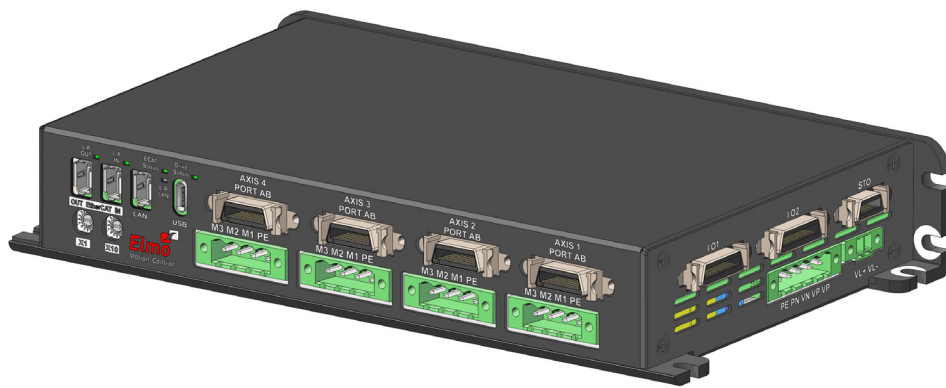


Platinum String Quad (Quartet) Digital Servo Drive Installation Guide

EtherCAT and CANopen



September 2021 (Ver. 1.001)

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Revision History

Version	Date
Ver. 1.000	Apr 2021
Ver. 1.001	Sept 2021

Catalog Number

PSTR-zz-zXX/YYYzzzQ

Family Name:
Platinum String Quartet

Mounting Version:
B — Fins & Fan
L — L-Shape

Safety Capability :
O — Hardware STO only
(SIL3,Plc,CAT3)

Rated Current Mode:
Blank — STD I_c/ I_p
R — Continuous Operation for T_i≤85C

Rated Voltage

Rated Continuous Current

Dual Use:

Q — Not subjected to export control according to ECCN-3A225 (US) or 428/2009 - 3A225 (EU Dual Use)
Commutation frequency limited to 599Hz

Blank - Standard. No Commutation frequency limitation

IO Style for Regular IO:

U — 5V Logic

V — PLC SRC (High Side) or SINK (Low Side)

Encoder Port B options:

E — Encoder, Incremental,
Analog Halls, Analog Encoder (SIN/COS)

Network:

F — EtherCAT with Switches and Ethernet
USB

S — CAN (available within the near future)
USB

Cable Kit

- The following cable kit may be ordered
Catalog number: CBL-PSTRKIT01 EtherCAT Cable kit
For further details, see the latest version of the MAN-P-STRQUAD-CBLKIT cable kit manual.

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Chapter 1: This Installation Guide

This installation Guide details the technical data, pinouts, and power connectivity of the Platinum String Quad (Quartet). **For a comprehensive specification and detailed description of the functions, refer to the Platinum Quad Drive Hardware Manual.**

Chapter 2: Safety Information

In order to achieve the optimum, safe operation of the Platinum String Quad (Quartet), 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 String Quad (Quartet) 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 String Quad (Quartet) 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.

2.1 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 String Quad (Quartet) from all voltage sources before servicing.
- The high voltage products within the Platinum Line range contain grounding conduits for electric current protection. Any disruption to these conduits may cause the instrument to become hot (live) and dangerous.



Capacitance Discharge

After shutting off the power and removing the power source from your equipment, wait at least TBD 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.

2.2 Cautions

- The maximum DC power supply connected to the instrument must comply with the parameters outlined in this guide.
- When connecting the Platinum String Quad (Quartet) to an approved isolated auxiliary power supply, connect it through a line that is separated from hazardous live voltages using reinforced or double insulation in accordance with approved safety standards.
- Before switching on the Platinum String Quad (Quartet), 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.

2.3 CE Marking Conformance

The Platinum String Quad (Quartet) 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 String Quad (Quartet) 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.

2.4 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 3: Product Description

The Platinum String Quad (Quartet) is an integrated solution delivering up to **2000W per axis and 6000W in total of continuous power** in a compact package (224 x 133 x 80 mm (8.82" x 5.24" x 3.15") for the Fins+Fan model, and 224 x 133 x 38.3 mm (8.82" x 5.24" x 1.51") for the L-shape model), designed to simply and efficiently connect Elmo's Platinum String Quad (Quartet) servo drive directly to the application.

This advanced, high power density servo drive provides top performance, Functional Safety, advanced networking as well as a fully featured motion controller and local intelligence.

The Platinum String Quad (Quartet) is provided as a **servo drive with STO Only (Safety Capability "O")** – The servo drive configuration supports only STO.

The Power to the drives is provided by a DC power source (not included with the Platinum String Quad (Quartet)).

Since the power stage is fully isolated from the control stage, the DC rectifier can be fed directly from the mains, without the need for a bulky and expensive transformer.

An auxiliary 24 VDC power supply is required as the Platinum String Quad (Quartet) does not operate without one. In addition, the Auxiliary 24 VDC also powers the heat cooling fan. This smart fan is activated only "when required", significantly prolonging the fan's life-time. The auxiliary 24 VDC power supply also serves as a backup functionality.



