MDX-IP20

Integrated Servo Motor

Hardware Manual

Rev. 1.1

SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.

MDX Models Available:

Part Number		RS-485	CANopen
16-bit magnetic encoder	1024 Lines magnetic encoder		
MDXK61GN3RA000	MDXK61GNMRA000	√	
MDXK62GN3RA000	MDXK62GNMRA000	√	
MDXK61GN3CA000	MDXK61GNMCA000		√
MDXK62GN3CA000	MDXK62GNMCA000		√
MDXK61GN3RAP10	MDXK61GNMRAP10	√	
MDXK61GN3RAP20	MDXK61GNMRAP20	√	
MDXK61GN3RAP40	MDXK61GNMRAP40	√	
MDXK61GN3CAP10	MDXK61GNMCAP10		√
MDXK61GN3CAP20	MDXK61GNMCAP20		√
MDXK61GN3CAP40	MDXK61GNMCAP40		√
MDXK62GN3RAP10	MDXK62GNMRAP10	√	
MDXK62GN3RAP20	MDXK62GNMRAP20	√	
MDXK62GN3RAP40	MDXK62GNMRAP40	√	
MDXK62GN3CAP10	MDXK62GNMCAP10		√
MDXK62GN3CAP20	MDXK62GNMCAP20		√
MDXK62GN3CAP40	MDXK62GNMCAP40		√
MDXK61GN3RB000	-	√	
MDXK62GN3RB000	-	√	
MDXK61GN3CB000	-		√
MDXK62GN3CB000	-		√
MDXK61GN3RBP10	-	√	
MDXK61GN3RBP20	-	√	
MDXK61GN3RBP40	-	√	
MDXK61GN3CBP10	-		√
MDXK61GN3CBP20	-		√
MDXK61GN3CBP40	-		√
MDXK62GN3RBP10	-	√	
MDXK62GN3RBP20	-	√	
MDXK62GN3RBP40	-	√	
MDXK62GN3CBP10	-		√
MDXK62GN3CBP20	-		√
MDXK62GN3CBP40	-		√

1 Introduction

Thank you for selecting MOONS' MDX Integrated Servo Motor. The MDX integrated servo motors combines servo technology with an integrated motor to create a product with exceptional feature and broad capability. We hope our commitment to performance, quality and economy will result in a successful motion control project.

1.1 Part Numbering

<div align="center">

MDX L 6 1 G N 3 R A 000

</div>

Series
MDX Integrated Servo Motors

Series Type
K = IP20, 24-60VDC input
L = IP65, 24-60VDC input

Frame Size
6 = 60 mm

Motor Length
1 = 1 Stacks
2 = 2 Stacks

Brake Options
N = No brake, Low inertia

Feedback Options
3 = 16-bit magnetic encoder
M = 1024 Lines magnetic encoder

Communications
R: RS-485
C: CANopen

Heat Sink
A: Slim Heat Sink
B: Standard Heat Sink

Gearbox
000 = Without planetary gearbox
        Standard shaft with keyway
Planetary gearbox
P10 = Gearing ratio, 10:1
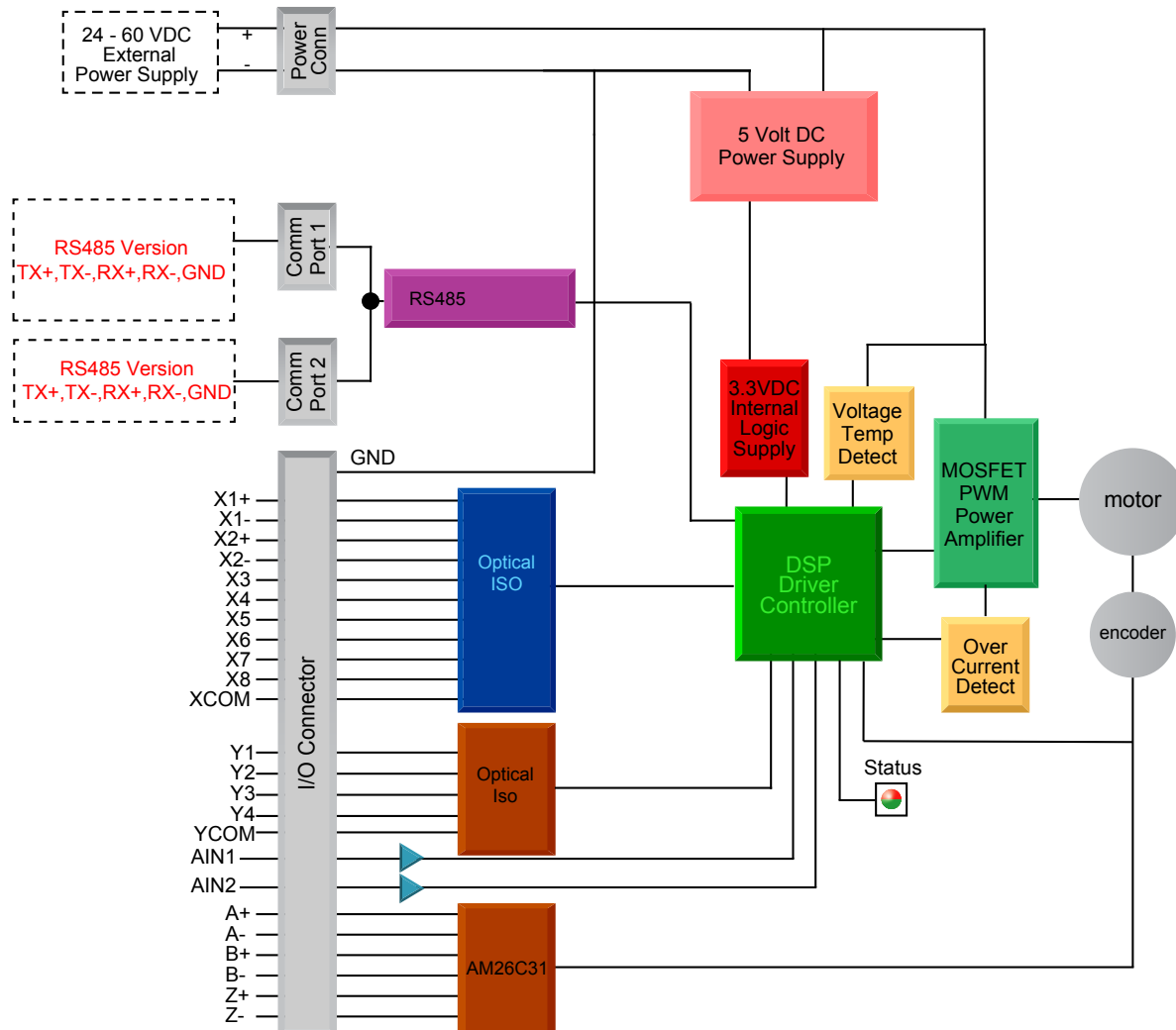P20 = Gearing ratio, 20:1
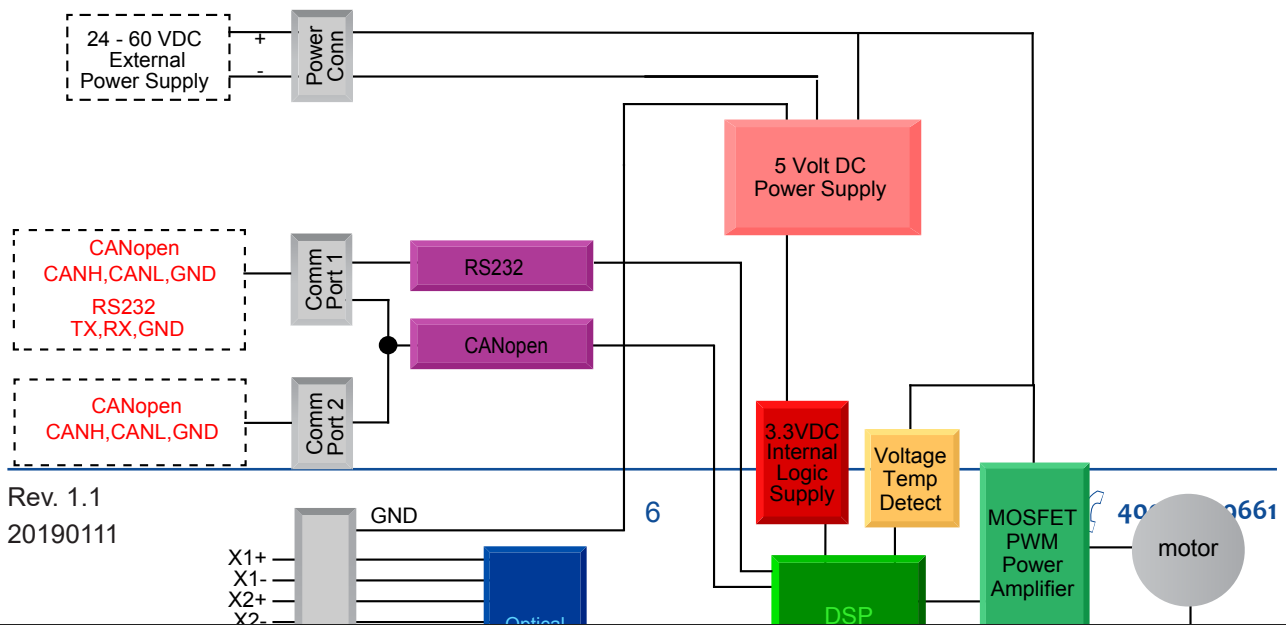P40 = Gearing ratio, 40:1

