Platinum Maestro with Integrated IO Functionality
Network Motion Controller
Installation Guide

April 2024 (Ver. 2.001)

This guide is delivered subject to the following conditions and restrictions:

- This guide contains proprietary information belonging to Elmo Motion Control Ltd. Such information is supplied solely for the purpose of assisting users of Elmo's servo drive(s) in their installation.

- The text and graphics included in this manual are for the purpose of illustration and reference only. The specifications on which they are based are subject to change without notice.

- Elmo Motion Control and the Elmo Motion Control logo are trademarks of Elmo Motion Control Ltd.

- Information in this document is subject to change without notice.

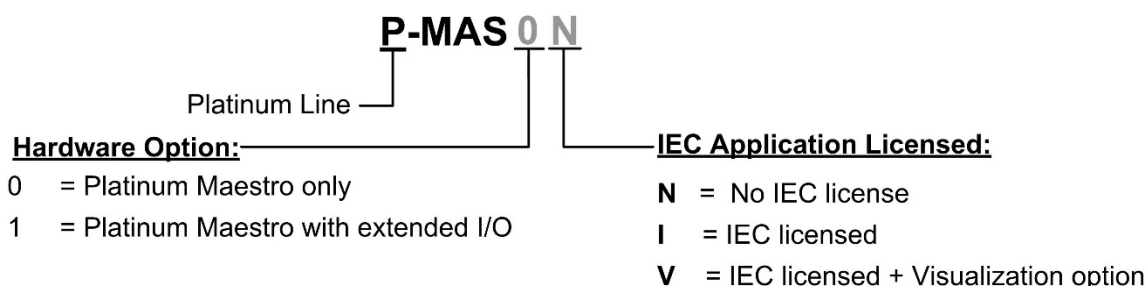|	
	Elmo Motion Control and the Elmo Motion Control logo are registered trademarks of Elmo Motion Control Ltd.
	EtherCAT® and Safety over EtherCAT® are registered trademarks and patented technologies, licensed by Beckhoff Automation GmbH, Germany.
	EtherCAT® Conformance tested is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
	CANopen compliant. CANopen® is a registered trademark and patented technology, licensed by CAN in Automation (CiA) GmbH, Kontumazgarten 3, DE-90429 Nuremberg, Germany.

Catalog Number

P-MAS 0 N

Platinum Line

Hardware Option:

0 = Platinum Maestro only

1 = Platinum Maestro with extended I/O

IEC Application Licensed:

N = No IEC license

I = IEC licensed

V = IEC licensed + Visualization option

CBL-PMASIOKIT01	Cable kit with RS-232, Differential Ended Analog Input, Bi-Directional Differential I/O, Digital Input, and Digital Output cables

Revision History

Version	Date	Details
Ver. 1.000	Aug 2017	Initial Release
Ver. 1.001	Aug 2017	Updated with small correction to page 43
Ver. 1.002	Sep 2017	Update to section 7.15 Differential Analog Input
Ver. 1.003	Nov 2017	Updated
Ver. 1.004	Aug 2018	Updated
Ver. 1.005	Oct 2018	Updated
Ver. 1.006	Feb 2019	Updated
Ver. 1.007	Nov 2019	Updated
Ver. 1.008	Jan 2020	Updated
Ver. 1.009	Oct 2017	Updated with future new connectors but not released
Ver. 2.000	Jun 2021	New template and general manual update
Ver. 2.001	Apr 2024	Minor text changes

Chapter 1:   Safety Information

In order to achieve the optimum, safe operation of the Platinum Maestro with IO, it is imperative that you implement the safety procedures included in this installation guide. This information is provided to protect you and to keep your work area safe when operating the Platinum Maestro with IO and accompanying equipment.

Please read this chapter carefully before you begin the installation process.

Before you start, ensure that all system components are connected to earth ground. Electrical safety is provided through a low-resistance earth connection.

Only qualified personnel may install, adjust, maintain and repair the servo drive. A qualified person has the knowledge and authorization to perform tasks such as transporting, assembling, installing, commissioning and operating motors.

The Platinum Maestro with IO contains electrostatic-sensitive components that can be damaged if handled incorrectly. To prevent any electrostatic damage, avoid contact with highly insulating materials, such as plastic film and synthetic fabrics. Place the product on a conductive surface and ground yourself in order to discharge any possible static electricity build-up.

To avoid any potential hazards that may cause severe personal injury or damage to the product during operation, keep all covers and cabinet doors shut.

The following safety symbols are used in this and all Elmo Motion Control manuals:

Warning: This information is needed to avoid a safety hazard, which might cause bodily injury or death as a result of incorrect operation.

Hot Surface Warning: To alert against surfaces that may reach high temperatures. The heatsink and wires may reach high temperatures.

Caution: This information is necessary to prevent bodily injury, damage to the product or to other equipment.

Important: Identifies information that is critical for successful application and understanding of the product.

The following symbols are used in this document:

Note: Information critical to the understanding and\or operating the feature.

Tip: Information that helps understanding a feature, is good practice or a possible different way of action.

1.1   Warnings

- To avoid electric arcing and hazards to personnel and electrical contacts, never connect/disconnect the servo drive while the power source is on.

- Power cables can carry a high voltage, even when the motor is not in motion. Disconnect the Platinum Maestro with IO from all voltage sources before servicing.

Capacitance Discharge
After shutting off the power and removing the power source from your equipment, wait at least 2 seconds before touching or disconnecting parts of the equipment that are normally loaded with electrical charges (such as capacitors or contacts). Measuring the electrical contact points with a meter, before touching the equipment, is recommended.

1.2   Cautions

- The maximum DC power supply connected to the instrument must comply with the parameters outlined in this guide.

- Before switching on the Platinum Maestro with IO, verify that all safety precautions have been observed and that the installation procedures in this manual have been followed.

- Make sure that the Safe Torque Off is operational.

1.3   Directives and Standards

The Platinum Maestro with IO is in accordance with the EU Low Voltage Directive (2014/35/EU), and EU Electromagnetic Compatibility Directive (2014/30/EU).

Conformity of the Platinum Maestro with IO is under the following Platinum Line standards:

Standard	Details
EN 61800-3:2017	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods.
In compliance with ROHS Directives 2011/65/EU and 2015/863	Restrictions on Application of Hazardous Substances in Electric and Electronic Equipment (RoHS)

The Platinum Maestro with IO has been developed, produced, tested and documented in accordance with the relevant standards. Elmo Motion Control is not responsible for any deviation from the configuration and installation described in this documentation. Furthermore, Elmo is not responsible for the performance of new measurements or ensuring that regulatory requirements are met.

1.4   CE Marking Conformance

The Platinum Maestro with IO is intended for incorporation in a machine or end product. The actual end product must comply with all safety aspects of the relevant requirements of the European Safety of Machinery Directive 2006/42/EC as amended, and with those of the most recent versions of standards EN 60204-1 and EN ISO 12100 at the least, and in accordance with 2006/95/EC.

Concerning electrical equipment designed for use within certain voltage limits, the Platinum Maestro with IO meets the provisions outlined in 2006/95/EC. The party responsible for ensuring that the equipment meets the limits required by EMC regulations is the manufacturer of the end product.

1.5   Warranty Information

The products covered in this manual are warranted to be free of defects in material and workmanship and conform to the specifications stated either within this document or in the product catalog description. All Elmo drives are warranted for a period of 12 months from the time of installation, or 12 months from time of shipment, whichever comes first. No other warranties, expressed or implied — and including a warranty of merchantability and fitness for a particular purpose — extend beyond this warranty.

Chapter 2:   Product Description

This installation guide describes the Platinum Maestro with IO Network Motion Controller and the steps for its wiring, installation and power up. Following these guidelines ensures maximum functionality of the system to which it is connected.

2.1   Description

The Platinum Maestro with IO is Elmo's premium network motion controller. It works in a network based system in conjunction with Elmo's intelligent servo drives to provide a total multi-axis motion control system solution.

The Platinum Maestro with IO Motion Controller incorporates an integral high-level computational dual-core system (2 x 1.5 GHz) with limitless memory (RAM, ROM, and SD-Card), and onboard additional hardware peripherals.

The Platinum Maestro with IO shares the motion processing workload with Elmo's SimplIQ and Gold Line drives, forming a distributed motion control system. The best servo and system performance is achieved by combining the Gold Family drives, and the new real-time motion control capabilities of the Platinum Maestro with IO controller.

The Platinum Maestro with IO provides:

- Self-sufficient machine motion control – No reliance on connection with PC server

- Time deterministic control over motion, I/Os and processes in the system

- Complete compatibility with recognized networking and communications protocols

- Full, real-time, multi-axis motion synchronization

- Advanced user programming capabilities based on the leading standards

- Unified development platform that streamlines motion control solutions for novice and expert programmers alike

The Platinum Maestro with IO offers real-time motion control support for full multi-axis system synchronization, using the well-known industry interface PLCopen for Motion Control standard.

Various programming capabilities, such as the IEC-61131-3 standard languages, as well as native C and C++ programming support, dramatically accelerate user-level program execution. Standard solutions are selected for ease of use.

Low-level communication with drives and I/O devices over the device network uses the CAN industry standard (DS 301, DS 401 for I/O devices, and DS 402 for drives and motion device profiles). These are used over standard CAN networks, as well as with the new EtherCAT CoE (CAN over EtherCAT) protocols.

Host interfaces are implemented using industry standard communications protocols, such as Ethernet TCP/IP and higher level protocols such as Ethernet/IP and Modbus.

The integrated I/O board offers the following:

- 12 Isolated Digital Inputs

- 8 Isolated Digital Outputs (PLC Source or PLC Sink)

- 4 Differential Analog inputs

- 4 Single Ended Analog outputs

- 10 RS-485 channels for:

  - Communication
  - Absolute encoder
  - Quadrature encoder

- 2 RS-232 channels

Standardization in protocols, definitions, and APIs allows users rapid system level integration and opens the system to third party devices on the device network.

Chapter 3:   Technical Specifications

3.1   Processor System

Feature	Details
Processor	Computational core system based on Dual Core (2×1.5 GHz)
Flash	4 GByte
RAM	DDR-3, 4 GByte, 64 bit bus width, (Operational at Full Core Rate)
SD Card	MicroSD™ Memory Card (Push-push Type) SCHA

3.2   Communications

Specification	Details
Ethernet for Host	1 Ethernet port 1000 base-T Automatically detected 10/100/1000Mbps CAT5e/6 Cable UDP, Telnet, TCP
EtherCAT Master Field bus	2 Ethernet port 100 base-T for EtherCAT Master. Baud Rate: 100 Mbit/sec CAT5e Cable CoE, EoE, FoE EtherCAT Master with full redundancy support
EtherCAT Slave Field bus	2 ports 100 base-T for EtherCAT IN and EtherCAT OUT Slave. EtherCAT Slave Network supporting for Network Bridging capabilities
CAN for device network	1 Port 1Mbps, with Isolation CANopen master port Maximum Baud Rate of 1 Mbits/sec. **CAN Profile:** DS 301 **Device Profile** (drive and motion control)**:** CAN device profiles, e.g., DS301, DS505, DS402, DS401 (for I/O)
USB Host	Host USB: Super-Speed (SS 5Gbps) USB 3.0
USB Device	Device USB: High-Speed (HS 480Mbps) USB 2.0

3.3   Input/Output

Specification	Details
Digital Inputs	12 Isolated Digital Inputs
Digital Outputs	8 Isolated Digital Outputs as: PLC Source or PLC Sink
Analog Inputs	4 Differential Analog inputs
Analog Outputs	4 Single Ended Analog outputs
RS-485 Channels	10 RS-485 channels for: • Communication • Absolute encoder • Quardature encoder
RS-232 Channels	2 RS-232 channels