Note: The auxiliary 24 VDC must operate from an isolated voltage source within the range of 18 to 30 VDC for the L-shape model and 24 ±10% VDC for the Fins+Fan model.

The drive can operate as a stand-alone device or as part of a multi-axis system in a distributed configuration on a real-time network.

The Platinum String Quad (Quartet) drive is easily set up and tuned using Elmo Application Studio (EASII) software tools now available in both 32bit and 64bit versions. As part of the Platinum product line, it is fully programmable with the Elmo motion control language. For more about software tools refer to the Elmo Application Studio Inline-Help.

3.1 Accessories

The following cable kit may be ordered

Catalog number: CBL-PSTRKIT01 EtherCAT Cable kit

For further details, see the documentation for the Platinum String Quad (Quartet) cable kit.

Chapter 4: Technical Information

4.1 Physical Specification

Feature	Units	All Types
L-shape model Weight	g (oz.)	~980 g (~34.57 oz)
Fins and Fan model Weight		~2630 g (~92.77 Oz)
L-shape model Dimension	mm (in)	224 x 133 x 38.3 mm (8.82" x 5.24" x 1.51")
Fins and Fan model Dimension		224 x 133 x 80 (8.82" x 5.24" x 3.15")
Mounting method		Bookshelf

4.2 Technical Data

The following table describes the technical data for the Platinum String Quad (Quartet).

Feature	Units	6/400
Minimum supply voltage	VDC	50
Nominal supply voltage	VDC	325
Maximum supply voltage	VDC	400
Maximum continuous power output	W	2000W per axis and 6000W total
Efficiency at rated power (at nominal conditions)	%	> 98
Maximum output voltage		> 95% of DC bus voltage
Amplitude sinusoidal/DC continuous current	A	6 (per axis)
RMS (sinusoidal commutation) current ratings	DC	4.24 (per axis)
Peak current limit	A	3 x I _c

Table 1: Power Rating

4.2.1 Control Supply

Feature	Units	Details
Control supply input voltage	VDC	24 ±10% for Fins+Fan model 18 to 30 for L-shape model
Control supply input power	W	TBD

4.2.2 Encoder Supply

Feature	Details
5V supply	5VDC Nominal, 4.75V±5.25V; up to 300mA (for each Axis)
11V supply	11VDC Nominal, 10.6V±11.5V; up to 300mA (for each Axis)

4.2.3 Product Features

4.2.3.1 General Product Features

Main Feature	Details	Presence and No.
Feedback	Standard Ports A and B for each axis.	√
Communication Option	USB	√
	EtherCAT with Address Switches	√
		√
	LAN	√
	CAN (Available in the future)	√
Analog Input	Differential ±10V for each axis	√

4.2.3.2 STO

Main Feature	Details	Presence and No.
STO	5V Logic, Opto Isolated, for IO TYPE = U	√
	PLC source, Opto Isolated, for IO TYPE = V	

4.2.4 Regular IO Features: IO TYPE = U, V

4.2.4.1 IO TYPE = U

Feature	Details	Max. Values	Presence / No.
Digital Input	5V logic (IN1, IN2, IN3, IN4)		4 per axis
Digital Output	5V logic (OUT1, OUT2)	Maximum 15 mA	2 per axis
VDD	Power supply for Outputs	4V to 30V	√

4.2.4.2 IO TYPE = V

Feature	Details	Max. Values	Presence / No.
Digital Input	IN1, IN2, IN3, IN4 PLC Source or Sink, Isolated		4 per axis
Digital Output	OUT1, OUT2 PLC Source or Sink, Isolated	The total current of the two digital outputs must not exceed 750 mA, and the maximum current per output must not exceed 500mA.	2 per axis
VDD	Power supply for Outputs	19.6V to 30V	√

4.3 Environmental Conditions

You can guarantee the safe operation of the Platinum String Quad (Quartet) by ensuring that it is installed in an appropriate environment.



Warning:

During operation the Platinum String Quad (Quartet) becomes hot to the touch (the heatsink and wires may heat up to 85 °C). Care should be taken when handling it.

Feature	Details
Operating ambient temperature according to IEC60068-2-2	0 °C to 55 °C (32 °F to 131 °F)
Storage temperature	-20 °C to +85 °C (-4 °F to +185 °F)
Maximum non-condensing humidity according to IEC60068-2-78	95%
Maximum Operating Altitude	2,000 m (6562 feet) It should be noted that servo drives capable of higher operating altitudes are available on request.
Mechanical Shock according to IEC60068-2-27	15g / 11ms Half Sine
Vibration according to IEC60068-2-6	5 Hz ≤ f ≤ 10 Hz: ±10mm 10 Hz ≤ f ≤ 57 Hz: 4G 57 Hz ≤ f ≤ 500 Hz:5G

Preliminary

4.4 Standards and Certifications

Main Standards	Item
The related standards below apply to the performance of the servo drives as stated in the environmental conditions in section 4.3 Environmental Conditions above.	
IEC 61800-5-2:2016 for STO Certification is pending	Adjustable speed electrical power drive systems – Safety requirements – Functional
EN ISO 13849-1:2015 for STO Certification is pending	Safety of machinery — Safety-related parts of control systems.
IEC/EN 61800-5-1 Certification is pending	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
In compliance with UL61800-5-1	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
In compliance with UL 508C	Power Conversion Equipment
In compliance with UL 840	Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment
Conformity with CE 2006/95/EC	Low-voltage directive 2006/95/EC
In compliance with CSA C22.2 NO. 14-13	Industrial Control Equipment

4.4.1 Dual Use

No export license is required for the Platinum Line products signified with the suffix Q in the Part Number.