1.2 Features

- Programmable, digital servo driver and motor in an integrated package
- Operates from a 24 to 60 volt DC power supply
- Control modes:
  - Torque control
    - * Analog input
    - * SCL commanded
  - Velocity control
    - * Fixed velocity
    - * Analog velocity
    - * SCL commanded
  - Position control
    - * Digital signal type
      - Step & Direction
      - CW & CCW pulse
      - A/B Quadrature
    - * Analog position
    - * CW/CCW
    - * Serial commanded position
  - Communication control
    - * RS485 (support Modbus)
    - * CANopen
- Q Programming
  - Stand alone operation
- Communication Interface:
  - RS-485，CANopen
- Encoder feedback
  - 16-bit magnetic encoder
  - 1024 Lines magnetic encoder
- Power output:
  - MDXK61GN 200 Watt rating
  - MDXK62GN 400 Watt rating
- I/O
  - 8 optically isolated digital inputs, with adjustable bandwidth digital noise rejection filter, 5 to 24 volts
  - 4 optically isolated digital outputs, 30V/100 mA max
  - 2 analog input (0 ~ 10VDC) for torque, speed and position control
- Technological advances:
  - Full servo control, Closed loop
  - Efficient, Accurate, Fast, Smooth
  - Intelligent, Compact

MOONS'

1.3 Block Diagrams

MDX-IP20 RS485 Block Diagram

```
24 - 60 VDC
External
Power Supply        Power Conn

RS485 Version
TX+,TX-,RX+,RX-,GND     Comm Port 1
                                        RS485
RS485 Version
TX+,TX-,RX+,RX-,GND     Comm Port 2

                         5 Volt DC
                         Power Supply

                         3.3VDC Internal Logic Supply

                         Voltage Temp Detect

I/O Connector
GND
X1+
X1-
X2+
X2-
X3          Optical ISO          DSP Driver Controller     MOSFET PWM Power Amplifier     motor
X4
X5
X6
X7
X8                                                          Over Current Detect     encoder
XCOM

Y1
Y2          Optical Iso                                    Status
Y3
Y4
YCOM
AIN1
AIN2

A+
A-
B+
B-          AM26C31
Z+
Z-
```

MDX-IP20 CANopen Block Diagram

```
24 - 60 VDC
External
Power Supply        Power Conn

CANopen
CANH,CANL,GND       Comm Port 1      RS232
RS232
TX,RX,GND
                                     CANopen
CANopen
CANH,CANL,GND       Comm Port 2

                         5 Volt DC
                         Power Supply

                         3.3VDC Internal Logic Supply

                         Voltage Temp Detect

GND
X1+                                                        MOSFET PWM Power Amplifier    motor
X1-
X2+         Optical                  DSP
X2-
```

1.4 Safety Instructions

Only qualified personnel should transport, assemble, install, operate, or maintain this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, operation, and maintenance of motors, and who meet the appropriate qualifications for their jobs.

To minimize the risk of potential safety problems, all applicable local and national codes regulating the installation and operation of equipment should be followed. These codes may vary from area to area and it is the responsibility of the operating personnel to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. MOONS＇ does not guarantee the products described in this publication are suitable for a particular application, nor do they assume any responsibility for product design, installation, or operation

- Read all available documentation before assembly and operation. Incorrect handling of the products referenced in this manual can result in injury and damage to persons and machinery. All technical information concerning the installation requirements must be strictly adhered to.

- It is vital to ensure that all system components are connected to earth ground. Electrical safety is impossible without a low-resistance earth connection.

- This product contains electrostatically sensitive components that can be damaged by incorrect handling. Follow qualified anti-static procedures before touching the product.

- During operation keep all covers and cabinet doors shut to avoid any hazards that could possibly cause severe damage to the product or personal health.

- During operation, the product may have components that are live or have hot surfaces.

- Never plug in or unplug the Integrated Motor while the system is live. The possibility of electric arcing can cause damage.

Be alert to the potential for personal injury. Follow recommended precautions and safe operating practices emphasized with alert symbols. Safety notices in this manual provide important information. Read and be familiar with these instructions before attempting installation, operation, or maintenance. The purpose of this section is to alert users to the possible safety hazards associated with this equipment and the precautions necessary to reduce the risk of personal injury and damage to equipment. Failure to observe these precautions could result in serious bodily injury, damage to the equipment, or operational difficulty.

2 Getting Started

The following items are needed:

- a 24 - 60 Volt DC power supply, see the section below entitled "Choosing a Power Supply" for help in choosing the right one

- a PC running Microsoft Windows XP (SP3), or Windows 7, 8, or 10 with an RS-232 serial communication port, otherwise a USB to RS-232 serial port converter is needed. For CANopen drives, CANopen communication tool is required.

- A power cable, I/O cable, and communication cable.

2.1 Installing Software

Before utilizing the MDX Integrated Servo Motor and Artemis Software in an application, the following steps are necessary:

- Download and install the Artemis software from MOONS' website

- Connect the drive to the PC using the programming cable. When using RS-485, it is best to be setup in a 4-Wire configuration (see Section 3.2.1 "Connecting to a host using RS-485".)

- Connect the drive to the power supply. See instructions below.

- Launch the software by clicking Start...Programs...MOONS'.

2.2 Mounting the Hardware

The MDX must be mounted to provide maximum heat sinking and airflow. Keep enough space around the Integrated Motor to allow for the airflow.

- Never use the drive where there is no airflow or where other devices cause the surrounding air to be more than 40°C (104°F).
- Never put the drive where it can get wet.
- Never use the drive where metal or other electrically conductive particles can
- infiltrate the drive.

2.3 Choosing a Power Supply

The main considerations when choosing a power supply are the voltage and current requirements for the application.

2.3.1 Supply Voltage

The MDX is designed to give optimum performance at 48 Volts DC. Choosing the voltage depends on the performance needed and motor/drive heating that is acceptable and/or does not cause a drive over-temperature. Higher voltages will give higher speed performance but will cause the MDX to produce higher temperatures. Using power supplies with voltage outputs that are near the drive's maximum may significantly reduce the operational duty-cycle.

The extended range of operation can be as low as 18VDC minimum to as high as 60VDC maximum. When operating below 24VDC, the power supply input may require larger capacitance to prevent under-voltage and internal-supply alarms. Current spikes may make supply readings erratic. The supply input cannot go below 18VDC for reliable operation. Absolute minimum power supply input is 18VDC. If the input supply drops below 15VDC the low voltage fault will be triggered. This will disable the drive.

Absolute maximum power supply input is 80VDC at which point an over-voltage alarm and fault will occur. When using a power supply that is regulated and is near the drive maximum voltage of 60VDC, a voltage clamp may be required to prevent over-voltage when regeneration occurs. When using an unregulated power supply, make sure the no-load voltage of the supply does not exceed the drive's maximum input voltage of 60VDC.

2.3.2 Regeneration Clamp

If a regulated power supply is being used, there may be a problem with regeneration. When a load decelerates rapidly from a high speed, some of the kinetic energy of the load is transferred back to the power supply, possibly tripping the over-voltage protection of a regulated power supply, causing it to shut down. This problem can be solved with the use of a MOONS' RC880 Regeneration Clamp. It is recommended that an RC880 initially be installed in an application. If the "regen" LED on the RC880 never flashes, the clamp is not necessary.


LEDs
Green- Power
Red - Regen on
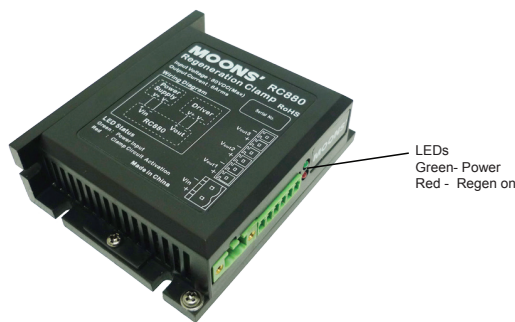
RC880 Regen Clamp

2.3.3 Supply Current

The maximum supply currents required by the MDX are shown in the charts below at different power supply voltage inputs. The MDX power supply current is lower than the winding currents because it uses switching amplifiers to convert a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current will be required from the power supply.

It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load the motor will encounter.