3.4   Video interface

Specification	Details
HDMI Port	Video Support for HMI Panels (HDMI connectivity) including I2C for Touch Panel Mouse support

3.5   Power Supply

Feature	Details
Supply input voltage	Single power supply, 12V to 31V
Supply input power	Typical 7.5 W (Without video support)
Output of 5V for Encoders	600mA maximum
VL Output	2.0 A Maximum

3.6   Physical Specifications

Feature	Details
Weight	410 g (14.5 oz)
Dimensions	150 mm x 105 mm x 25 mm (5.91" x 4.13" x 0.98")
Mounting Method (with adapter)	Wall Mount ("Bookshelf")

3.7   General

Feature	Details
RTC	Real Time Clock Option maintained with an internal backup battery @ 25°C for a minimum period of 15 years
Internal System BIT	The Platinum Maestro with IO supports internal hardware BIT (Built-in-tests) procedures to check the system integrity level on each power up
Status LEDs	EtherCAT and Ethernet activity

3.8   Environmental Conditions

Feature	Details
Ambient operating temperature	0 °C to 40 °C (32 °F to 104 °F)
Storage temperature	-20 °C to +85 °C (-4 °F to +185 °F)
Maximum non-condensing humidity	90%

Chapter 4: Platinum Maestro with IO Software Specifications

4.1 Operating System

Feature	Details
Linux Operating System	With Elmo's RT extension for real-time motion control support
Motion Programming and Debugging	Native C Programming, running on the target CPU. Compiling and debugging via the Eclipse IDE using GCC under Cygwin.
	IEC 61131-3 with PLCopen Motion Library extension, using Elmo IDE. The following languages are supported:
	Structured text (ST), textual Function block diagram (FBD), graphical Ladder diagram (LD), graphical Sequential function chart (SFC), has elements to organize programs for sequential and parallel control processing.

4.2 Axes

Feature	Details
Axes	Up to 96 axes, allowing mixed single axis, multiple axis and coordinated axes motions
Axis Types	Intelligent Servo Drives (Elmo), supporting both the SimplIQ and Gold lines Operation of Maestro Profiler (real-time master synchronization) as well as non-Maestro profiler modes DS 402 CoE for EtherCAT and standard DS 402 drives for CANopen
Control System Update Rate	**EtherCAT:** Cycle Simultaneous Update Rates: ≥ 250 µs for up to 16 axes 500 µs for 32 axes 1 msec for 64 axes Cycle Jitter: < 1 µs, based on Master DC (Distributed Clock) support, for the full network **CAN:** Cycle Update Rate ≥ 1 ms (CAN physical network limitations only) Cycle Jitter: < 100 µs for CAN Sync message initiation (actual jitter dependent on the CAN network's physical limitations)

4.3 Motion Modes and Interfaces

Feature	Details
The Platinum Maestro motion interfaces use PLCopen Standard	64 bit, real-time, double precision profile calculations, allowing full on-the-fly control over speed, acceleration, deceleration and jerk Complex motion schemes, including look-ahead optimizing of trajectory speed calculations, for complex vector motions Cyclic buffer for 1,000 function blocks (a buffer for 1,000 motion segments). The cyclical buffer removes any practical limit on the number of function blocks
Communication Protocols	**Host:** Ethernet TCP-IP/UDP for operational modes Telnet communication for setup and configuration USB: Using binary protocol (maintenance) Application level: Ethernet-IP/Modbus **Device Network:** EtherCAT: CoE/EoE/FoE, supports distributed clock master CAN: CANopen device profiles, e.g., DS 301, DS 305, DS 402, DS 401 (I/O device profile)
Host and Internal Software Interface	TCP/IP interface from Host Computer. Software Library is provided for easy TCP/IP communication interface. This version will also support Ethernet-IP and Modbus over the TCP-IP. Internal Software libraries, for "C" user programs are provided, to write user code running on the Platinum Maestro target processor (native mode).
Data Recording	8 MB data recording Up to 64 vectors can be recorded simultaneously. Supports more than 10 advanced triggering options and real-time scope capabilities Very fast data upload using Ethernet
Upload/Download Support	Firmware update support (Platinum Maestro and drives) System resource files Axis parameter files

4.4 Drive Communication Bridge Support

Feature	Details
Communication	The Platinum Maestro supports full communication with any specific drive (EtherCAT and CAN) for the purpose of simple tuning or configuration at the drive level, i.e. there is no need for direct communication with the drive.

Feature	Details
Spatial Position-Based Pulse Generation	The Platinum Maestro supports spatial (along the path) position-based pulse generation. This is a unique feature, required for the generation of position-based events in 3D scanning systems. The Platinum Maestro system, with Elmo's intelligent Gold servo drives, can support single axis and spatial enhanced position-based compare functions, resulting in trigger output signals accurate to 1 encoder count along the trajectory path.

4.5   General

Feature	Details
Network Encoders	Supports master based motion on network encoders
Position Error Mapping	Supports 1-D, 2-D, and 3-D position-based error mapping compensation

4.6   Communication Options

The Platinum Maestro with IO can communicate with a host PC either via a standard Ethernet port or through USB using a binary protocol for maintenance.

The Platinum Maestro with IO communicates with its network devices using either EtherCAT or CAN networks.
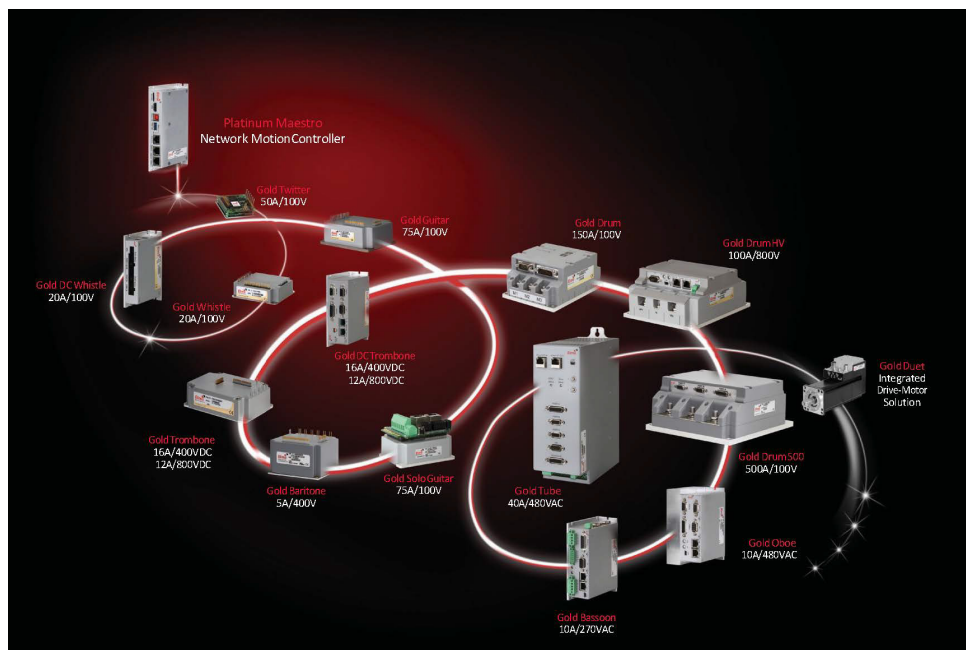
Figure 1: The Platinum Maestro with IO Network Connections

Chapter 5:   How to Use this Guide

This manual is part of a documentation set that can be used to set up and program the motion of any machine whose motors are controlled by Elmo's SimplIQ or Gold Line servo drives. When used in conjunction with the Platinum Lion Mounting Application Note and Maestro Software Manual which describe everything needed to get the Platinum Maestro with IO up and running. Please read the safety instructions in the first chapter of the Maestro Software Manual before starting.

After you have successfully mounted and installed the Platinum Maestro with IO we suggest that you read the Maestro Software Manual completely. If you have not already done so, follow the instructions in the Installation Guide that arrived with your servo drive, and install a drive. At least one drive needs to be connected to the Platinum Maestro with IO in order for it to function as a motion controller.

Chapter 6:   Installation

6.1   Environmental Conditions

You can guarantee the safe operation of the Platinum Maestro with IO by ensuring that it is installed in an appropriate environment.

For safe operation of the Platinum Maestro with IO make sure it is installed in an appropriate environment.

Feature	Value
Ambient operating temperature	0 °C to 40 °C (32 °F to 104 °F)
Maximum non-condensing humidity	90%
Operating area atmosphere	No flammable gases or vapors permitted in area

6.2   Unpacking the Components

Before you begin working with the Platinum Maestro with IO system, verify that you have all of its components, as follows:

● The Platinum Maestro with IO multi-axis motion controller

● Platinum Maestro with IO software which may be downloaded from www.elmomc.com

The Platinum Maestro with IO is shipped in a cardboard box with Styrofoam protection.

To unpack the Platinum Maestro with IO:

1. Carefully remove the Platinum Maestro with IO from the box.
2. Check the Platinum Maestro with IO to ensure that there is no visible damage to the instrument. If any damage has occurred, report it immediately to the carrier that delivered your controller.
3. To ensure that the Platinum Maestro with IO you have unpacked is the appropriate type for your requirements, locate the part number sticker on the side of the Platinum Maestro with IO as shown below.

The part number at the top gives the type designation.

4. Verify that the Platinum Maestro with IO type is the one that you ordered.
5. If you are using CAN networking, verify that you have CAN termination resistors (dongles), illustrated below.
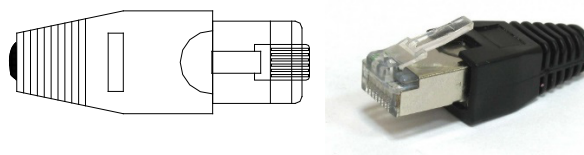
6.3   Mounting the Platinum Maestro with IO

The Platinum Maestro with IO has three mounting options:

- Wall mount
- Surface mount

6.3.1 Wall Mount

Two M4 round head screws, one through each opening in the heat sink, are used to mount the Platinum Maestro with IO (see the diagram below) on a wall.
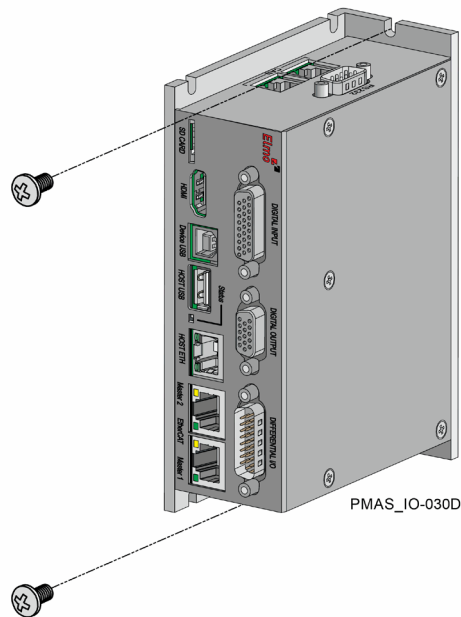
Figure 2: Wall Mounting the Platinum Maestro with IO

6.3.2 Surface Mount

Use four M4 round head screws, one through each opening in the heat sink to connect the Platinum Maestro with IO to a surface.
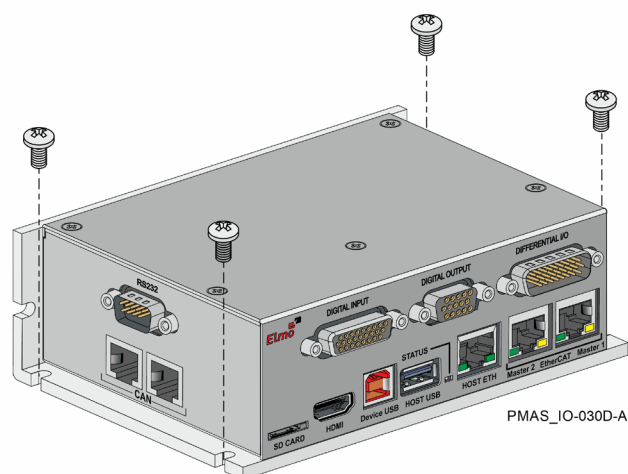
Figure 3: Surface Mounting the Platinum Maestro with IO

Chapter 7: Wiring

7.1 Connectors
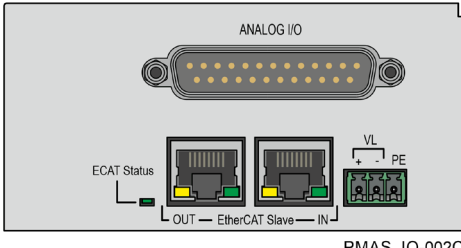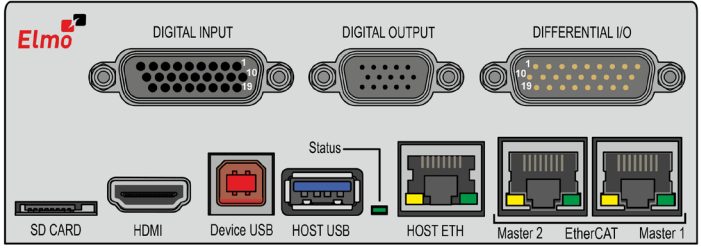
7.1.1 Wiring the Platinum Maestro with IO

Once the Platinum Maestro with IO is mounted, you are ready to wire the device. Proper wiring, grounding and shielding are essential for ensuring safe, immune and optimal performance of the Platinum Maestro with IO.