The operating frequency of the Platinum Line products is “factory limited” to ≤ 599 Hz, and therefore complies with the EU Dual Use Regulation 428/2009, 3A225, and the US Dual Use regulation EAR ECCN# 3A225.

This statement applies to all identical specimens and will become invalid if a change is made in the firmware.

Chapter 5: Installation

The Platinum String Quad (Quartet) must be installed in a suitable environment and properly connected to its voltage supplies and the motor.

5.1 Unpacking the Drive Components

Before you begin working with the Platinum String Quad (Quartet), verify that you have all of its components, as follows:

- The Platinum String Quad (Quartet) servo drive
- The Elmo Application Studio (EASII) software

The Platinum String Quad (Quartet) is shipped in a cardboard box with Styrofoam protection.

To unpack the Platinum String Quad (Quartet):

1. Carefully remove the servo drive from the box and the Styrofoam.
2. Check the drive 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 drive.
3. To ensure that the Platinum String Quad (Quartet) you have unpacked is the appropriate type for your requirements, locate the part number sticker on the top of the Platinum String Quad (Quartet). It looks like this:



4. Verify that the Platinum String Quad (Quartet) type is the one that you ordered, and ensure that the voltage meets your specific requirements.

The part number at the top provides the type designation. Refer to the appropriate part number in the section Catalog Number at the beginning of the installation guide.

5.2 Mounting the Platinum String Quad (Quartet)

Mount the Platinum String Quad (Quartet) as follows:

L-Shape models:

- Narrow back-side mounting with four M4 screws
- Wide-side mounting with four M4 screws

Fan+Fins models:

- Narrow back-side mounting with four M4 screws

5.2.1 Mounting the L-shaped Platinum String Quad (Quartet)

The Platinum String Quad (Quartet) mounting dimensional guidelines are shown in Figure 50: Platinum String Quad (Quartet) L-Shape.

To mount the L-shape Platinum String Quad (Quartet):

- For narrow back-side mounting the Platinum String Quad (Quartet), use four M4 screws, as shown in Figure 1: Mounting the Platinum String Quad (Quartet) L-Shape below.
- For wide-side mounting the Platinum String Quad (Quartet), use four M4 screws, as shown in Figure 1: Mounting the Platinum String Quad (Quartet) L-Shape below. This is the recommended way to mount the L-shaped Platinum String Quad (Quartet).

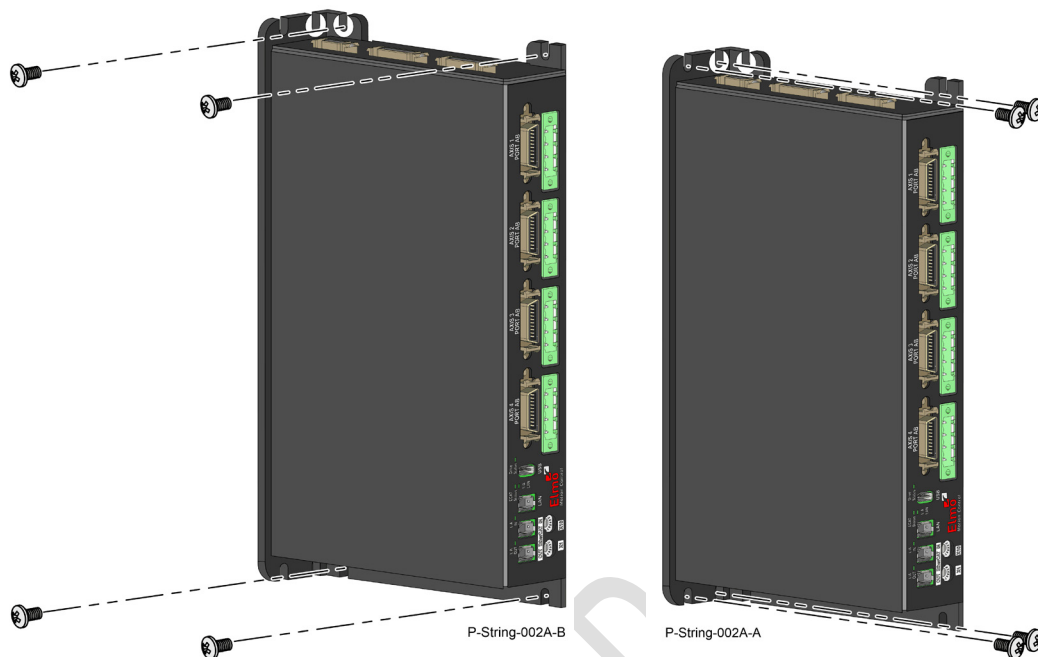


Figure 1: Mounting the Platinum String Quad (Quartet) L-Shape

5.2.2 Mounting the Fins+Fan Platinum String Quad (Quartet)

The Platinum String Quad (Quartet) mounting dimensional guidelines are shown in Figure 51.