MDX 48VDC Supply Current
MDX 200W 48VDC 10A

MDX 48VDC Supply Current
MDX 400W 48VDC 12A
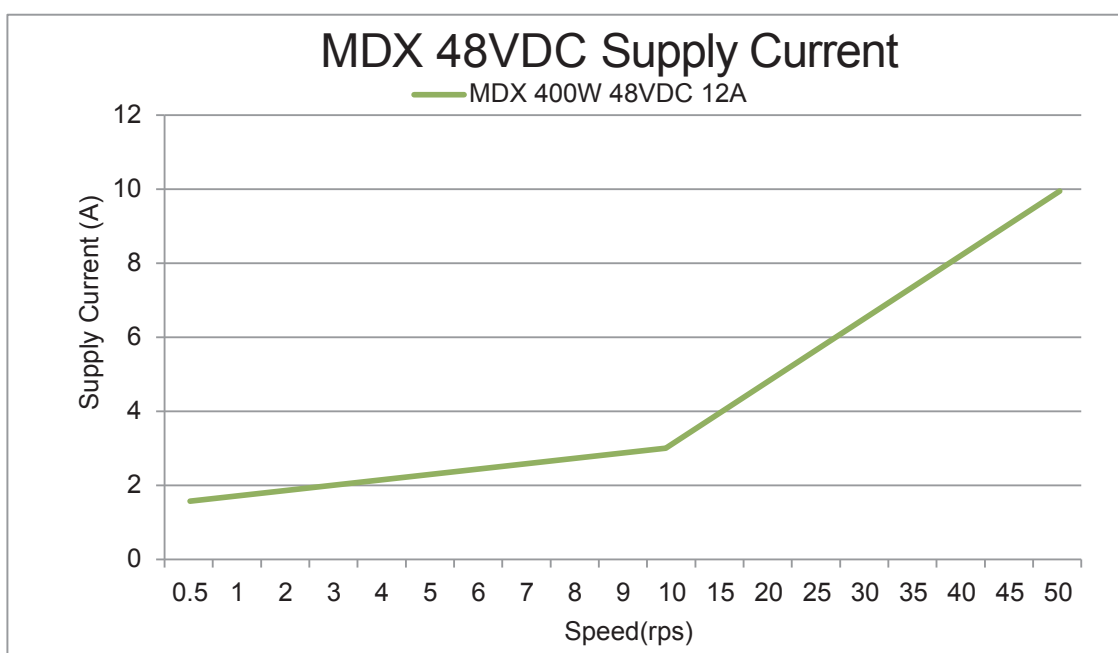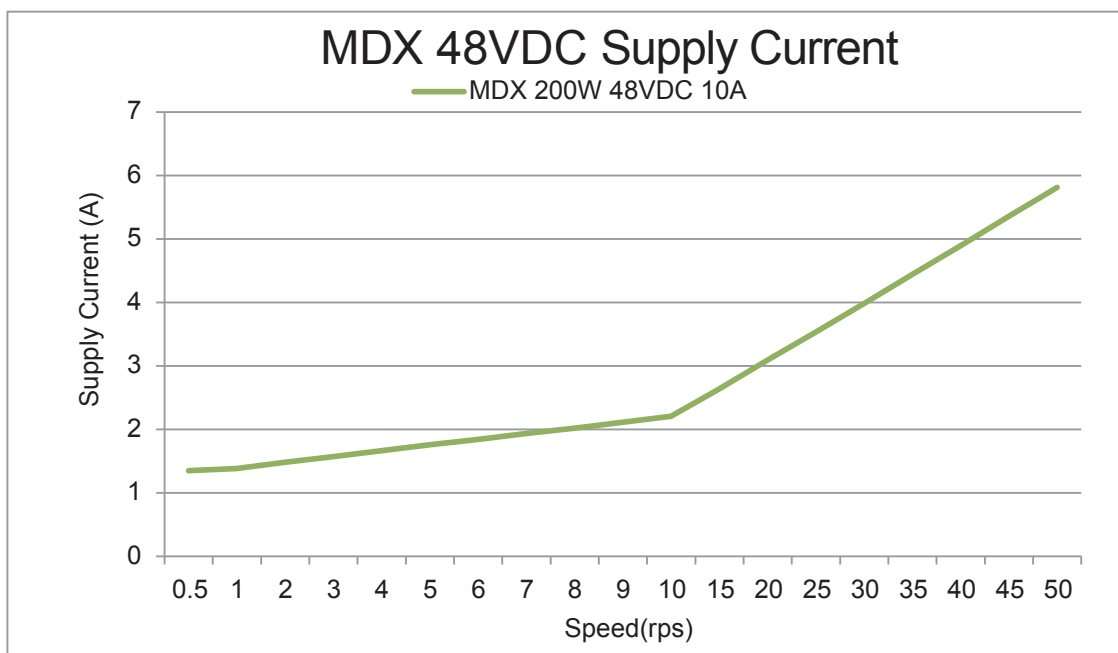
3 Connections

3.1 Connecting the Power Supply

The MDX contains an internal fuse connected to the "＋" terminal that is not user replaceable. If a user serviceable fuse is desired, install a fast acting fuse in line with the "＋" power supply lead.

Model	24V	48V
200W	12A	10A
400W	15A	15A

3.1.1 Connect Main Power Supply

Recommend power supply cable: AWG14.

Be careful not to reverse the wires. Reversing the connection may invalidate the internal fuse on the drive and void the warranty.
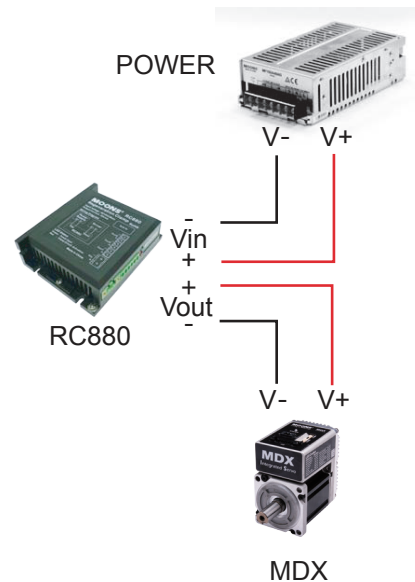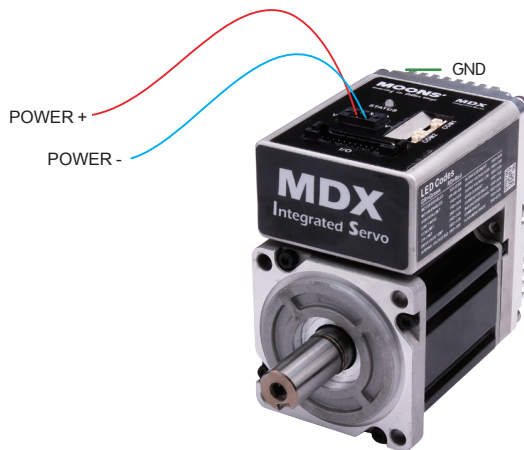
3.2 Connecting the MDX Communications

The MDX is available with 2 different communications types, RS-485 /422(MDX□RA□), CANopen (MDX□CA□) . Each type requires a different hardware connection for interface to a PC or other Host system.

Part of the communication mating cables are NOT included and must be purchased separately. The following describes in detail how several communication modes of MDX are connected to PC respectively.

3.2.1 Connecting to a Host using RS-485

RS-485 communication allows connection of more than one drive to a single host PC, PLC, HMI

or other computer. It also allows the communication cable to be long (more than 30 meters or 100 feet). A shielded cable is recommended.

The MDX can be used with either Two-Wire or Four-Wire RS-485 implementation. The connection can be point-to-point (i.e. one drive and one host) or a multi-drop network (one host and up to 32 drives).

NOTE: To use the MDX RS-485 version with the Artemis software, it is better to be connected in the Four-Wire configuration (see below)

RX+
RX-
TX+
TX-
GND
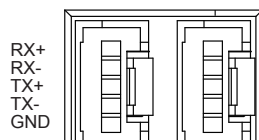
RS-485 Connector Diagram

Four-Wire Configuration

Four-Wire Systems utilize separate transmit and receive wires. One pair of wires must connect the host's transmit signals to each drive's RX+ and RX- terminals. The other pair connects the drive's TX+ and TX- terminals to the host's receive signals. A logic ground terminal is provided on each drive and can be used to keep all drives at the same ground potential.

Because the host in a four-wire system never needs to disable its transmitter, software is simplified. Some converters make this process very difficult to implement and can delay communications.
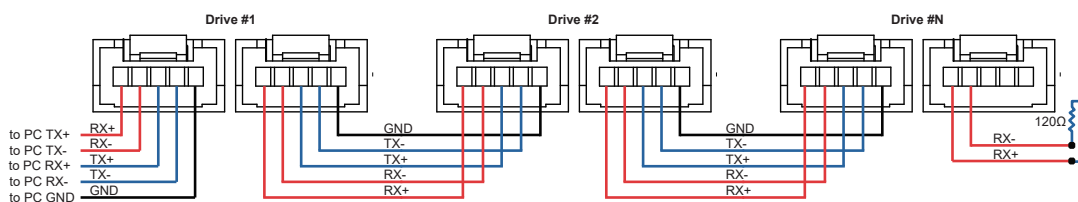
Drive #1   Drive #2   Drive #N

to PC TX+ RX+
to PC TX- RX-
to PC RX+ TX+
to PC RX- TX-
to PC GND GND

GND   GND
TX-   TX-
TX+   TX+
RX-   RX-
RX+   RX+

120Ω
RX-
RX+

NOTE: If the PC does not have an RS-485 serial port, a converter is required. You can contact MOONS' to buy a USB to RS-485 converter.
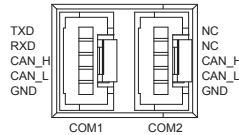
Two-Wire Configuration

In a 2-wire system, the host must disable its transmitter before it can receive data. This must be done quickly before a drive begins to answer a query. The MDX includes a transmit delay parameter that can be adjusted to compensate for a host that is slow to disable its transmitter. This adjustment can be made over the network using the TD command, or it can be set using the Artemis software. It is not necessary to set the transmit delay in a four wire system.
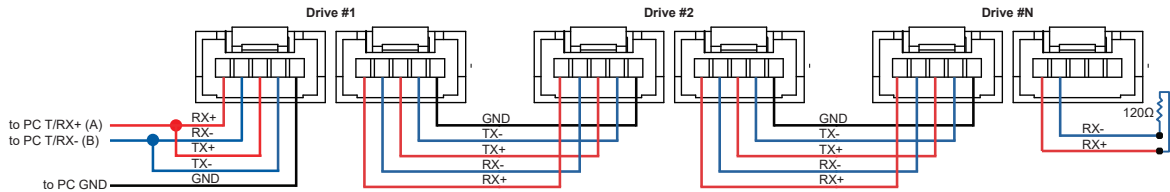
**NOTE: If the PC does not have an RS-485 serial port, a converter is required. You can contact MOONS' to buy a USB to RS-485 converter.**

Assigning Addresses

Before the entire system is wired, each drive will need to connect individually to the host computer so that it can be assigned a unique address.

Once the drive has been connected to the PC as described above, launch the Artemis software. select a right COM port and the apply power to the drive. If a drive has already been configured, click the Upload button so that the Artemis settings match those of the drive. When operating the drive in SCL mode it will need to be assigned an address. This is done on the Drive Configuration tab where a list of address options can be seen. The numerals 0..9 or the special characters ! " #$ % & ' ( ) * + , - . / : ; < = > ? @ may be used as addresses. Make sure each drive on the network has a unique address. On a 2-wire network, the Transmit Delay may also need to be set. Most adapters work well with 10 milliseconds. Once the address has been assigned, click Download to save the settings to the drive.