- Use CAT5e/6 cables for Ethernet and EtherCAT communication.
- After completing the wiring, carefully inspect all wires to ensure tightness, good solder joints and general safety.

7.1.2 Connector Types

The Platinum Maestro with IO has the following connectors:

Pins	Type	Function	
Top Connector			
PMAS_IO-002C			
3	Phoenix 3.81 mm Pitch Header	Power and ground	
8	RJ-45	EtherCAT Slave IN	
8	RJ-45	EtherCAT Slave OUT	
25	Male D-Type 2-rows	Analog Input/Output	
Front Connectors			
PMAS_IO-001D			
	MMC1 Micro SD Card	SD Card	
13	HDMI	HDMI	
4	Type B - Device	Device USB	
9	Type A - Host	Host USB	
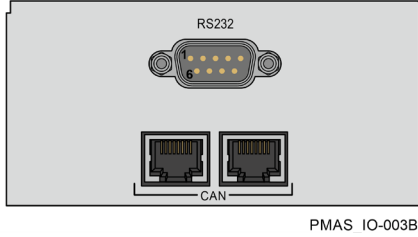
Pins	Type	Function	
8	RJ-45	Host EtherCAT	
8	RJ-45	EtherCAT Master 2	
8	RJ-45	EtherCAT Master 1	
26	D-TYPE High Density Female	Digital Input	
15	D-TYPE High Density Female	Digital Output	
26	D-TYPE High Density Male	Differential Input/Output	
Bottom Connectors			
PMAS IO-003B			
8	RJ-45	CAN	
8	RJ-45	CAN	
9	D-Type 2 Rows Male	RS232	

Table 1: Connector Types

7.1.3 Cable Kit

The cable kit for the Platinum Maestro with IO, has the following catalog number:

CBL-PMASIOKIT01	Cable kit with RS-232, Differential/Single Ended Analog IO, Bi-Directional Differential I/O, Digital Input, and Digital Output cables

7.2   Status Indicator

Figure 4 shows the position of the red/green dual LED, which is used for immediate indication of the Initiation and Working states.

PMAS_IO-001D-H
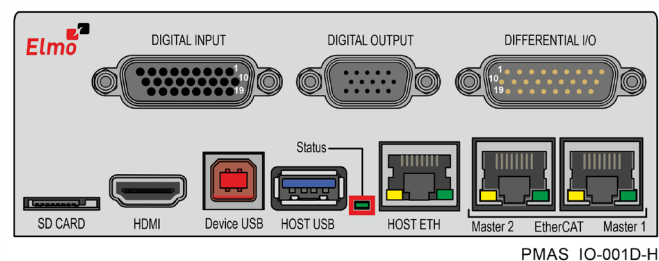
Figure 4: Platinum Maestro Status Indicator

The red/green dual LED is used for immediate indication of the following states:

- **Initiation state:** In this state the LED indicates whether the Maestro is in the boot state (blinking red) or in the operational state (steady green).

- **Error state:** In this state the LED indicates whether the motion controller is in error state (blinking green).

7.3   Power Connector
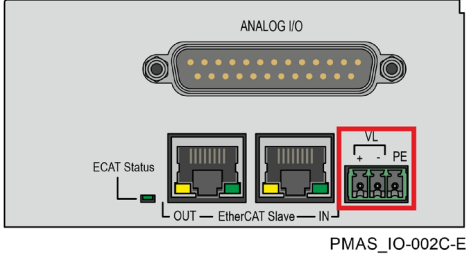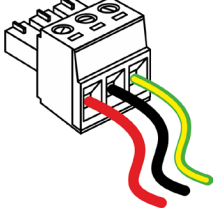
Pin	Signal	Function
PE	PE	Protective Earth
[-]	VL-	Power Supply Input Return
[+]	VL+	Power Supply Input Positive

Connector Location		Cable Connector
 PMAS_IO-002C-E **3-Pin 3.81 mm Pitch Phoenix Header (MC 1.5/3-G-3.81)**		 **3-Pin Phoenix Plug (MC 1.5/3-ST-3.81)**

Type	Manufacturer & Part No.	Mating Connector
3.81 mm pitch Header and Plug	Phoenix Header MC 1.5/3-G-3.81	Phoenix Plug (supplied) MC 1.5/3-ST-3.81

Table 2: Platinum Maestro with IO Power and Ground Connectors

7.3.1   Connecting the DC Power Supply

Feature	Details
Supply input power	Typical 7.5 W (Without video support)
Supply input voltage	Single power supply, 12V to 31V

The Platinum Maestro with IO requires 7.5 W when turned on. Any isolated power supply that can supply that power is acceptable. The supplied power must be within the rated voltage range of 12 V to 31 V.

Connect the DC output from the power supply to the power input port on the Platinum Maestro with IO using the 3-pin power plug provided.

To connect the power supply:

- It is recommended to use a twisted pair shielded cable. The shield should have copper braid.

- Before applying power, first verify the polarity of the connection (protected).
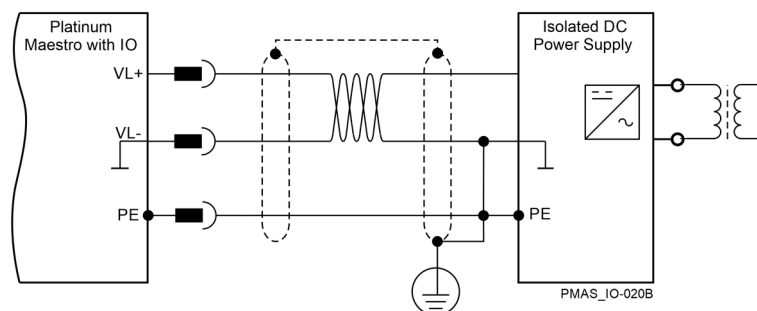
Figure 5: Power Supply Connection Diagram

7.4   EtherCAT Slave Connectors

7.4.1 EtherCAT Slave IN Connector
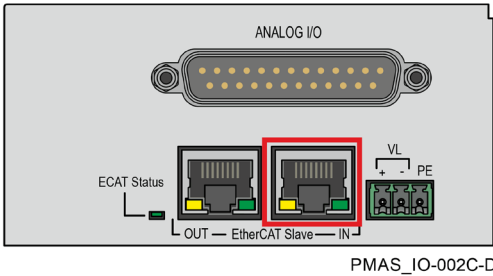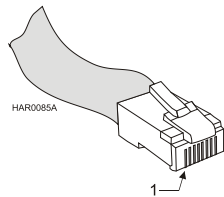
Pin	Signal	Function
1	EtherCAT_IN_TX+	EtherCAT_IN transmit +
2	EtherCAT_IN_TX-	EtherCAT_IN transmit -
3	EtherCAT_IN_RX+	EtherCAT_IN receive +
4,5	N/A	
6	EtherCAT_IN_RX-	EtherCAT_IN receive -
7, 8	N/A	

Connector Location	Cable Connector
8-Pin RJ-45 Connector	8 pin RJ-45 plug

Table 3: EtherCAT Slave IN Pin Assignments

7.4.2 EtherCAT Slave OUT Connector
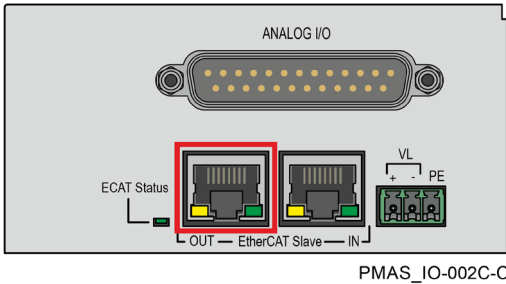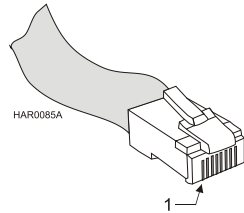
Pin	Signal	Function
1	EtherCAT_OUT_TX+	EtherCAT_OUT transmit +
2	EtherCAT_OUT_TX-	EtherCAT_OUT transmit -
3	EtherCAT_OUT_RX+	EtherCAT_OUT receive +
4,5	N/A	
6	EtherCAT_OUT_RX-	EtherCAT_OUT receive -
7, 8	N/A	

Connector Location	Cable Connector
8-Pin RJ-45 Connector	8 pin RJ-45 plug

Table 4: EtherCAT Slave OUT Pin Assignments

7.4.3 EtherCAT Status Indicator
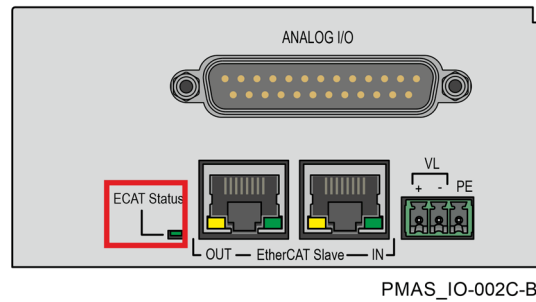
Figure 6: EtherCAT Status LEDs

The EtherCAT status indicator is a single red/green dual bi-colored LED that combines the green RUN indicator and the red ERROR indicator of the EtherCAT state machine. For further details, see the EtherCAT Application Manual.

7.4.4 EtherCAT Slave Activity Indicators

The green LED is the link/activity indicator (shown at side). It shows the state of the applicable physical link and the activity on that link.

The amber LED is the speed indicator (shown at side). It shows the speed of the connection on the Ethernet line. The possible states of these LEDs are summarized in Table 5.