To mount the Fins+Fan Platinum String Quad (Quartet):

- Narrow back-side mount the Fins+Fan Platinum String Quad (Quartet) with four M4 screws, as shown in the following figure:

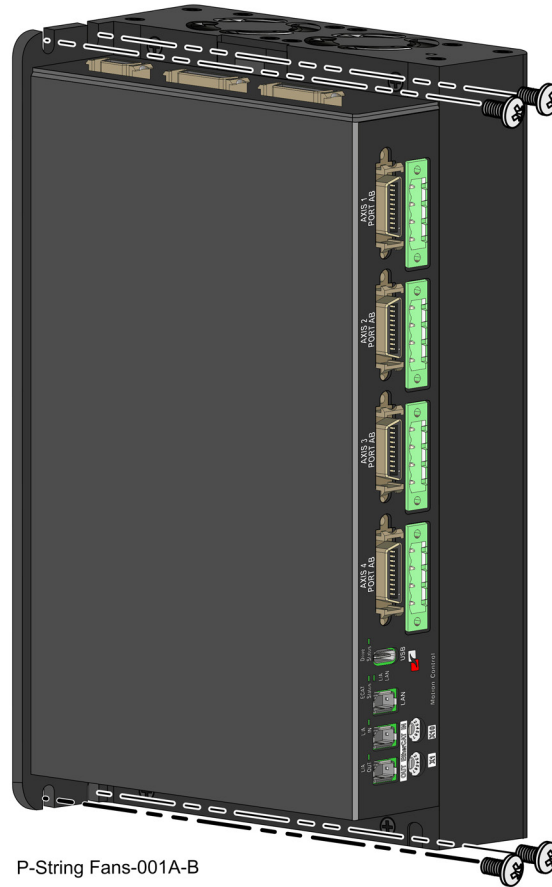


Figure 2: Narrow back-side mounting of Fins+Fan Platinum String Quad (Quartet)

Chapter 6: Connector Types, Pinouts, and LEDs

Throughout this document, all Ax connections refer to the specific axis “x”, numbered from 1...4.

The Platinum String Quad (Quartet) has seventeen connectors.

Port	No. Pins	Type	Function
P3 (M1) M1, M2, M3, PE	4	Pheonix 5.08 mm pitch	Motor A1 phases
P4 (M2) M1, M2, M3, PE	4	Pheonix 5.08 mm pitch	Motor A2 phases
P5 (M3) M1, M2, M3, PE	4	Pheonix 5.08 mm pitch	Motor A3 phases
P6 (M4) M1, M2, M3, PE	4	Pheonix 5.08 mm pitch	Motor A4 phases
P1 Main Power	5	Pheonix 5.08 mm pitch	Power
P2 VL+, VL-	2	Pheonix 3.81 mm pitch	Control Power
P7	20	MDR 1.27 mm pitch	Feedback Port A/B A1
P8	20	MDR 1.27 mm pitch	Feedback Port A/B A2
P9	20	MDR 1.27 mm pitch	Feedback Port A/B A3
P10	20	MDR 1.27 mm pitch	Feedback Port A/B A4
P11	14	MDR 1.27 mm pitch	STO
P12	26	MDR 1.27 mm pitch	I/O1 connector for Port A1 and A2
P13	26	MDR 1.27 mm pitch	I/O2 connector for Port A3 and A4
X3	14	USB Device Type-C	USB
X6	10	IX 0.5 mm pitch	LAN Communication
EtherCAT / CAN Version			
X1	10	IX 0.5 mm pitch	EtherCAT in / CAN in
X2	10	IX 0.5 mm pitch	EtherCAT out / CAN out

6.1 Mating Connector

Connector	Mating Connector Type
P7, P8, P9, P10 Feedback Port A/B	3M 1.27 mm pitch 20-pin 10120-3000PE/PC
P12, P13 I/O	3M 1.27 mm pitch 26-pin 1026-3000PE/PC
X6 LAN communication	HIROSE 0.5 mm pitch 10-pin IX30G-A-105-CV (7.0)
X1, X2 IN/OUT CAN/EtherCAT Communication	HIROSE 0.5 mm pitch 10-pin IX30G-A-105-CV (7.0)
P11 STO	3M 1.27 mm pitch 14-pin 10114-3000PE/PC
P3/M1, P4/M2, P5/M3, P6/M4 Motor Phases	Phoenix 5.08 mm pitch terminal 4-pin plug 1912207
P1 Main Power	Phoenix 5.08 mm pitch terminal 5-pin plug 1912210
P2 Control Power	Phoenix 3.81 mm pitch terminal 2-pin plug 1748354
X3 USB	Standard Type C cable

