BZ-	**12**	AD_BZ-	Phase B- output of Y Sensor
15	+5V	**14**	+5V	DC Power supply
Shell	Frame Ground	**Shell**	Frame Ground	Frame Ground

Table 4.6.2 Encoder Feedback Input Pin Assignment

Appendix A: Accessory

Item	HIWIN Part number	Name	Specification
1	HE00EAU06000	Communication cable	RS-2322 Cable
2	HE00EGFDM300	Motor power cable	LMAC_3m
3	HE00EGFDE300	Encoder cable	LMAC_3m
4	HE00EGFDP300	Pulse cable	LMAC_3m
5	051500400388	AC power connector	PLT-253-P

Table Appendix A: Accessory