LED	State	Meaning
Link /Activity	Off	No link is established
	On	A link is established
	Blinking	There is data transmission activity
Speed	On	The connection speed is 100 Mbps
		The speed of the EtherCAT line must be 100 Mbps. Otherwise, there is no EtherCAT data transmission
	Off	The connection speed is 10 Mbps

Table 5: LED States

7.5   EtherCAT Master Connectors

7.5.1   EtherCAT Master Port 1 Connector

Pin	Signal	Function
1	Ethernet_TX+	Ethernet transmit +
2	Ethernet_TX-	Ethernet transmit -
3	Ethernet_RX+	Ethernet receive +
4,5	N/A	
6	Ethernet_RX-	Ethernet receive -
7, 8	N/A	
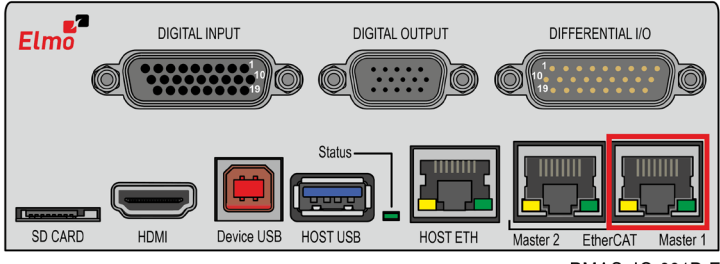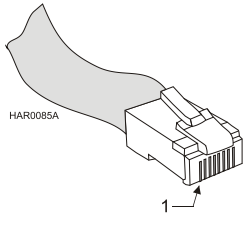
Connector Location	Cable Connector
8-Pin RJ-45 Connector	**8 pin RJ-45 plug**

Table 6: EtherCAT Master Port 1 Pin Assignments

7.5.2   EtherCAT Master port 2 (for redundancy) Connector

Pin	Signal	Function
1	Ethernet_TX+	Ethernet transmit +
2	Ethernet_TX-	Ethernet transmit -
3	Ethernet_RX+	Ethernet receive +
4,5	N/A	
6	Ethernet_RX-	Ethernet receive -
7, 8	N/A	
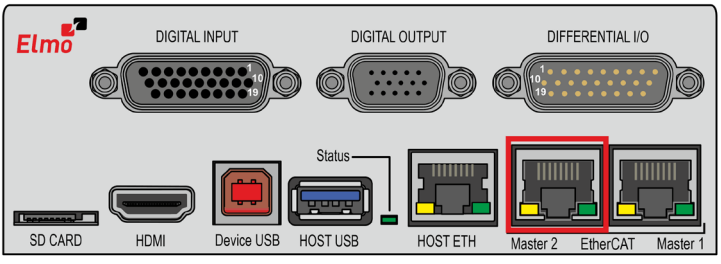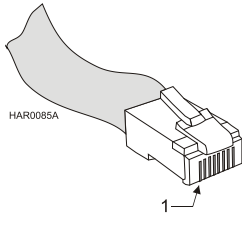
Connector Location	Cable Connector
8-Pin RJ-45 Connector	**8 pin RJ-45 plug**

Table 7: EtherCAT Master Port 1 Pin Assignments

7.5.3 EtherCAT Master Activity Indicators

The green LED is the link/activity indicator (shown at side. It shows the state of the applicable physical link and the activity on that link.

The amber LED is the speed indicator (**Error! Reference source not found.**). It shows the speed of the connection on the Ethernet line. The possible states of these LEDs are summarized in Table 8.

PMAS_IO-026D-A

LED	State	Meaning
Link /Activity	Off	No link is established
	On	A link is established
	Blinking	There is data transmission activity
Speed	On	The connection speed is 100 Mbps
		The speed of the EtherCAT line must be 100 Mbps. Otherwise, there is no EtherCAT data transmission
	Off	The connection speed is 10 Mbps

Table 8: LED States

7.5.4 EtherCAT Network

The Platinum Maestro with IO is the master of the EtherCAT network and must always be the first device in the line.

The Ethernet Master 1 port of the Platinum Maestro with IO should be connected to the EtherCAT In port of the next device down the line. The EtherCAT Out port of the last device in line can be left open. If redundancy is required, the Out port of the last device should be connected to the In port of the Platinum Maestro with IO.

Note: **When connecting the EtherCAT communication cable it is recommended to use CAT5e cable.**

PMAS_IO-027E
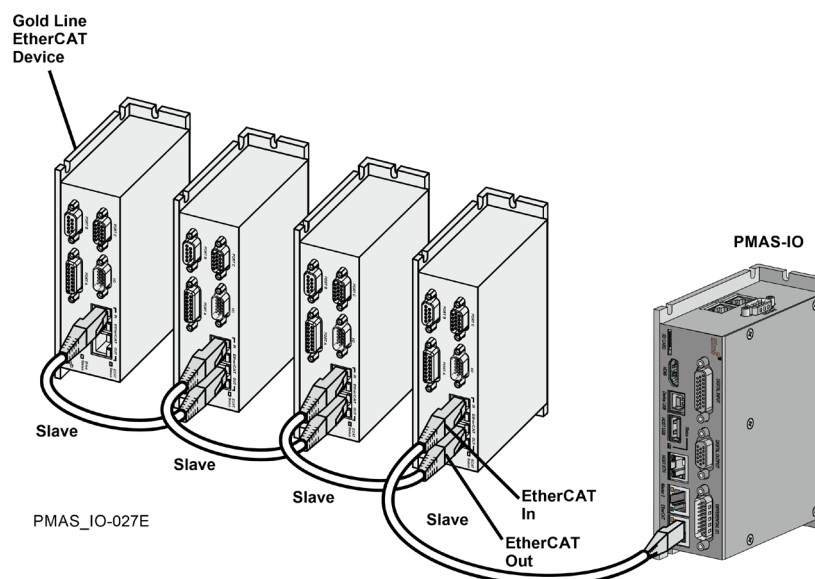
Figure 7: EtherCAT Network with no Redundancy

Platinum Maestro_IO

EtherCAT LINK CABLE
(CBL-GTWIECATLINK01)

Platinum
Solo Twitter
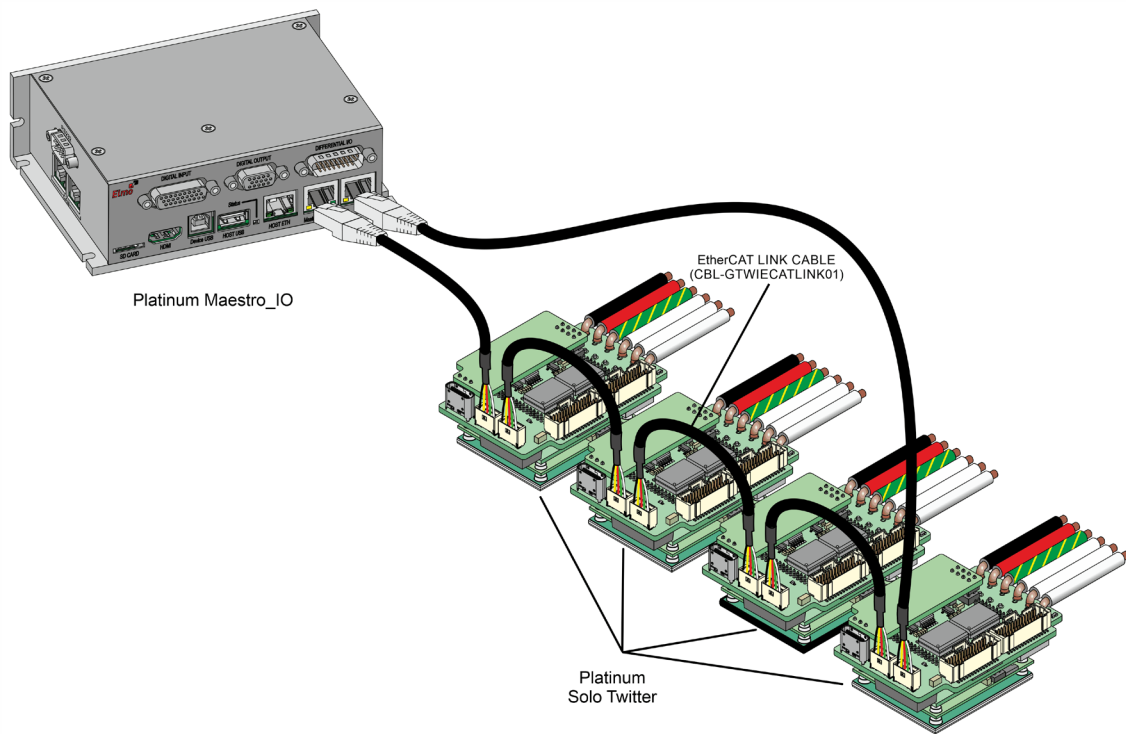
Figure 8: EtherCAT Network with Redundancy

7.6 Ethernet Host Connectors
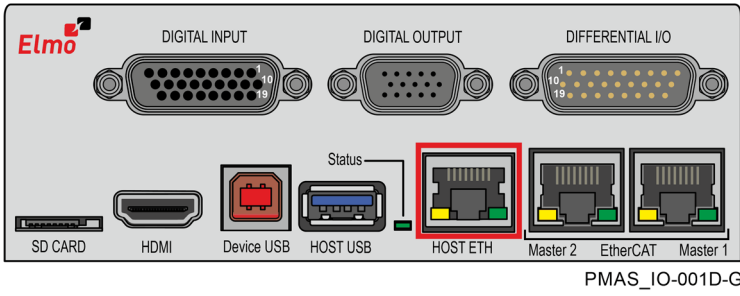
Pin	100Base-T		1000Base-T	
	Signal	**Description**	**Signal**	**Description**
1	TX+	Transmit Data+	BI_DA+	BiDirectional Data A+
2	TX-	Transmit Data-	BI_DA-	BiDirectional Data A-
3	RX+	Receive Data+	BI_DB+	BiDirectional Data B+
4	n/c	Not connected	BI_DC+	BiDirectional Data C+
5	n/c	Not connected	BI_DC-	BiDirectional Data C-
6	RX-	Receive Data-	BI_DB-	BiDirectional Data B+
7	n/c	Not connected	BI_DD+	BiDirectional Data D+
8	n/c	Not connected	BI_DD-	BiDirectional Data D-

Connector Location	**Cable Connector**
PMAS_IO-001D-G **8-Pin RJ-45 Connector**	**8 pin RJ-45 plug**

Table 9: EtherCAT Host Pin Assignments

7.6.1 Ethernet Host Activity Indicators

The green LED is the link/activity indicator (**Error! Reference source not found.**). It shows the state of the applicable physical link and the activity on that link.