Preliminary

6.2 Connector Locations



Figure 3: IO, Power, Control Power and STO Connector Locations

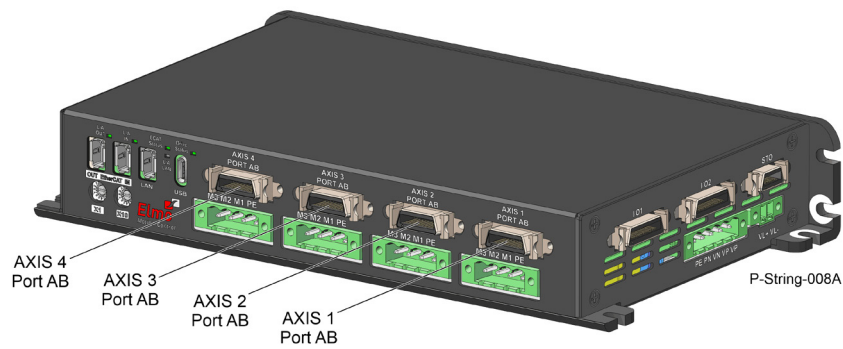


Figure 4: Feedback Connector Locations

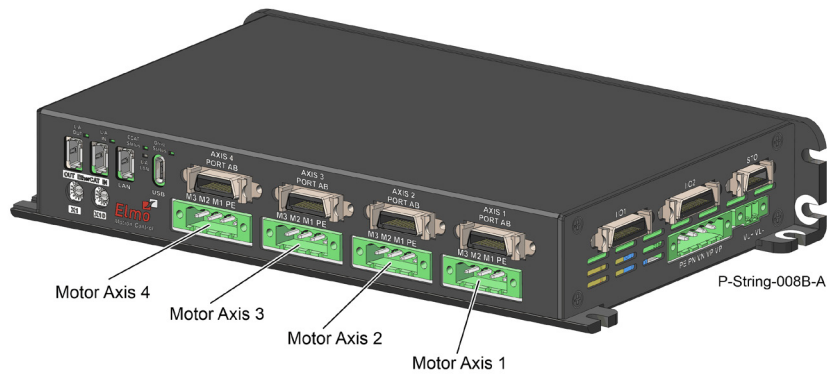


Figure 5: Motor Power Connector Locations

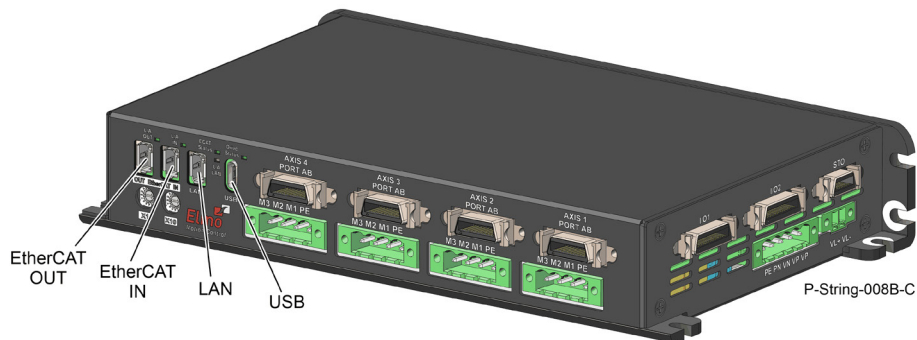


Figure 6: ECAT, LAN, USB Locations

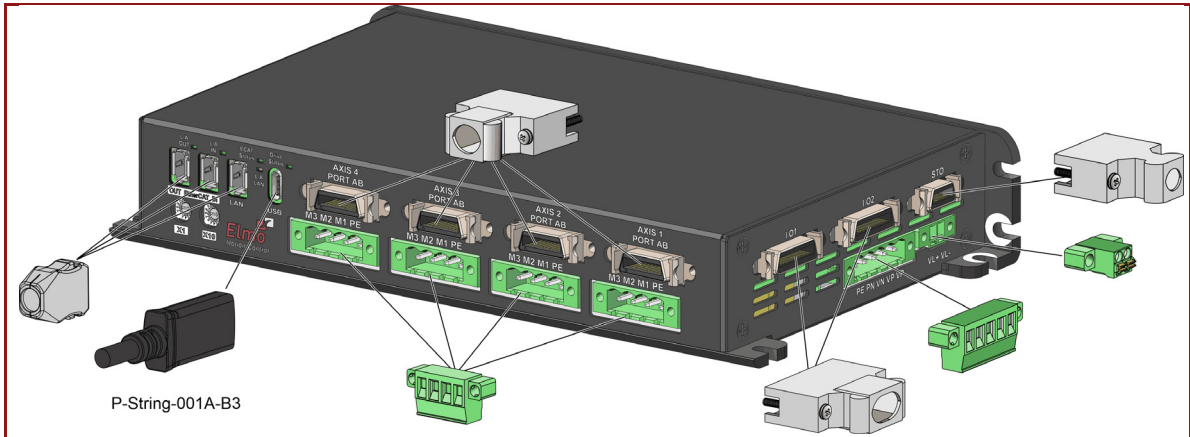


Figure 7: Mating Connector Locations - 1

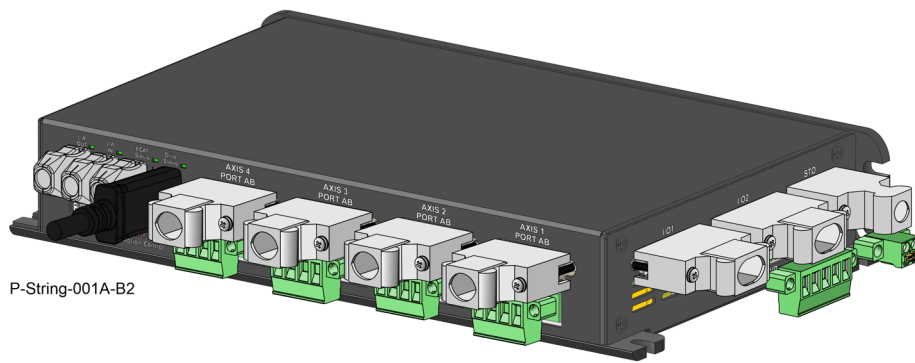


Figure 8: Mating Connector Locations - 2

Table 2: Connector Types

The pinouts in Chapter 7: Wiring describe the function of each pin in the Platinum String Quad (Quartet) connectors that are listed in Table 2.