3.2.2 Connecting to a Host using CANopen

Two standard 5-pin disconnectable crimp style connectors are used for the communications interface of MDX CANopen version. Only COM1 can be used to configure the MDX CANopen version by RS-232 serial interface.

```
TXD                       NC
RXD                       NC
CAN_H                     CAN_H
CAN_L                     CAN_L
GND                       GND

    COM1      COM2
```

CANopen Connector Diagram

The RS-232 interface is used for configuration, tuning, node ID setting and Q program downloading etc. The CANopen network could be connected in a daisy-chain fashion, with a 120 ohm terminating resistor at each end of network.

R termination:
Network must be terminated at each end with a 120 ohm resistor.

n:
Cable may be made with up to 127 drive connectors. Termination is only required at each end.
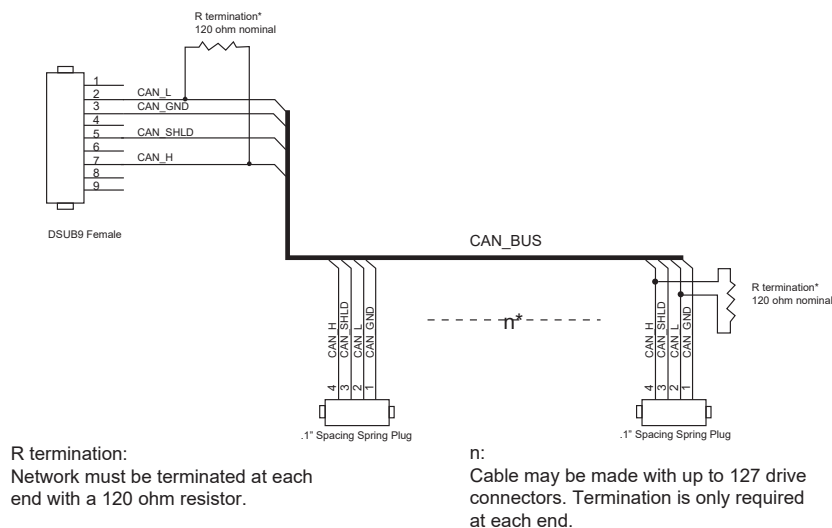
NOTE: If the PC does not have an RS-232 serial port, a USB Serial Converter will be needed. You can contact MOONS' to buy a USB to RS-232 converter.

⚠ **The RS-232 circuitry does not have any extra electrical "hardening" and care should be taken when connecting to the RS-232 port as hot plugging could result in circuit failure.**

3.2.2.1 Node ID

Each node on a CANopen network must have a unique Node ID. The Node ID is configured by using Artemis. The range of the CANopen Node IDs is 1 - 127. Any changes to the NOD require either a power cycle or a CANopen reset command to take effect.
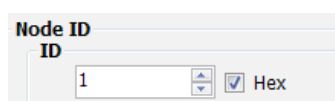
3.2.2.2 Setting the Baud rate

The CANopen network baud rate is set by using Artemis software. The baud rate must be the same for all nodes on the CANopen network. Any changes to the baud rate require either a power cycle or a CANopen reset command to take effect.
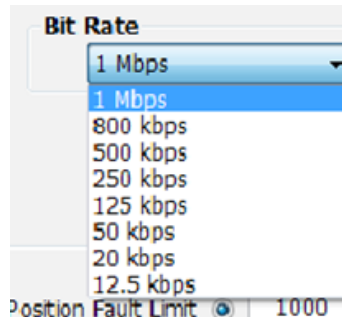

3.2.3 Choosing the Right COM Port

1. Open the "Device Manager" on the PC. If the PC has an built-in RS-232 serial port, "Ports (COM & LPT)" (1) will be displayed. Connect the PC and drive with the included RS-232 communication cable. Choose the connected COM(n) port in the Artemis software.

2. If the PC does not have an RS-232 serial port, or has one but in using. An USB to RS-232 serial port adapter will be needed. Open the "Device Manager" on the PC. There may or may not be a "Ports" selection. (2) Connect the adapter to the PC, this USB adapter COM port should then be displayed. (3) Choose this new COM(n) port in the Artemis software.
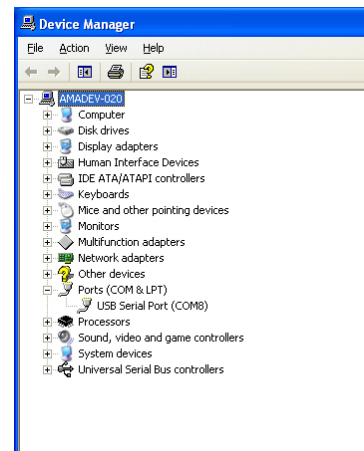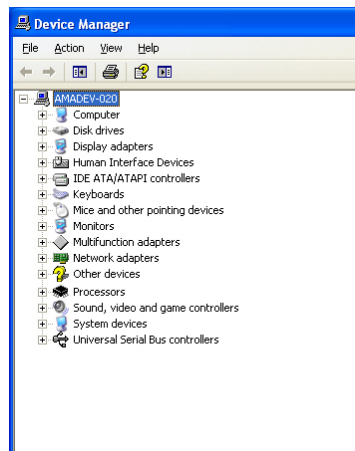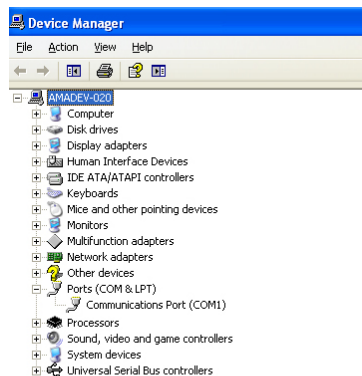
3.3 Inputs and Outputs
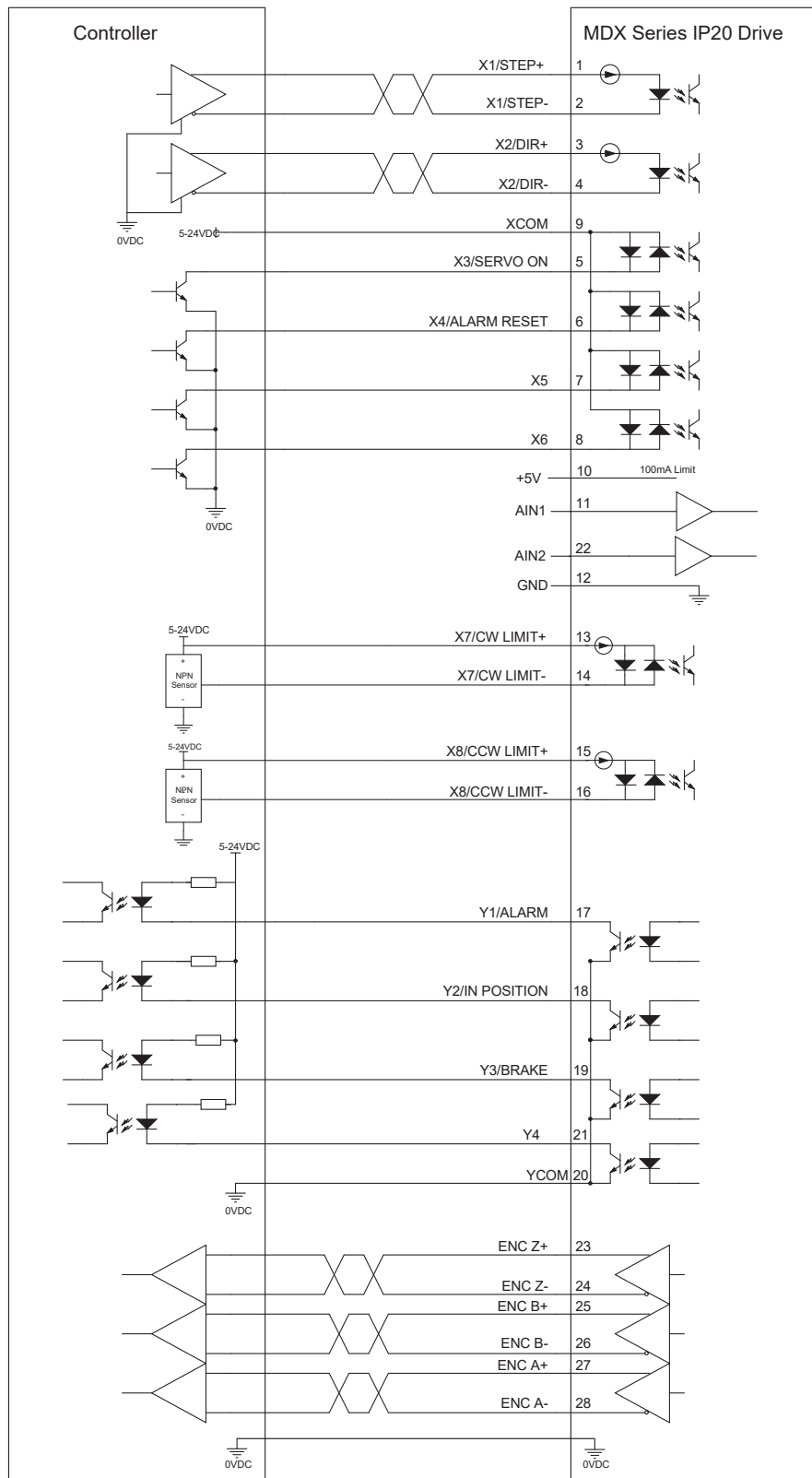
The MDX has three types of inputs:

- High speed digital inputs: step & direction signal or encoder following, 5 to 24 volt logic

- Low speed digital inputs: enable, alarm clearing signal (or other function configured by software), 5 to 24 volt logic
- Analog input for analog speed and positioning modes

All drives include 8 digital inputs and 2 analog inputs:

- X1/STEP & X2/DIR are high-speed digital inputs for commanding position. Quadrature signals from encoders can also be used. When not being used for the Step & Direction function these inputs can be used for CW & CCW step, (start/stop)/direction (oscillator mode), or general purpose input.