The Orange LED is the speed indicator (**Error! Reference source not found.**).
It shows the speed of the connection on the Ethernet line. The possible states of these LEDs are summarized in Table 10.
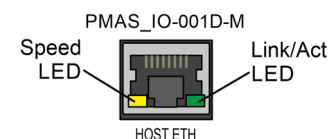
LED	State	Meaning
Link /Activity	Off	No link is established
	On	A link is established
	Blinking	There is data transmission activity
Speed	Green	The connection speed is 1000 Mbps
	Orange	The connection speed is 100 Mbps
	Off	The connection speed is 10 Mbps

Table 10: LED States

7.6.2 Ethernet Communication

Note: **When connecting the Ethernet communication cable use a shielded CAT5e/6 Ethernet cable.**

The Platinum Maestro with IO connects to a PC either directly or through a hub, switch or router. Use a standard CAT5e/6 Ethernet cable.
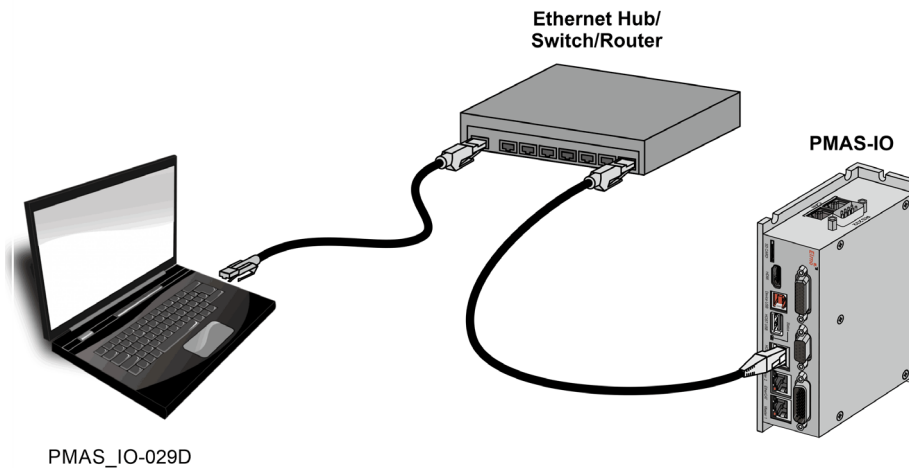

PMAS_IO-029D
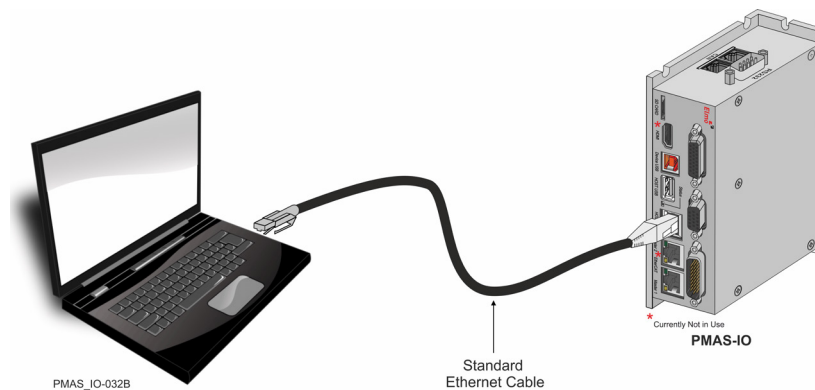
Figure 9: Platinum Maestro with IO Connected to a Network

PMAS_IO-032B

Standard
Ethernet Cable

Figure 10: Platinum Maestro with IO Connected Peer-to-Peer to a PC

7.7   CAN Connectors
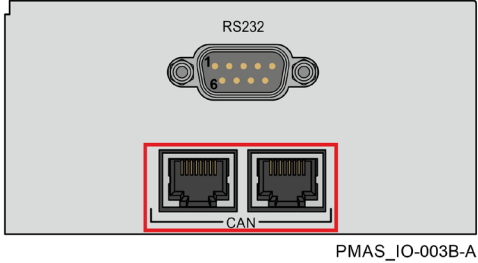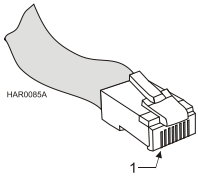
Pin	Signal	Function
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_COMRET	CAN Communication Return
4, 5	N/A	—
6	CAN_SHLD	Shield, connected to the RJ plug cover
7	CAN_COMRET	CAN Communication Return
8	N/A	—

Connector Location	Cable Connector
8-Pin RJ-45 Connector	**8 pin RJ-45 plug**

Table 11: CAN Cable Pin Assignments
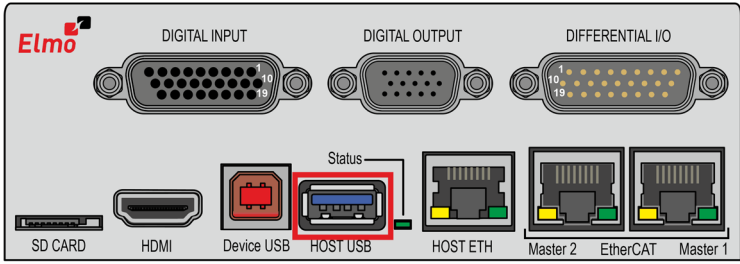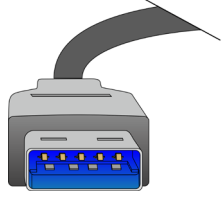
To connect the CAN communication cable:

- Use 26 or 28 AWG twisted pair shielded cables. For best results, the shield should have aluminum foil and be covered by copper braid with a drain wire (CAT5e FTP applicable).

- Connect the shield to the ground of the host (PC). Usually, this connection is soldered internally inside the connector at the PC end. You can use the drain wire to facilitate connection.

- The male RJ plug must have a shield cover.

- Ensure that the shield of the cable is connected to the shield of the RJ plug. The drain wire can be used to facilitate the connection.

- Connect a 120 Ω termination resistor to each end of the network cable.
  (The Platinum Maestro with IO does not have an internal terminal.)

- Termination resistors should be installed in all the unused CAN ports on the Platinum Maestro with IO.

- Use the CAN termination dongle supplied as a second "device end". Simply insert the termination resistor into the CAN connector of the second end device on the bus. This is only possible if there are two CAN connectors.
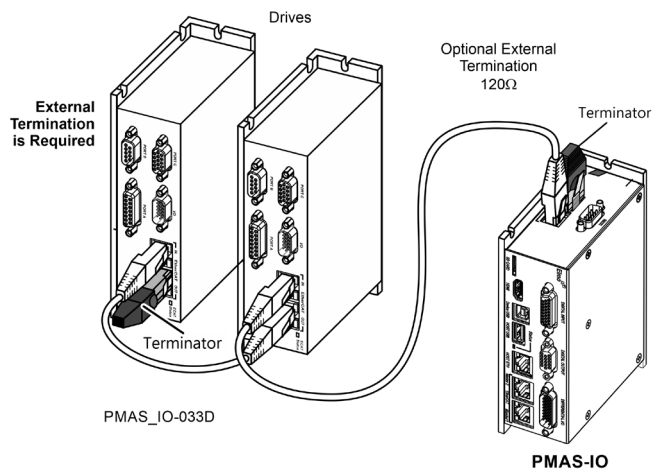
7.8   Host USB 3.0/2.0 Type A

Dependent of the firmware version, the Platinum Maestro with IO supports USB 3.0 with communication speed of super high speed (5 Gbit/s).

Pin	Signal	Function	Pairs
1	USB VBUS	USB VBUS 5 V	
2	USBD-	USB _N line USB 2.0	differential pair
3	USBD+	USB _P line	
4	USB COMRET	USB communication return	
5	StdA_SSRX-	Super-Speed transmitter RX-	differential pair
6	StdA_SSRX+	Super-Speed transmitter RX+	
7	GND_DRAIN	Ground for signal return	
8	StdA_SSTX−	SuperSpeed receiver TX-	differential pair
9	StdA_SSTX+	SuperSpeed receiver TX+	
Connector Location			**Connector**

PMAS_IO-001D-I

9-Pin Connector

USB 3.0 Connector

7.9   Device USB 2.0 Type B

The Platinum Maestro with IO supports USB 2.0 (Host mode) in communication speed of Low-Speed (1.5Mbs), Full-Speed (12Mbs), and High-Speed (480Mbps).

Pin	Signal	Function
1	USB VBUS	USB VBUS from host
2	USBD-	USB _N line
3	USBD+	USB _P line
4	USB COMRET	USB communication return
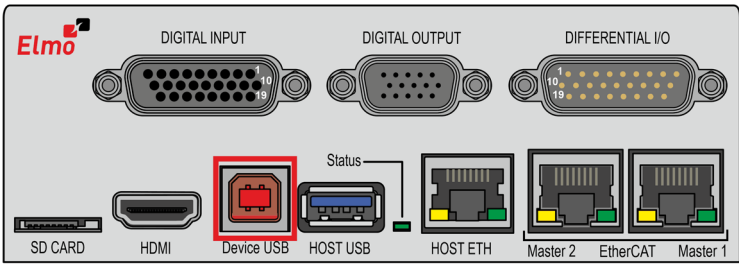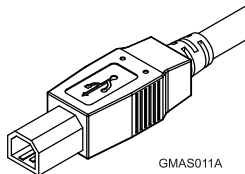
Connector Location	Connector
USB 2.0 Connector	**USB Device Type B Plug**

Table 12: USB Pin Assignments
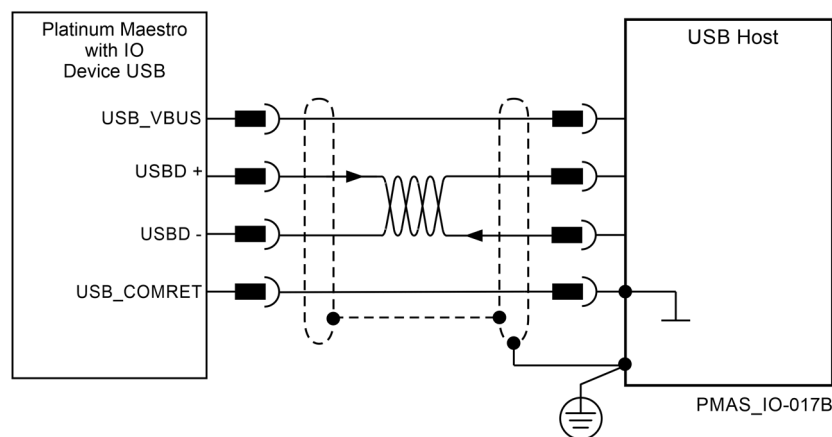
Figure 11: USB Network Diagram

USB communication cable:

- Make sure to connect the cable shield to the ground of the host (PC). Usually, this connection is soldered internally inside the connector at the PC end. You can use the drain wire to facilitate connection.

- Note that the maximum length for USB 2.0 is 5 meter.
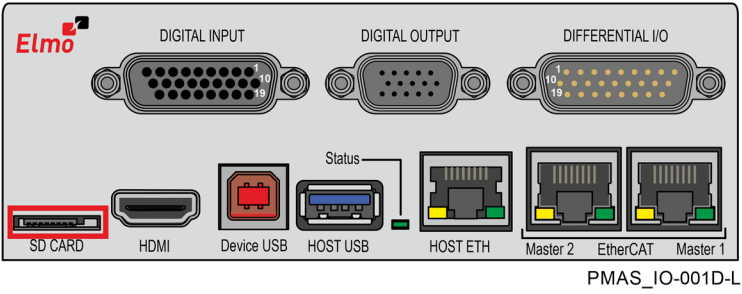
7.10   HDMI Connector Type A
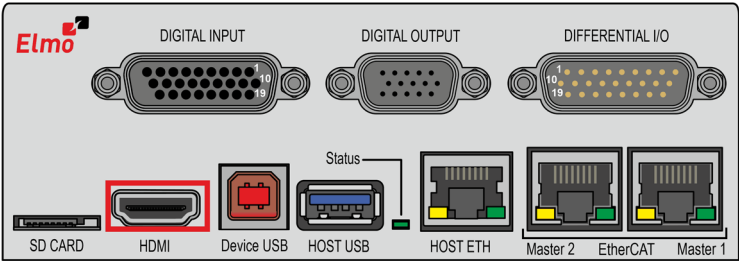
No	Name	Description
1	HDMI_TX_DATA2_P	
2	HDMI_TX_DATA2_Shield	
3	HDMI_TX_DATA2_N	
4	HDMI_TX_DATA1_P	
5	HDMI_TX_DATA1_Shield	
6	HDMI_TX_DATA1_N	
7	HDMI_TX_DATA0_P	
8	HDMI_TX_DATA0_Shield	
9	HDMI_TX_DATA0_N	
10	HDMI_TX_Clock_P	
11	HDMI_TX_Clock_Shield	
12	HDMI_TX_Clock_N	
13	HDMI_TX_CEC_LINE	
14	Reserved (HDMI 1.0–1.3c)	Utility/HEC/ARC (Optional, HDMI 1.4+ with HDMI Ethernet Channel and Audio Return Channel)
15	SCL	I²C Serial Clock for DDC
16	SDA	I²C Serial Data Line for DDC
17	DDC/CEC/ARC/HEC Ground	
18	+5 V	Max. 0.05 amp
19	Hot Plug detect	All versions and HEC/ARC (Optional, HDMI 1.4+ with HDMI Ethernet Channel and Audio Return Channel)