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6.3 Motor Power Connector Pinouts (P3, P4, P5, P6)

The following table describes the pinouts for the Motor Power connectors P3 (Motor M1), P4 (Motor M2), P5 (Motor M3), and P6 (Motor M4).

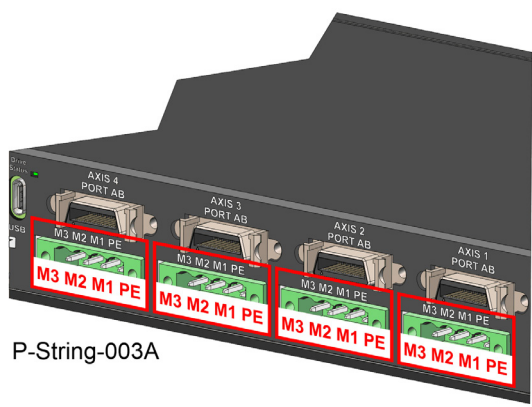
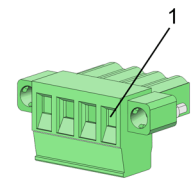
P3/P4/P5/P6	Pin Signal	Function	Cable – Wires		
			Brushless Motor	Brushed DC Motor	
1	PE	Shield	Motor PE	Motor PE	
2	M1	Motor phase	Motor	No Connection	
3	M2	Motor phase	Motor	Motor	
4	M3	Motor phase	Motor	Motor	
Pin Positions				Connector	
 <p>P-String-003A</p>				 <p>Motor Connector JCW-203104F0 P-String-001B-G</p>	

Table 3: Main Power and Motor Connections

6.4 Main Power Connector Pinouts (P1)

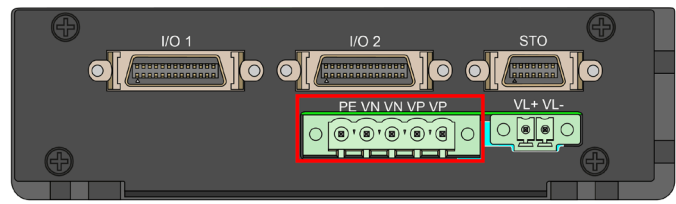
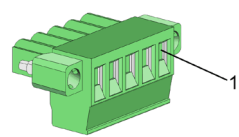
Pin (P1) No.	Signal	Function	Cable
1	VP+	DC Power Supply input	DC Power
2	VP+	DC Power Supply input	DC Power
3	VN	Power Supply Return	DC Power
4	VN	Power Supply Return	DC Power
5	PE	SHIELD	DC Power
Pin Positions			Connector
 <p>P-String-009A</p>			 <p>VP Connector JCW-203105F0 P-String-001B-E</p>

Table 4: Main Power and Motor Connections

6.5 Control Power Supply Connector Pinouts (P2)

Pin (P2)	Signal	Function
1	VL+	Control Supply Logic Input +24VDC
2	VL-	Control Supply Logic Input Return

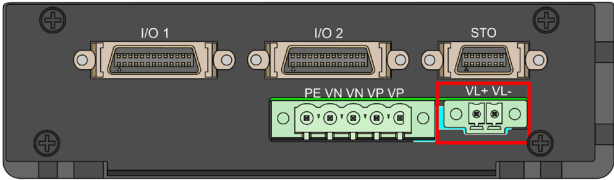
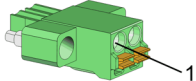
Pin Positions	Cable Connector
 <p>P-String-009A-A</p>	 <p>VL Connector JCW-202102FC P-String-001B-D</p>

Table 5: Control Supply Pins

6.6 STO Connector Pinouts (P11)

Pin (P11)	Signal	Function	
1	1A	A1_STO1 A1 STO1 Input Opto Isolated	
2	2A	A1_STO2 A1 STO2 Input Opto Isolated	
3	3A	A1_STO return A1 STO1+2 Input return	
4	4A	A2_STO1 A2 STO1 Input Opto Isolated	
5	5A	A2_STO2 A2 STO2 Input Opto Isolated	
6	6A	A2_STO return A2 STO1+2 Input return	
7	7A	VL+	Output VL, in PLC model as user bypass
		Not Connected	Not connected in TTL model
8	1B	A3_STO1 A3 STO1 Input Opto Isolated	
9	2B	A3_STO2 A3 STO2 Input Opto Isolated	
10	3B	A3_STO return A3 STO1+2 Input return	
11	4B	A4_STO1 A4 STO1 Input Opto Isolated	
12	5B	A4_STO2 A4 STO2 Input Opto Isolated	
13	6B	A4_STO return A4 STO1+2 Input return	
14	7B	COMRET Common return	