- X3/X4/X5/X6/X7/X8 are low speed software programmable inputs and can be used for Motor Enable/ Disable and Alarm/Fault Reset function, CW/CCW Limit, or general purpose input.

- AIN1 and AIN2 are two single-ended analog inputs for analog command input signals. They can accept 0~+10 volts and the gain, filtering, offset and dead-band can be set.These two analog inputs also can be configured to one -10~+10V differential analog input.

3.3.1 ConnectorS Pin Diagram

| Pin no.	Assignment	Description
1	X1+/STEP+	High Speed Digital Input 1
2	X1-/STEP-	
3	X2+/DIR+	High Speed Digital Input 2
4	X2-/DIR-	
5	X3	X3 Digital Input
6	X4	X4 Digital Input
7	X5	X5 Digital Input
8	X6	X6 Digital Input
9	XCOM	Digital Input COM
10	+5	+5V OUT 100mA max.
11	AIN1	Analog Input 1
12	GND	Aanlog Ground
13	X7+	X7 Digital Input
14	X7-	
15	X8+	X8 Digital Input
16	X8-	
17	Y1	Y1 Digital Output
18	Y2	Y2 Digital Output
19	Y3	Y3 Digital Output
20	YCOM	Digital Output COM
21	Y4+	Y4 Digital Output
22	AIN2	Analog Input 2
23	Z+	Encoder Output Z
24	Z-	
25	B+	Encoder Output B
26	B-	
27	A+	Encoder Output A
28	A-	
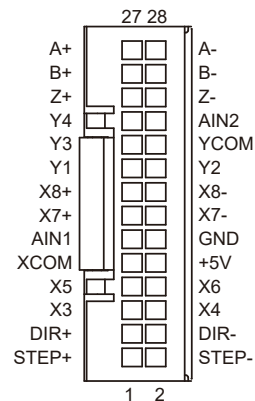
3.3.2 STEP & DIR Digital Inputs

The MDX drives include two high-speed inputs: X1/STEP and X2/DIR. They accept 5 to 24 volt single-ended or differential signals, up to 2 MHz. Typically these inputs connect to an external controller that provides step & direction command signals.

The functions for X1/STEP and X2/DIR can be configured by Artemis software as following:

X1/STEP : Step signal; CW pulse signal; Quadrature signal A, start/stop signal below torque and velocity control mode or general purpose inputs.

X2/DIR : Direction signal; CCW pulse signal; Quadrature signal B, direction signal below torque and velocity control mode or general purpose inputs.

The diagrams below show how to connect the STEP & DIR inputs to various commonly used devices.
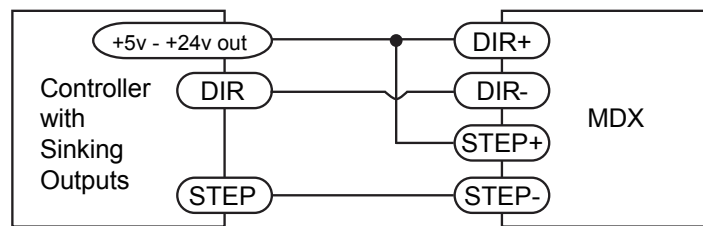
Connecting to Controller with Sinking Outputs
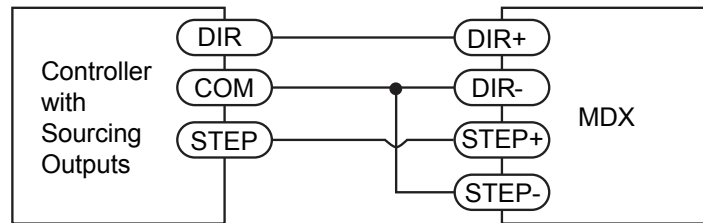
Connecting to Controller with Sourcing Outputs
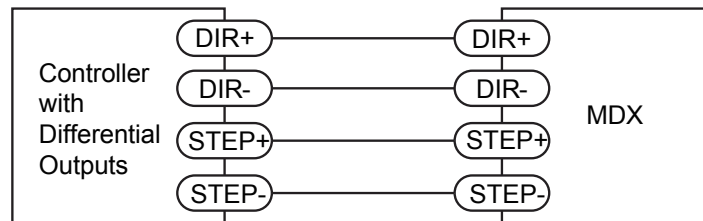
Connecting to Controller with Differential Outputs
Many high-speed indexers have differential outputs
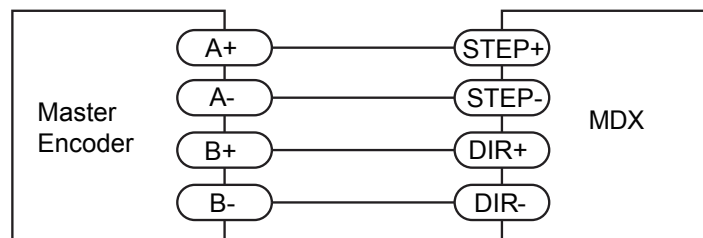
Wiring for Encoder Following

### 3.3.3 X3/X4/X5/X6 Digital Input

X3/X4/X5/X6 input are optically Isolated Single-ended input. They can be used with sourcing or sinking signals, 5 to 24 volts. This allows connection to PLCs, sensors, relays and mechanical switches. Because the input circuits are isolated, they require a source of power. If you are connecting to a PLC, you should be able to get power from the PLC power supply. If you are using relays or mechanical switches, you will need a 5-24 V power supply.

What is COM?

"Common" is an electronics term for an electrical connection to a common voltage. Sometimes "common" means the same thing as "ground", but not always. In the case of the MDX drives, if you are using sourcing (PNP) input signals, then you will want to connect COM to ground (power supply -). If you are using sinking (NPN) signals, then COM must connect to power supply +.

Note: If current is flowing into or out of an input, the logic state of that input is low or closed. If no current is flowing, or the input is not connected, the logic state is high or open.

The diagrams below show how to connect X3/X4/X5/X6 input to various commonly used devices.
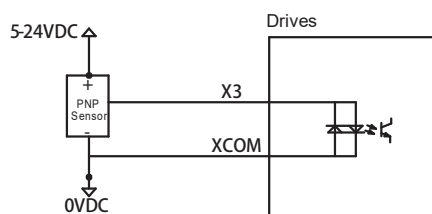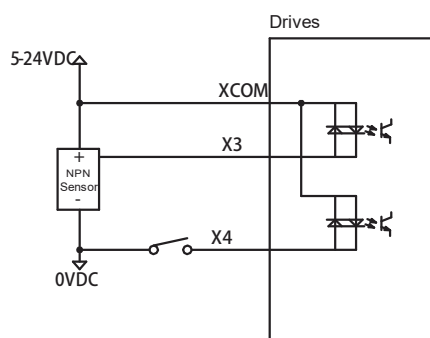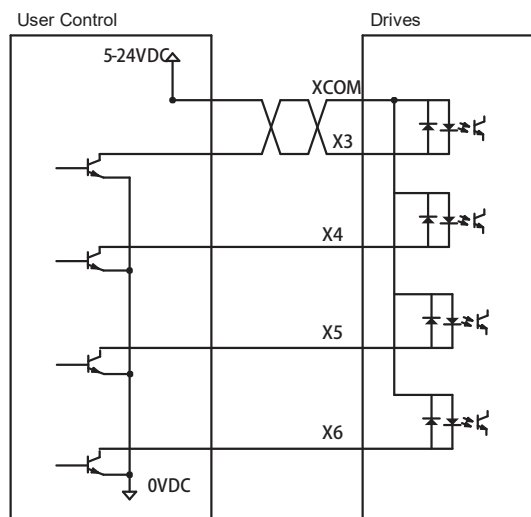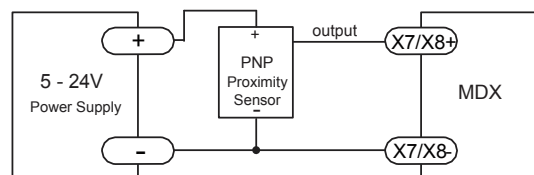
3.3.4 X7/X8 Digital Input

The X7/X8 input are optically Isolated differential input. They are normally used for end of travel limit switches.The diagrams below show how to connect the X7/X8 Inputs to various commonly used devices.
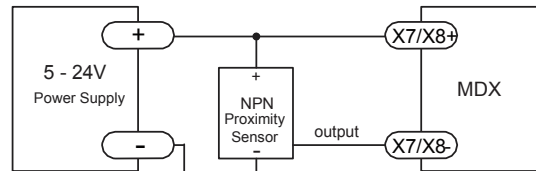
Connecting an NPN type Proximity Sensor to an Input
(when prox sensor activates, input goes low)

Connecting a PNP type Proximity Sensor to an Input
(when prox sensor activates, input goes high)

3.3.5 Programmable Output Y1/Y2/Y3/Y4

MDX series integrated motors feature four optically isolated digital outputs (Y1/Y2/Y3/Y4) with common ground.
They can be configured by Artemis software.
• Y1 can be set to indicate a fault output or general purpose output.

• Y2 can be set to servo on status, torque reach or general purpose output.

• Y3 can be set to indicate dynamic in position, velocity reach or general purpose output.