Connector Location

HDMI Connector

Table 13: HDMI Pin Assignments

7.11   microSD™ Memory Card (Push-push Type) SCHA

Connector Location	Cable Connector

MicroSD™ Memory Slot

PMAS_IO-001D-L

MicroSD Memory Card

7.12 Digital Inputs

Pin	Signal	Function
1	IN1_A	Digital Input 1 Anode
2	IN2_A	Digital Input 2 Anode
3	IN3_A	Digital Input 3 Anode
4	IN4_A	Digital Input 4 Anode
5	IN5_A	Digital Input 5 Anode
6	IN6_A	Digital Input 6 Anode
7	IN7_A	Digital Input 7 Anode
8	IN8_A	Digital Input 8 Anode
9	IN9_A	Digital Input 9 Anode
10	IN1_C	Digital Input 1 Cathode
11	IN2_C	Digital Input 2 Cathode
12	IN3_C	Digital Input 3 Cathode
13	IN4_C	Digital Input 4 Cathode
14	IN5_C	Digital Input 5 Cathode
15	IN6_C	Digital Input 6 Cathode
16	IN7_C	Digital Input 7 Cathode
17	IN8_C	Digital Input 8 Cathode
18	IN9_C	Digital Input 9 Cathode
19	IN10_C	Digital Input 10 Cathode
20	IN10_A	Digital Input 10 Anode
21	IN11_C	Digital Input 11 Cathode
22	IN11_A	Digital Input 11 Anode
23	IN12_C	Digital Input 12 Cathode
24	IN12_A	Digital Input 12 Anode
25,26	N/A	
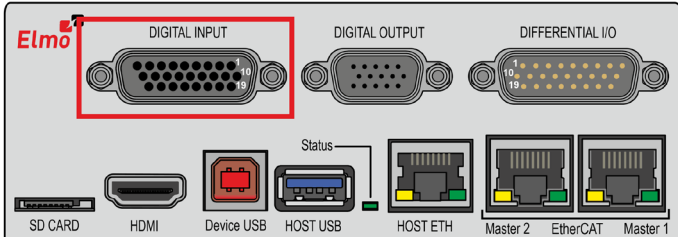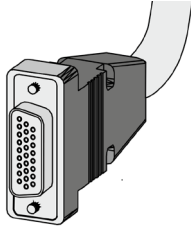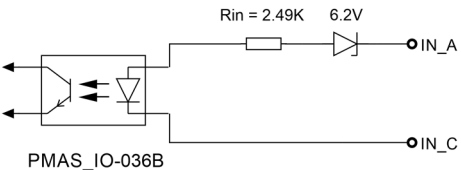
Connector Location	Connector
26-Pin D-TYPE H.D Female Connector	PMAS_IO-034A **Male D-Type Connector**

Table 14: Digital Inputs Pin Assignments

Feature	Details
Number of Digital inputs	12
Input type	Isolated PLC source Diode Anode and Cathode
Input current	$I_{in}=(Vin-7.4)/2.5\ Kohm$ $I_{in} = 2\ mA\ @\ Vin = 12\ V$ $I_{in} = 9\ mA\ @\ V_{in} = 30\ V$
High-level input voltage	12 V < Vin < 30 V
Low-level input voltage	0 V < Vin < 7 V
Input type	Optically isolated

Figure 12: Digital Input Schematic

7.12.1 Digital Inputs PLC voltage level Connections

PMAS_IO-035B
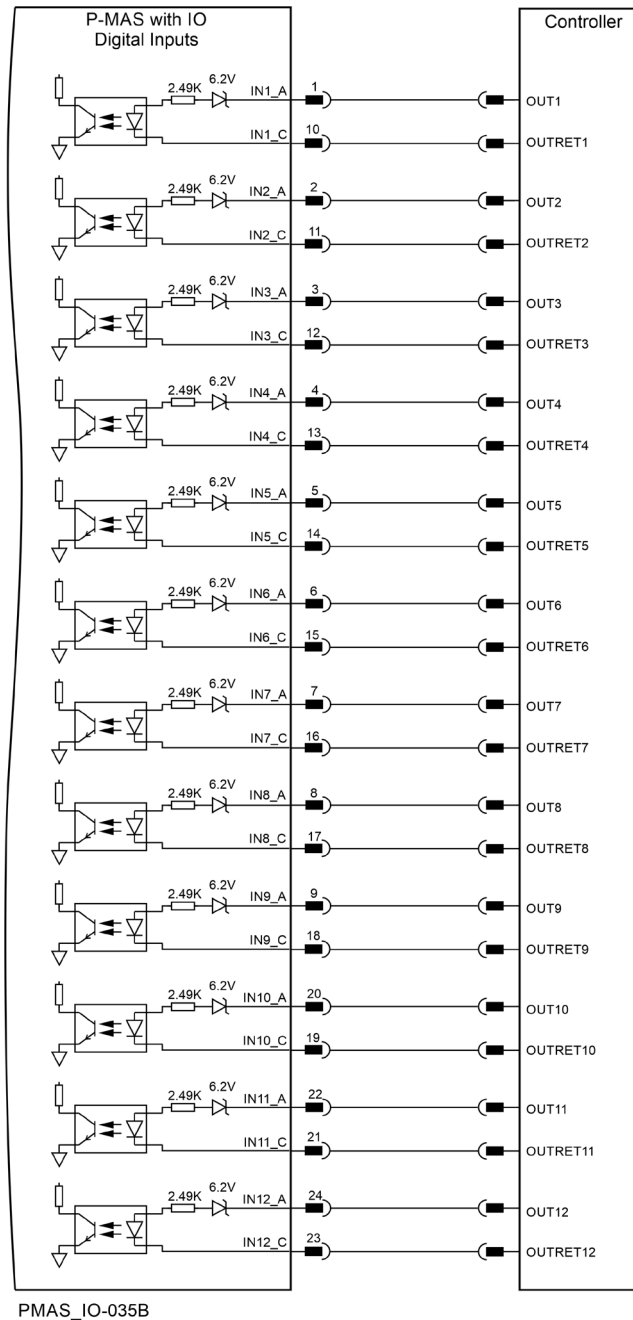
Figure 13: Digital Input– PLC voltage level Connection Diagram
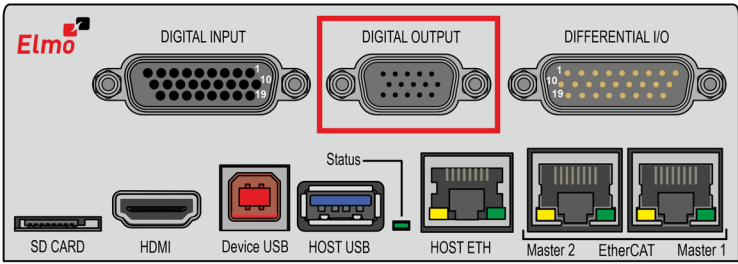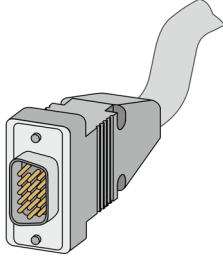
7.13   Digital Outputs

Pin	Signal	Function
1	OUT1	Digital Output 1 Source/Sink
2	OUT2	Digital Output 2 Source/Sink
3	OUT3	Digital Output 3 Source/Sink
4	OUT4	Digital Output 4 Source/Sink
6	OUT5	Digital Output 5 Source/Sink
7	OUT6	Digital Output 6 Source/Sink
8	OUT7	Digital Output 7 Source/Sink
9	OUT8	Digital Output 8 Source/Sink
10,11	VDD	Supply Voltage for Digital Outputs
5,12	VDD_RET	Supply Voltage Return for Digital Outputs
14	VL_OUT+	VL+ Output
15	VL_OUT-	VL- Output

Connector Location	Connector
15-Pin D-TYPE H.D Female Connector PMAS_IO-001D-C	**Male D-Type Connector** G-GEN-002A

Table 15: Digital Outputs Pin Assignments

| Feature	Details
Number of Digital Outputs	8 PLC Source or 8 PLC Sink
Output type	Optically isolated
Supply output (VDD)	12 V to 30 V For PLC
Max. output current I_{out} (max) (V_{out} = High)	I_{out} (max) ≤ 250 mA
T_{on} (Time from low to high) If V_{dd}= 30V, If V_{dd} = 12V	< 10usec < 85usec
T_{off} (Time from high to Low)	< 85usec
R_L	The external R_L must be selected to limit output current to 250mA $$R_L = \frac{VDD - VOL}{I_{out}(max)}$$
Executable time	0 < T < 250 μsec
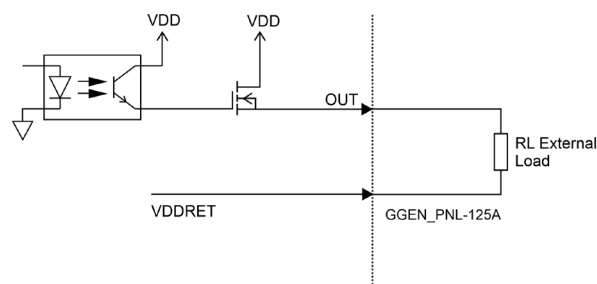
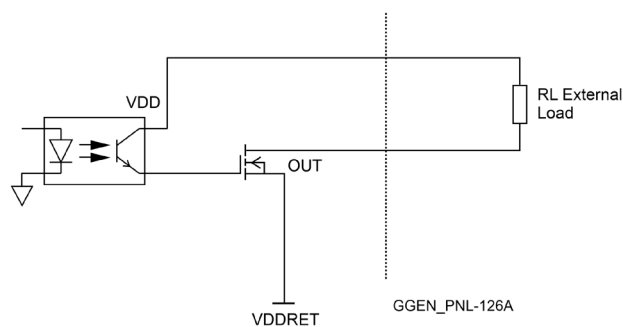**Figure 14: Digital Output Schematic – Source Mode PLC Level**