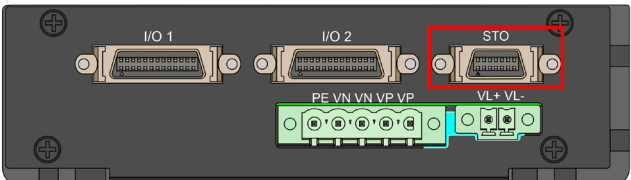
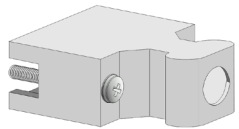
Pin Positions	Cable Connector
 <p>P-String-009A-B</p>	 <p>STO Connector P-String-001B-F</p>

Table 6: STO Pins

6.7 Feedback Port A and Port B Connector Pinouts (P7, P8, P9, P10)

The following tables describe the pinouts for the Port A and B Feedbacks P7 (AB1), P8 (AB2), P9 (AB3), and P10 (AB4). The Port A and Port B signals are similar for each of the connector pinouts, and are labelled Px = P7, P8, P9, or P10, where x=7, 8, 9, 10 axis in the connection diagrams in section 7.6 Feedbacks (P7, P8, P9, P10).

Pin No.	No. Pins	Description
P7	20	Port A and Port B Feedback, A1
P8	20	Port A and Port B Feedback, A2
P9	20	Port A and Port B Feedback, A3
P10	20	Port A and Port B Feedback, A4

6.7.1 Port A

P7/P8/P9/P10		Signal	Incremental Encoder	Absolute Serial Encoder
			Function	Function
3A	3	PORTA_A+/ CLK+	Channel A +	Absolute encoder clock+
4A	4	PORTA_A-/ CLK-	Channel A -	Absolute encoder clock-
5A	5	PORTA_B+/DATA+	Channel B +	Absolute encoder data +
6A	6	PORTA_B-/ DATA-	Channel B -	Absolute encoder data -
7A	7	PORTA_Index+	Channel Index+	
8A	8	PORTA_Index-	Channel Index-	

Table 7:Port A Pin Assignments

6.7.2 Port B

P7/P8/P9/P10		Signal	Incremental Encoder	Interpolated Analog Encoder
			Function	Function
3B	13	PORTB_A+ /SIN+	Channel A+	Sine+
4B	14	PORTB_A- /SIN-	Channel A-	Sine-
5B	15	PORTB_B+ /COS+	Channel B+	Cosine+
6B	16	PORTB_B- /COS-	Channel B-	Cosine-
7B	17	PORTB_Index+	Channel Index+	Analog Index+
8B	18	PORTB_Index-	Channel Index-	Analog Index-

Table 8: Port B Pin Assignments

6.7.3 Hall Sensors

P7/P8/P9/P10	Signal	Function
9A	9	HA
10A	10	HC
9B	19	HB

Table 9: Hall Sensors Pin Assignments

6.7.4 Feedback Power Supply

P7/P8/P9/P10		Signal	Function
1A	1	+11VE	+11VE supply
2A	2	COMRET	Common return
1B	11	+5VE	+5VE supply
2B	12	COMRET	Common return
10B	20	COMRET	Common return

Table 10: Supply

6.7.5 Pin Positions

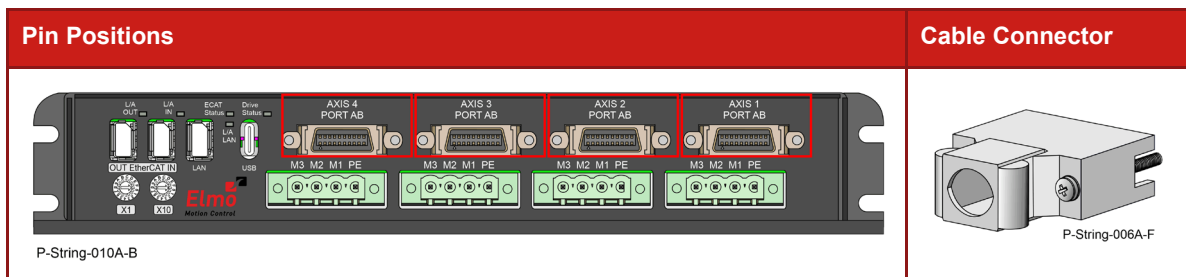


Table 11: Port A and Port B Pin Positions

6.8 Digital I/Os, & Analog Inputs Connector Pinouts (P12, P13)

The Digital I/Os and Analog Inputs connector includes the following functions:

- Digital I/O
- Analog input

The Digital I/O and Analog Input signals are similar for each of the connector pinouts, and are labelled **P12** and **P13**, in the connection diagrams in section 7.7 Digital I/Os (P12, P13) .