• Y4 can be set to static in position, or general purpose output.
The output can be used to drive LEDs, relays and the inputs of other electronic devices like PLCs and counters. Diagrams of various connection types follow.
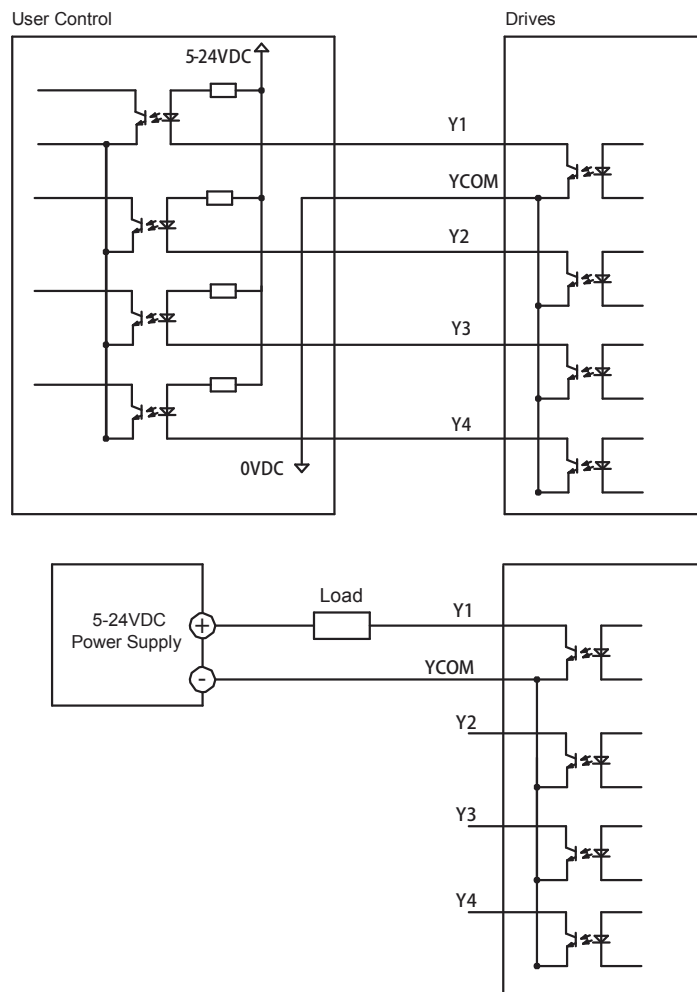
NOTE: Do not connect the output to more than 30 volts. The current through the output terminal must not exceed 100mA.

3.3.6 Analog Input

The MDX drives have two single-ended analog inputs (AIN) which can accept a signal range of 0 to +10 volts. The drive can be configured to operate at a speed, torque or position that is proportional to the analog signal. Use the Artemis software to set the signal range, offset, deadband and filter frequency.

AIN1 is used for Analog Position Control or Analog Velocity Control.

AIN2 is used for Analog Torque Control.

These two single-ended analog inputs can be configured to a differential analog input with the range of -10~+10vdc.

Single−ended analog input

DiferentIal analog input
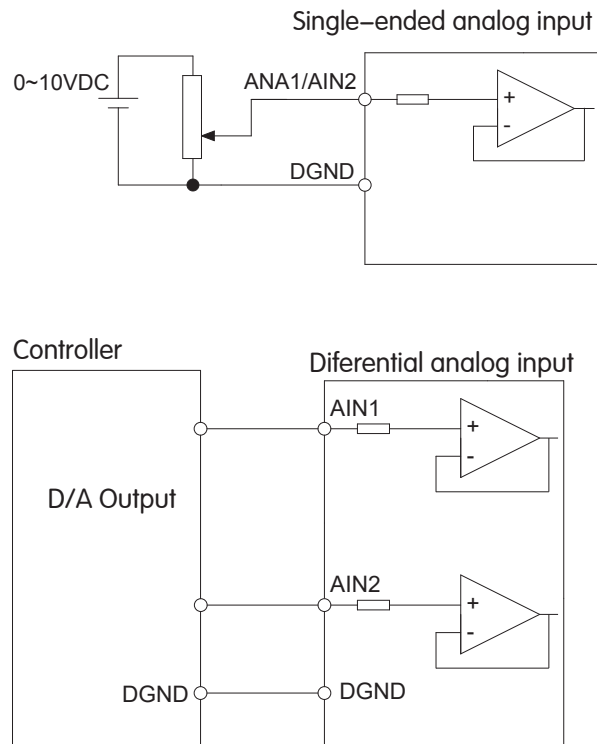
4 Troubleshooting

4.1 Status (STAT) LED Error Codes

The MDX uses a bi-color LED to indicate status. When the motor is enabled, the LED slowly flashes green. When the LED is solid green, the motor is disabled. Errors are indicated by combinations of red and green flashes as shown below.

Code		Error	Alarm type	Status after alarm occurs
🟢	Solid green	No alarm, motor disabled	No alarm	No change
🟢🟢	Flashing green	No alarm, motor enabled	No alarm	No change
🔴🟢	1 red, 1 green	*Position limit*	*Fault*	*Fault*
🔴🟢🟢	1 red, 2 green	Move while disabled	Warning	No change
🔴🔴🟢	2 red, 1 green	CCW limit	Warning	No change
🔴🔴🟢🟢	2 red, 2 green	CW limit	Warning	No change
🔴🔴🔴🟢	3 red, 1 green	*Drive over temperature*	*Fault*	*Fault*
🔴🔴🔴🟢🟢	3 red, 2 green	*Internal voltage out of range*	*Fault*	*Fault*
🔴🔴🔴🔴🟢	4 red, 1 green	*Power supply overvoltage*	*Fault*	*Fault*
🔴🔴🔴🔴🟢🟢	4 red, 2 green	*Power supply Too Low*	*Fault*	*Fault*
🔴🔴🔴🔴🟢🟢🟢	4 red, 3 green	*Blank Q Segment*	*Fault*	*Fault*
🔴🔴🔴🔴🟢🟢🟢🟢	4 red, 4 green	Power supply Under Voltage	Warning	No change
🔴🔴🔴🔴🔴🟢	5 red, 1 green	*Over current*	*Fault*	*Fault*
🔴🔴🔴🔴🔴🟢🟢	5 red, 2 green	Current limit	Warning	No change
🔴🔴🔴🔴🔴🟢🟢🟢	5 red, 3 green	*Over speed*	*Fault*	*Fault*
🔴🔴🔴🔴🔴🔴🔴🟢	7 red, 1 green	communication error	Warning	No change
🔴🔴🔴🔴🔴🔴🔴🟢🟢	7 red, 2 green	flash memory error	Warning	No change

NOTE: Items in **bold italic** represent drive Faults, which automatically disable the motor.

5 Reference Materials

5.1 Torque-Speed Curves

MDX Motor Torque/24VDC/200Watt

Continuous running — Short time tunning

Torque (N.m) vs *Speed(rpm)*

MDX Motor Torque/48VDC/200Watt

Continuous running — Short time tunning

Torque (N.m) vs *Speed(rpm)*

MDX Motor Torque/24VDC/400Watt

Continuous running — Short time tunning

Torque (N.m) vs *Speed(rpm)*

MDX Motor Torque/48VDC/400Watt

Continuous running — Short time tunning

Torque (N.m) vs *Speed(rpm)*

5.2 Mechanical Outlines

5.2.1 MDX IP20 200W
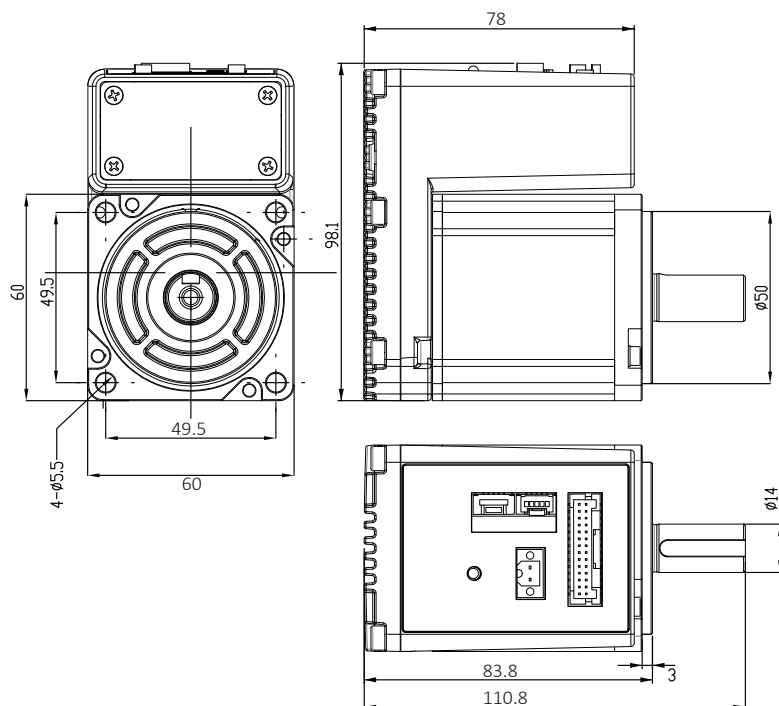
(Unit：mm)

(Unit：mm)