Figure 15: Digital Output Schematic – Sink Mode PLC level

7.13.1 Digital Output Source Mode PLC Level Connections
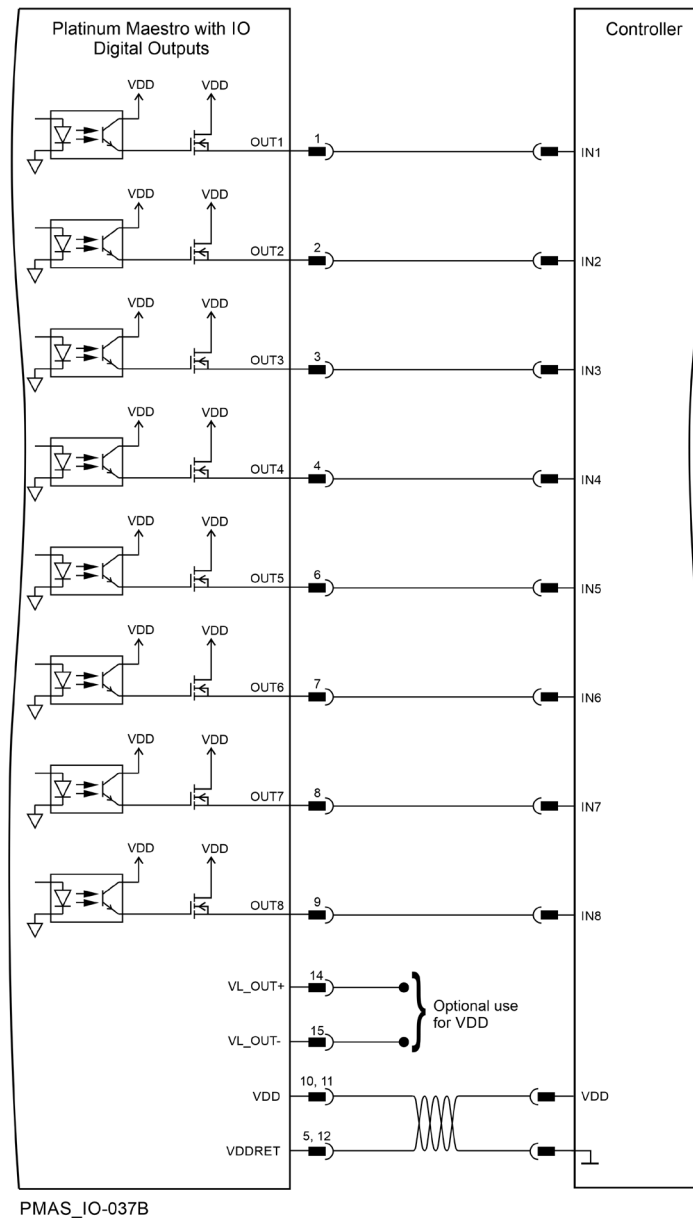

PMAS_IO-037B

Figure 16: Digital Output PLC Source Connection Diagram

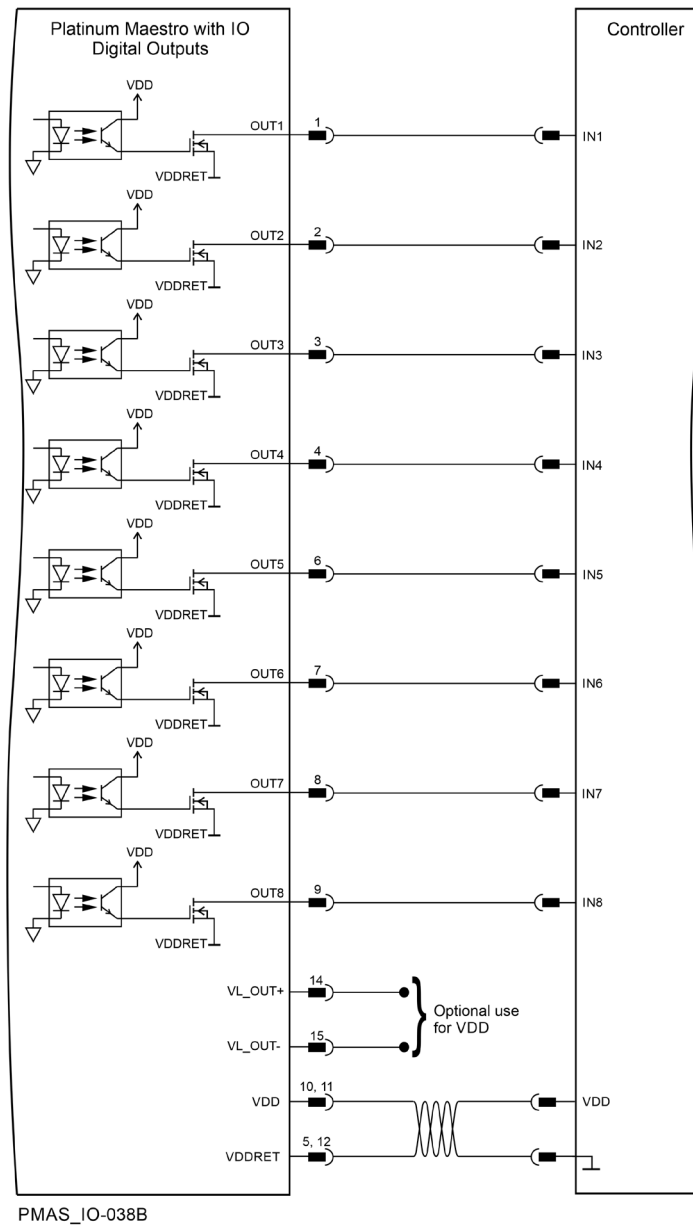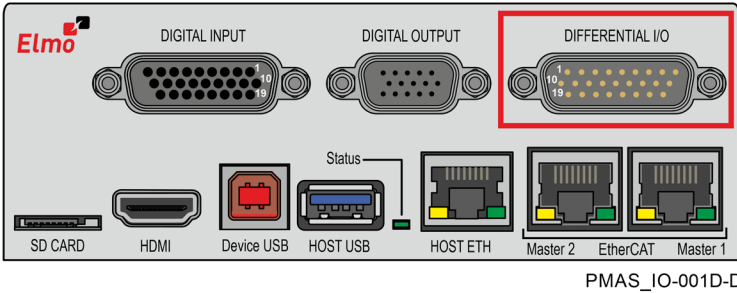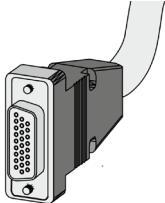## 7.13.2 Digital Output Sink Mode PLC Level Connections

PMAS_IO-038B

Figure 17: Digital Output PLC Sink Connection Diagram

7.14 Bi-Directional Differential IO

Differential IO Features	Details
Number of Differential I/O	10
IO type	RS-485 transceiver
Termination line	120 Ohm (refer to the figure below) It is required to connect termination of 120 ohm in the user side
Usage	Up to 8 Differential UART 3.6Mbps Absolute Encoders Quadrature Encoders General Fast IO
Sample Rate	Max 50MHz

Pin	Signal	Function
1,9,16,20	COMRET	Common Return
8,19	+5VE	Encoders Supply +5V
2	IO1+	Differential I/O1+
3	IO1-	Differential I/O1-
4	IO2+	Differential I/O2+
5	IO2-	Differential I/O2-
6	IO3+	Differential I/O3+
7	IO3-	Differential I/O3-
10	IO4+	Differential I/O4+
11	IO4-	Differential I/O4-
12	IO5+	Differential I/O5+
13	IO5-	Differential I/O5-
14	IO6+	Differential I/O6+
15	IO6-	Differential I/O6-
17	IO7+	Differential I/O7+
18	IO7-	Differential I/O7-
21	IO8+	Differential I/O8+
22	IO8-	Differential I/O8-
23	IO9+	Differential I/O9+
24	IO9-	Differential I/O9-
25	IO10+	Differential I/O10+
26	IO10-	Differential I/O10-

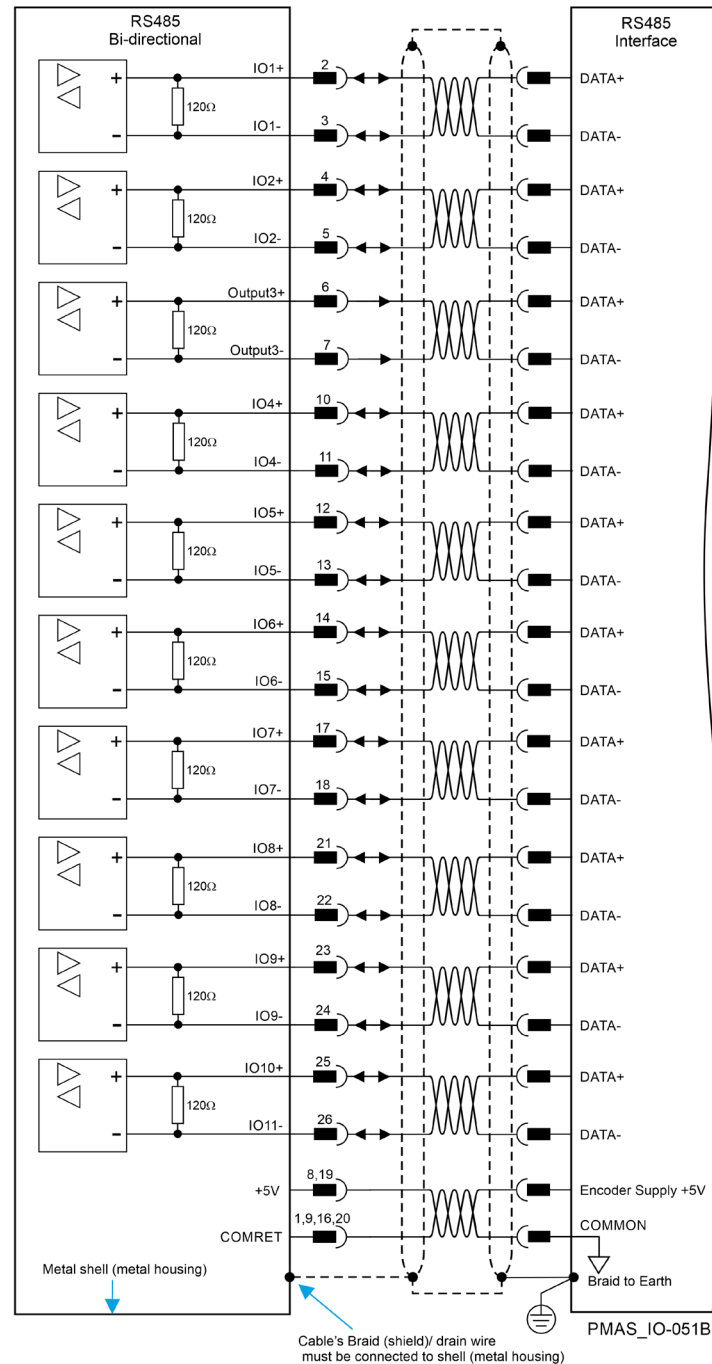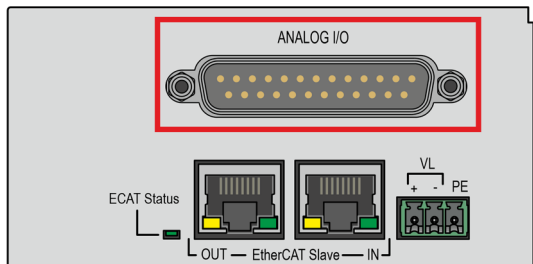| Connector Location	Connector
 PMAS_IO-001D-D **26-Pin D-TYPE H.D Male Connector**	 PMAS_IO-034A **Female D-Type Connector**

Figure 18: Bi-Directional RS485 Connection Diagram for Differential IOs

7.15   Differential Analog Input

Operation of the differential analog is dependent on the firmware version.

Analog Input Features	Details
Number of inputs	4
Input type	Differential
Maximum operating differential voltage	± 10 V
Maximum differential input voltage	± 11 V
Differential input resistance	200 MΩ
Analog input resolution	16-bit
Analog input cycle time	The ADC input channels are sampled every P-MAS cycle time. The cycle time approximates between 250us to <2ms (Depending on the number of axes – 8 axes at 250µs, 16 axes at 500µs, etc.).

Pin	Signal	Function
6	ANA_IN1+	Differential Analog Input 1+
19	ANA_IN1-	Differential Analog Input 1-
8	ANA_IN2+	Differential Analog Input 2+
21	ANA_IN2-	Differential Analog Input 2-
10	ANA_IN3+	Differential Analog Input 3+
23	ANA_IN3-	Differential Analog Input 3-
12	ANA_IN4+	Differential Analog Input 4+
25	ANA_IN4-	Differential Analog Input 4-
5, 7, 9, 11, 13	N/A	
18, 20, 22, 24	COMRET	Common Return

Connector Location	Connector
PMAS_IO-002C-A **25-Pin D-TYPE Male Connector**	**Female D-Type Connector**
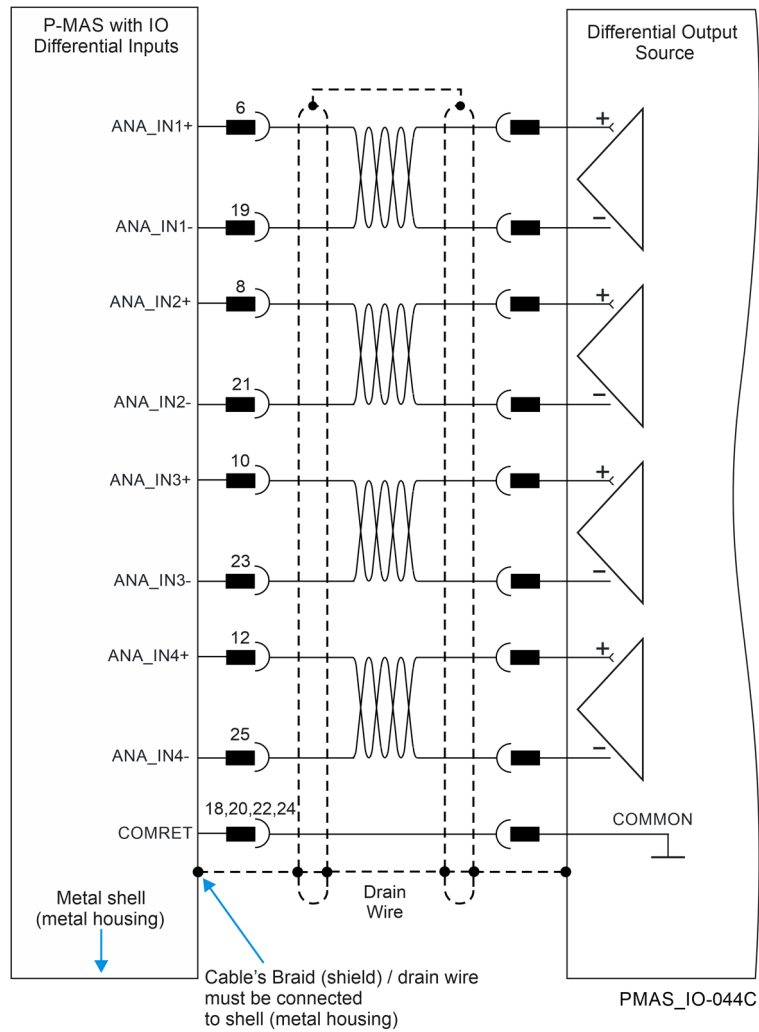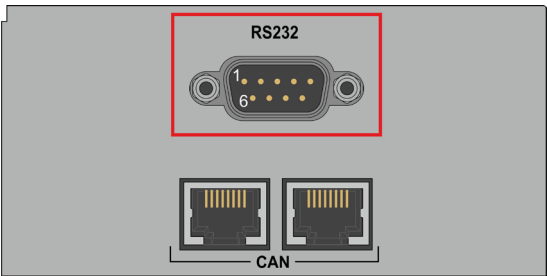
Figure 19: Differential Analog Input Connection Diagram

7.16   RS232 Communication

Feature	Details
Number of channels	2
Port type	Standard RS-232
Maximum baud rate	3.6Mbps

Pin	Signal	Function
2	RS232_RX1	Receive Data 1
3	RS232_TX1	Transmit Data 1
6	RS232_RX2	Receive Data 2
7	RS232_TX2	Transmit Data 2
5,9	COMRET	Common Return
1,4,8	N/A	

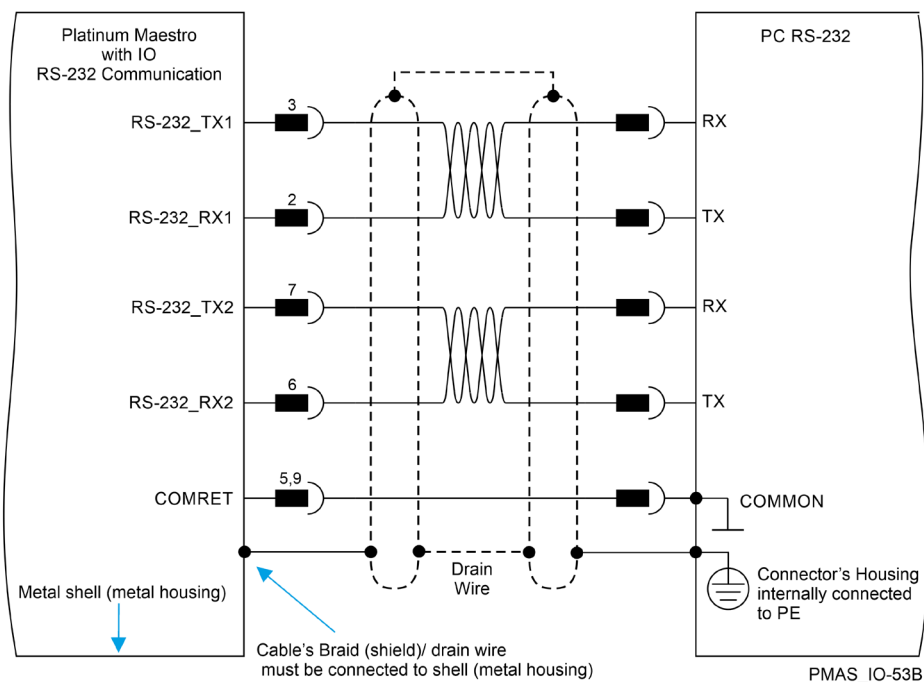| Connector Location	Connector
9-Pin D-TYPE Male Connector	**Female D-Type Connector**

Figure 20: RS232 Connection Diagram

Chapter 8:   Powering Up

After the Platinum Maestro with IO has been mounted, check that the cables are intact. The Platinum Maestro with IO is then ready to be powered up.

8.1   Initializing the System

After the Platinum Maestro with IO has been connected and mounted, the system must be set up and initialized. The minimum system requirements for a setup are:

- Platinum Maestro with IO (and power supply)

- PC with the required Elmo software

- At least one servo drive and motor

- EtherCAT cables or a terminated CAN network

- A servo drive connected through an EtherCAT cable or a CAN cable (the terminated CAN network)

Users of SimplIQ servo drives:

Setting up the drives and motors is described in the Installation Guide for each servo drive and in the Elmo Application Studio User Guide. Advanced features are described in the SimplIQ Software Manual, Interlude API User Guide, SimplIQ Command Reference and CAN Implementation Guide.

Users of Gold Line servo drives:

Setting up the drives and motors is described in the Gold Line Servo Drive Installation Guide and Elmo Application Studio Users Guide. Advanced features are described in the Gold Line Software Manual, Gold Line Command Reference and CAN Implementation Guide.

Chapter 9:   Platinum Maestro with IO Dimensions
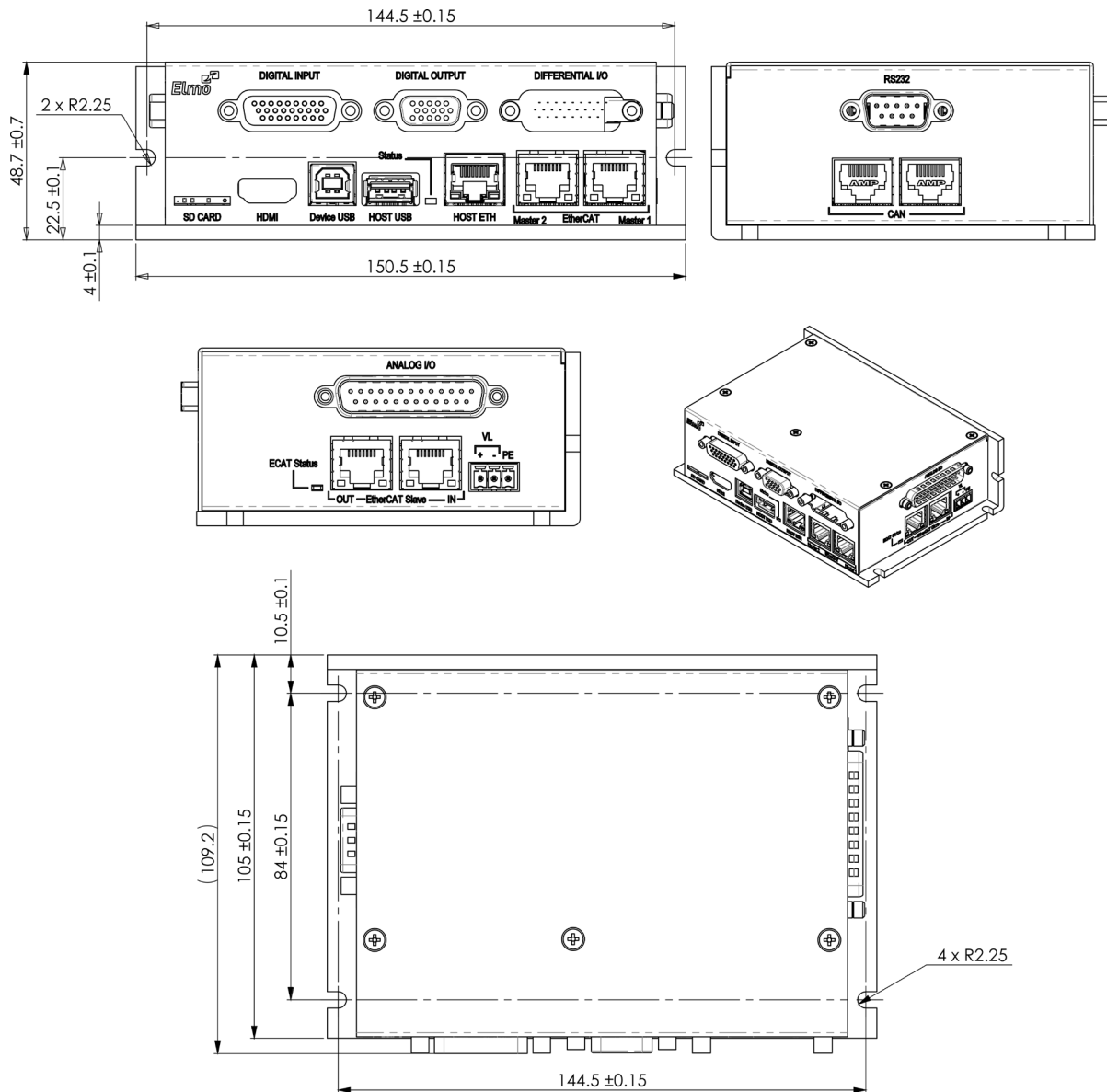
Chapter 10: Compliance with Standards

The Platinum Maestro with IO network motion controller has been developed, produced, tested and documented in accordance with the relevant standards. Elmo Motion Control is not responsible for any deviation from the configuration and installation described in this documentation. Furthermore, Elmo is not responsible for the performance of new measurements or ensuring that regulatory requirements are met.

10.1   Low Voltage Directive

Specification	Details
The related standards below apply to the performance of the servo drives as stated in the environmental conditions paragraph 3.8 Environmental Conditions. The Platinum Maestro with IO is UL compliant up to 32 VDC. For power supplies higher than 32 VDC, the Platinum Maestro with IO is NON UL compliant.	

10.2   Other Compliant Standards

Quality Assurance	
ISO 9001:2008	Quality Management
Design	
• IPC-D-275 • IPC-SM-782 • IPC-CM-770	Printed wiring for electronic equipment (clearance, creepage, spacing, conductors sizing, etc.)
Reliability	
MIL-HDBK- 217F	Reliability prediction of electronic equipment (rating, de-rating, stress, etc.)
Workmanship	
In compliance with **IPC-A-610**, level 3	Acceptability of electronic assemblies
PCB	
In compliance with **IPC-A-600**, level 3	Acceptability of printed circuit boards
Packing	
In compliance with **EN 100015**	Protection of electrostatic sensitive devices
Environmental	
In compliance with **2002/96/EC**	Waste Electrical and Electronic Equipment regulations (WEEE) **Note:** Out-of-service Elmo drives should be sent to the nearest Elmo sales office.

Go Safer, Smarter, Smaller, Simpler.
Go Platinum.

Platinum
by Elmo