5.2.2 MDX IP20 400W
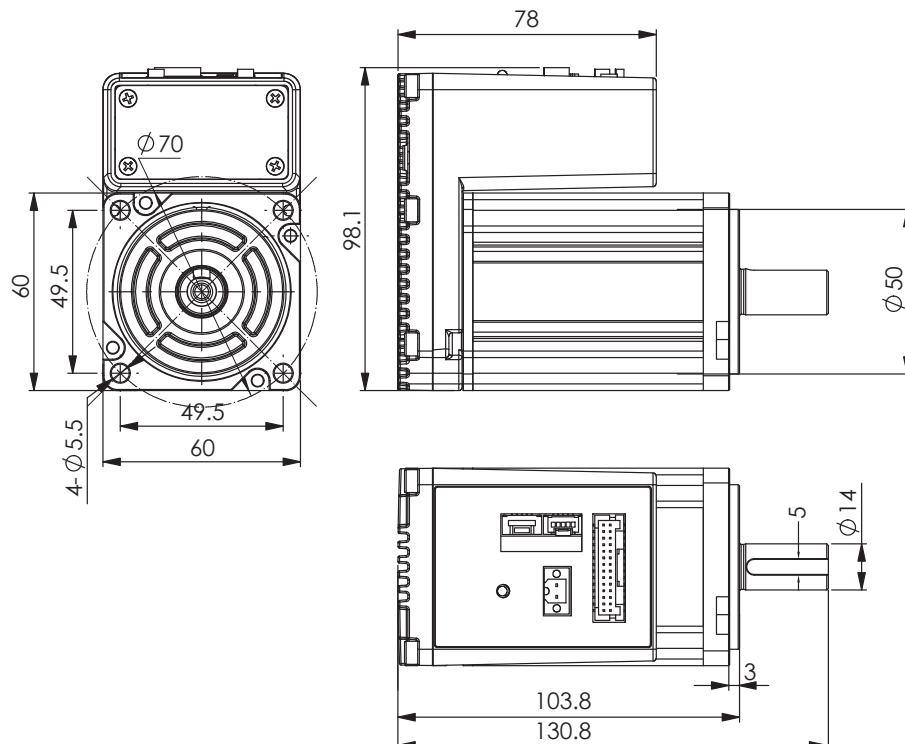
(Unit：mm)
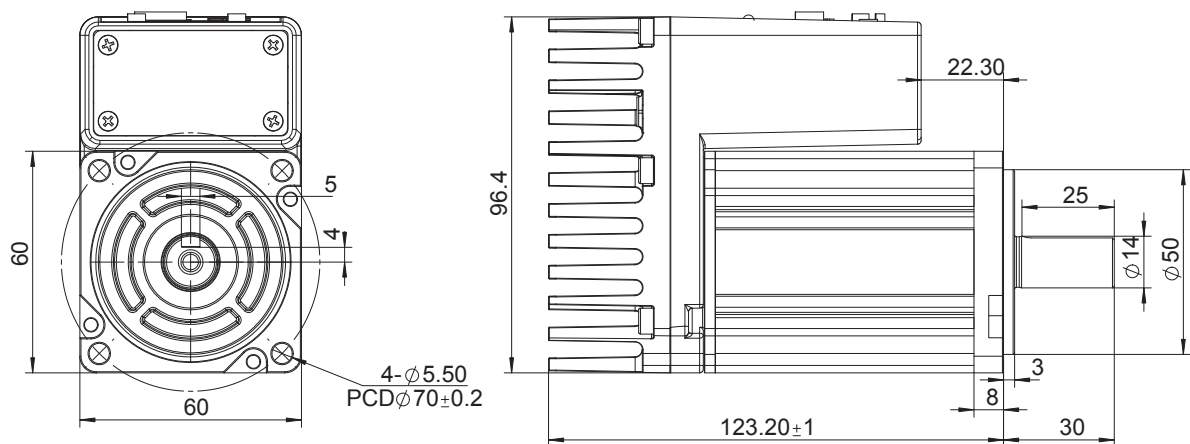
(Unit：mm)

5.3 Technical Specifications

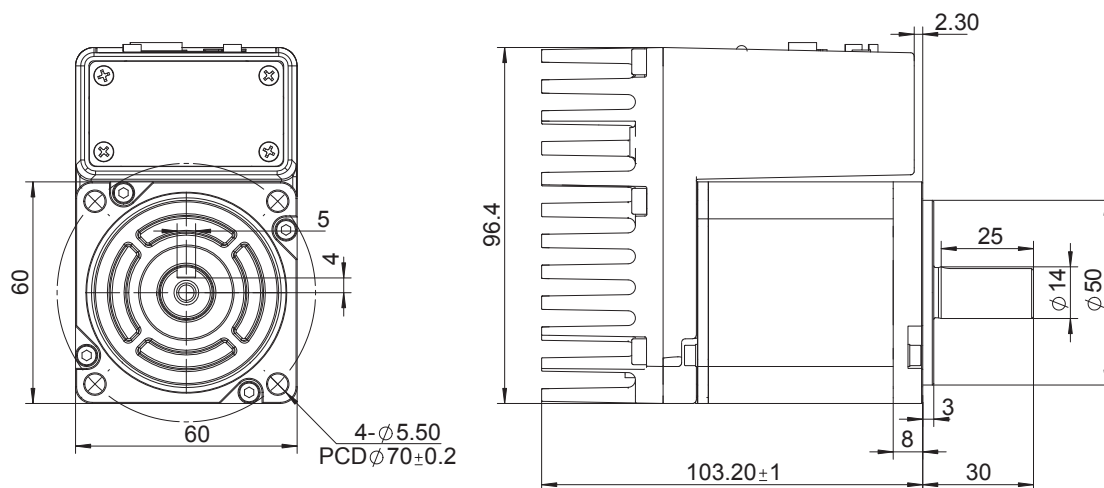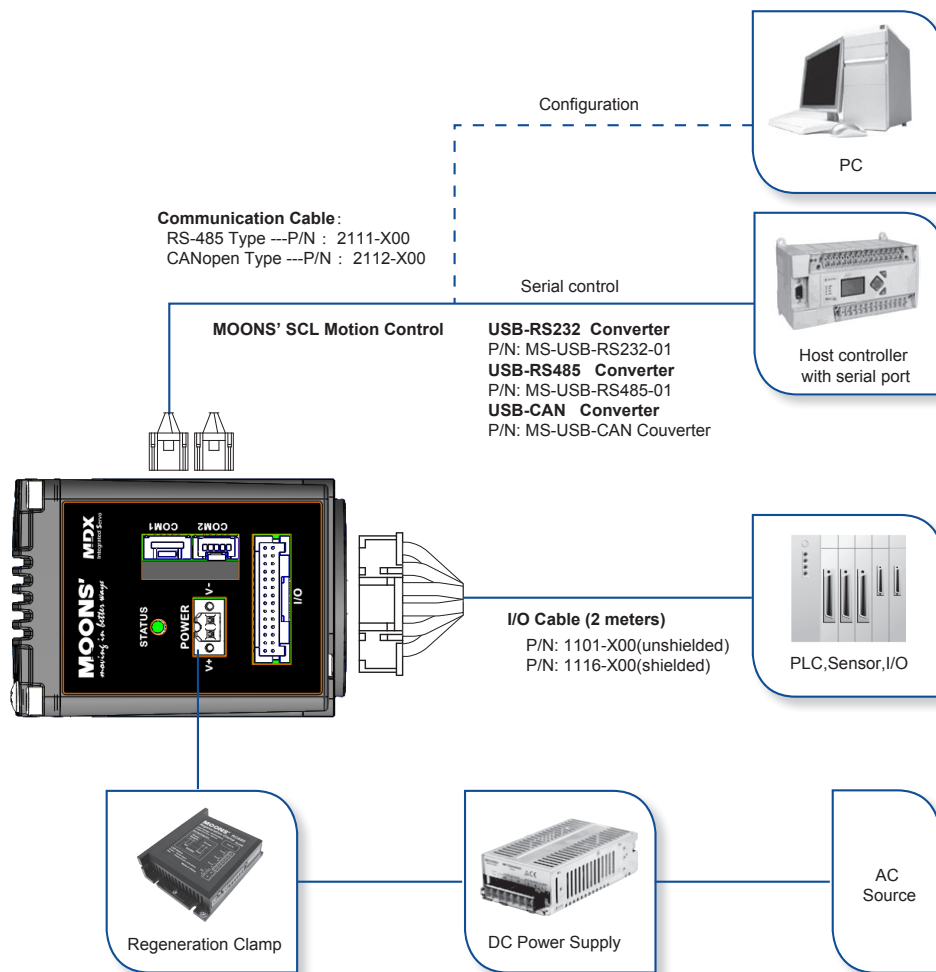| Specifications	
Specifications	
Output Power	MDXK61GN: 200W rating MDXK60404: 400W rating
Power Supply	External 24 - 60 VDC main power supply
Protection	Over-voltage, under-voltage, over-current, over-temp
Controller	
Encoder Feedback	1024 line magnetic encoder 16-bit magnetic encoder
Speed Range	Up to 6000 rpm
Filters	Digital input noise filter, Analog input noise filter, Smoothing filter, PID filter, Notch filter

Modes of Operation	Torque control: Analog torque, SCL commanded
	Velocity control: Fixed velocity,, Analog velocity,SCL commanded
	Position control: Digital signal type Step & Direction, CW & CCW pulse, A/B Quadrature,
	        Analog position, Serial commanded position
	Communication control: RS485 (support Modbus), CANopen mode control,
	        Q Programming

Digital Inputs	X1/X2: Optically isolated, 5-24 volt, max. pulse frequency = 2 MHz
	   Function: Pulse/Direction, CW/CCW Pulse, A/B quadrature (encoder following), (start/stop)/direction(torque and velocity mode), or general purpose input
	X3/X4/X5/X6: Optically isolated, 5-24 volt, max. pulse frequency = 5 KHz
	   Function: Servo on/off, Alarm/Fault Reset, or general purpose input
	X7,X8：Optical isolated,5-24 volt, max. pulse frequency = 2MHz.
	   Function：CW/CCW limit sensor input, or general purpose input.

Digital Outputs	Y1/Y2/Y3/Y4: Optically isolated, 30V/100mA max Open Collector Output. Function: Alarm/Fault, In Position (dynamic/static), servo on status, torqur reached, velocity reached or general purpose output
Analog Input	Two single-ended analog inputs 0 to 10VDC. Resolution 12 bits(They can be configurated to as -10 to 10VDC differential analong input.)
Communication Interface	RS-485，CANopen(RS-232)
Physical	
Ambient Temperature	0 to 40°C when mounted to a suitable heatsink(If the ambient temperature of MDX is higher than 40°C, please install the drive in a well-ventilated location)
Humidity	Working and storage : 10-85% Max., non-condensing
Insulation Class	Class B
Rotor Inertia	MDXK61GN：165 g•cm^2 MDXK62GN：272 g•cm^2

5.4 Optional Accessories

◇ Regeneration Clamp

Configuration

PC

Serial control

Communication Cable：
RS-485 Type ---P/N： 2111-X00
CANopen Type ---P/N： 2112-X00

MOONS' SCL Motion Control

USB-RS232 Converter
P/N: MS-USB-RS232-01
USB-RS485 Converter
P/N: MS-USB-RS485-01
USB-CAN Converter
P/N: MS-USB-CAN Couverter

Host controller
with serial port

I/O Cable (2 meters)
P/N: 1101-X00(unshielded)
P/N: 1116-X00(shielded)

PLC,Sensor,I/O

Regeneration Clamp

DC Power Supply

AC
Source

◇ Regeneration Clamp

P/N：**RC880**

When using a regulated power supply you may encounter a problem with regeneration. The kinetic energy caused by regeneration is transferred back to the power supply. This can trip the overvoltage protection of a switching power supply, causing it to shut down.
MOONS' offers the RC880 "regeneration clamp" to solve this problem. If in doubt, use an RC880 for the first installation. If the "regen" LED on the RC880 never flashes, you don't need the clamp.

MOONS'
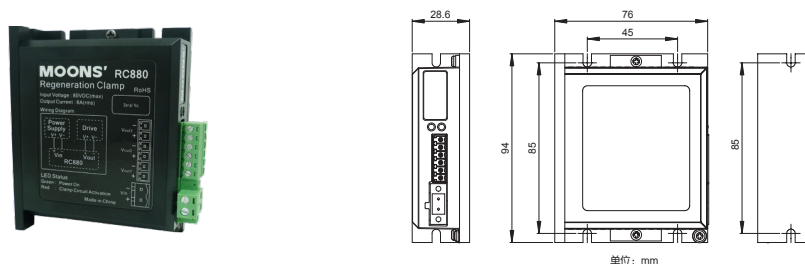
◇ USB Converter

Model: MS-USB-RS232-01
Description: USB-RS-232 converter

Model: MS-USB-RS485-01
Description: USB-RS-485 converter

Model: MS-USB-CAN-01
Description: USB-CAN converter

◇ USB Converter

◇ General Purpose I/O Cable(unshielded)

P/N	Length (L)
1101-100	1m
1101-200	2m
1101-500	5m

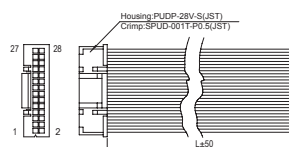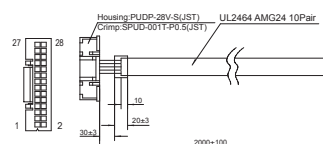| Pin No.	Assignment	Description	Color
1	X1+	High Speed Digital Input	BLU
2	X1-		BLU/WHT
3	X2+	High Speed Digital Input	YEL
4	X2-		YEL/WHT
5	X3	X3 Digital Input	GRN
6	X4	X4 Digital Input	ORG
7	X5	X5 Digital Input	GRY
8	X6	X6 Digital Input	PUR
9	XCOM	X Digital Input COM	WHT
10	+5V	+5VDC Output	RED
11	AIN1	Analog Input 1	BLU
12	GND	Analog Input Ground	BLK
13	X7+	X7 Digital Input	ORG
14	X7-		ORG/WHT
15	X8+	X8 Digital Input	GRN
16	X8-		GRN/WHT
17	Y1	Y1 Digital Output	BLU
18	Y2	Y2 Digital Output	YEL
19	Y3	Y3 Digital Output	BRN
20	YCOM	Y Output COM	BLK
21	Y4	Y4 Digital Output	RED
22	AIN2	Analog Input 2	RED/WHT
23	Z+	Encoder Output Z (if applicable)	BLK
24	Z-		BLK/WHT
25	B+	Encoder Output B (if applicable)	GRN
26	B-		GRN/WHT
27	A+	Encoder Output A (if applicable)	ORG
28	A-		ORG/WHT

◇ General Purpose I/O Cable(shielded)

P/N	Length (L)
1116-100	1m
1116-200	2m
1116-300	3m
1116-500	5m

Pin No.	Assignment	Description	Color
1	X1+	High Speed Digital Input	BLU/WHT
2	X1-		BLU/BLK
3	X2+	High Speed Digital Input	GRN/WHT
4	X2-		GRN/BLK
5	X3	X3 Digital Input	BLU
6	X4	X4 Digital Input	PUR
7	X5	X5 Digital Input	YEL
8	X6	X6 Digital Input	GRN
9	XCOM	X Digital Input COM	ORG
10	+5V	+5VDC Output	RED
11	AIN1	Analog Input 1	WHT
12	GND	Analog Input Ground	BLK
13	X7+	X7 Digital Input	BRN/WHT
14	X7-		BRN/BLK
15	X8+	X8 Digital Input	GRY/WHT
16	X8-		GRY/BLK
17	Y1	Y1 Digital Output	BRN
18	Y2	Y2 Digital Output	GRY
19	Y3	Y3 Digital Output	PNK
20	YCOM	Y Output COM	YEL/GRN
21	Y4	Y4 Digital Output	PUR/WHT
22	AIN2	Analog Input 2	PUR/BLK
23	Z+	Encoder Output Z (if applicable)	YEL/WHT
24	Z-		YEL/BLK
25	B+	Encoder Output B (if applicable)	ORG/WHT
26	B-		ORG/BLK
27	A+	Encoder Output A (if applicable)	RED/WHT
28	A-		RED/BLK

◇ RS-485 Daisy Chain Communication Cable

P/N	Length (L)
2111-025	0.25m
2111-050	0.5m
2111-100	1m
2111-300	3m
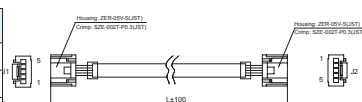
◇ CANopen Daisy Chain Communication Cable

P/N	Length (L)
2112-025	0.25m
2112-050	0.5m
2112-100	1m
2112-300	3m
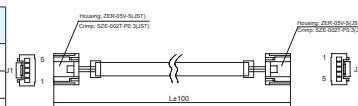
◇ RS-232 Communication Cable(C Type)

P/N	Length (L)
2113-150	1.5m
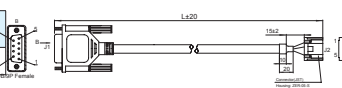
5.5 SCL Command Reference

The Serial Command Language (SCL) was developed to give users a simple way to control a motor drive via a serial port. This eliminates the need for separate motion controllers or indexers to supply Pulse and Direction signals to the drive. It also provides an easy way to interface to a variety of other industrial devices such as PLCs and HMIs, which often have standard or optional serial ports for communicating to other devices. Some examples of typical host devices might be:

• A Windows based PC running MOONS' software

• An industrial PC running a custom or other proprietary software application

• A PLC with an ASCII module/serial port for sending text strings

• An HMI with a serial connection for sending text strings

SCL commands control the motion of the motor, use of the inputs and outputs, and configure

aspects of the drive such as motor current and microstep resolution.

In SCL mode, the MDX receives commands from the host, executing them immediately or sending them to a command buffer and then executing them directly from the buffer. The MDX also can create a stored program for stand-alone operation.

The communications protocol of SCL is simple in that the host initiates all communication, with one exception. The only time the drive will initiate communication is at power-up. At that time, the drive will send an identifier to tell the software which drive is connected and what the firmware version is.

There are two types of SCL commands: buffered and immediate. Buffered commands are loaded into and then executed out of the drive's command buffer. Buffered commands are executed

one at a time and in sequential order. The buffer can be filled with commands without the host

controller needing to wait for a specific command to execute before sending the next command. Special buffer commands enable the buffer to be loaded and to pause for a desired time.

Immediate commands are not buffered, but are executed immediately, running in parallel with a buffered command if necessary. Immediate commands are designed to access the drive at any time and can be sent as often as needed. This allows a host controller to get information from the drive at a high rate, most often for checking drive status or motor position.

The basic structure of a command packet from the host to the drive is always a text string followed by a carriage return. The text string is composed of the command itself, followed by any required parameters. A carriage return denotes the end of transmission to the drive.

The syntax of the command is:

<div align="center">XXAB<cr></div>

where XX designates the command (always composed of 2 uppercase letters), and A and B define

the possible parameters. These parameters can vary in length, can be letters or numbers, and are often optional. Once a drive receives the <cr> (carriage return), it will determine whether or not it understood the command-if it did, it will either execute or buffer the command. The drive

can also be programmed ahead of time to send a response as to whether or not it understood the command as well as any error code.

Some SCL commands transfer data to the drive for immediate or later use. These data values are stored in data registers and remain there until new commands change the values or power

is removed from the drive. Some data registers in a drive are Read-Only and contain predefined information about the drive which can also be read through SCL commands.

Because of the intense nature of serial communications required in host mode applications, there is a serial communication Protocol (PR) command available that will adjust a drive's serial communications protocol to best fit an application. Typically this command is used when configuring a drive and saved as part of the startup parameters. But it can be used at any time to dynamically alter the serial communications.

The Host Command Reference contains the complete command listing as well as instructions on connecting and configuring the MDX for use in SCL mode, using the Data Registers and the Protocol command. It also contains detailed information on:

• Host Serial Communications
• Host Serial Connections
• Alarm and Status Codes
• Working with Inputs and Outputs

The Host Command Reference is available from the MOONS' website at http://www. moonsindustries.com under Products/Drives1/Downloads/manual.

6 Contacting MOONS'

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400-820-9661

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