Pin No.	No. Pins	Description
P12	26	I/O1 connector for Port 1 and 2
P13	26	I/O2 connector for Port 3 and 4

6.8.1 I/O 1 Connector for Port 1 and 2 (P12)

Pin	Signal	Function	
1A	1	ANALOG_RET	Analog input Return
2A	2	Analog+ A1	Differential Analog input A1, $\pm 10V$
3A	3	Analog- A1	Differential Analog input A1 complement, $\pm 10V$
4A	4	IN_COM A1	Inputs Common A1 and PLC Select A1
5A	5	IN1_A1	Digital input 1 Isolated A1
6A	6	IN2_A1	Digital input 2 Isolated A1
7A	7	IN3_A1	Digital input 3 Isolated A1
8A	8	IN4_A1	Digital input 4 Isolated A1
9A	9	OUT1_A1	Digital output 1 Isolated A1, $I_{max}=250mA$
10A	10	OUT2_A1 (BRK_OUT)	Digital output 2 Isolated A1, $I_{max}=500mA$
11A	11	VDD	VDD Supply for Digital Output
12A	12	VDD	VDD Supply for Digital Output
13A	13	VDD	VDD Supply for Digital Output
1B	14	ANALOG_RET	Analog input Return
2B	15	Analog+ A2	Differential Analog input A2, $\pm 10V$
3B	16	Analog- A2	Differential Analog input A2 complement, $\pm 10V$
4B	17	IN_COM A2	Inputs Common A2 and PLC Select A2
5B	18	IN1_A2	Digital input 1 Isolated A2
6B	19	IN2_A2	Digital input 2 Isolated A2
7B	20	IN3_A2	Digital input 3 Isolated A2
8B	21	IN4_A2	Digital input 4 Isolated A2
9B	22	OUT1_A2	Digital output 1 Isolated A2, $I_{max}=250mA$

Pin	Signal	Function	
10B	23	OUT2_A2 (BRK_OUT)	Digital output 2 Isolated A2, I _{max} =500mA
11B	24	VDD_RET	VDD Supply return for digital outputs
12B	25	VDD_RET	VDD Supply return for digital outputs
13B	26	VDD_RET	VDD Supply return for digital outputs

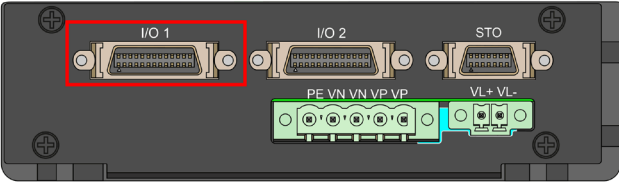
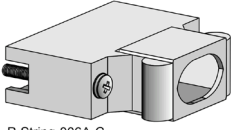
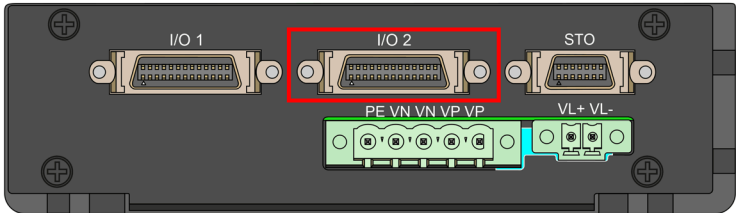
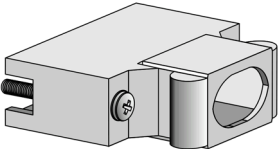
Pin Positions	Cable Connector
 <p>P-String-009A-C</p>	 <p>P-String-006A-C</p>

Table 12: I/O 1 Connector for Port 1 and 2 - Pin Assignments

6.8.2 I/O 2 Connector for Port 3 and 4 (P13)

Pin	Signal	Function	
1A	1	ANALOG_RET	Analog input Return
2A	2	Analog+ A3	Differential Analog input A3, ±10V
3A	3	Analog- A3	Differential Analog input A3 complement, ±10V
4A	4	IN_COM A3	Inputs Common A3 and PLC Select A3
5A	5	IN1_A3	Digital input 1 Isolated A3
6A	6	IN2_A3	Digital input 2 Isolated A3
7A	7	IN3_A3	Digital input 3 Isolated A3
8A	8	IN4_A3	Digital input 4 Isolated A3
9A	9	OUT1_A3	Digital output 1 Isolated A3, I _{max} =250mA
10A	10	OUT2_A3 (BRK_OUT)	Digital output 2 Isolated A3, I _{max} =500mA
11A	11	VDD	VDD Supply for Digital Output
12A	12	VDD	VDD Supply for Digital Output
13A	13	VDD	VDD Supply for Digital Output
1B	14	ANALOG_RET	Analog input Return
2B	15	Analog+ A4	Differential Analog input A4, ±10V
3B	16	Analog- A4	Differential Analog input A4 complement, ±10V
4B	17	IN_COM A4	Inputs Common A4 and PLC Select A4
5B	18	IN1_A4	Digital input 1 Isolated A4
6B	19	IN2_A4	Digital input 2 Isolated A4

Pin		Signal	Function
7B	20	IN3_A4	Digital input 3 Isolated A4
8B	21	IN4_A4	Digital input 4 Isolated A4
9B	22	OUT1_A4	Digital output 1 Isolated A4, I _{max} =250mA
10B	23	OUT2_A4 (BRK_OUT)	Digital output 2 Isolated A4, I _{max} =500mA
11B	24	VDD_RET	VDD Supply return for digital outputs
12B	25	VDD_RET	VDD Supply return for digital outputs
13B	26	VDD_RET	VDD Supply return for digital outputs

Pin Positions	Cable Connector
 <p>P-String-009A-D</p>	 <p>P-String-006A-C</p>

Preliminary

6.9 USB Connector Pinouts (X3)

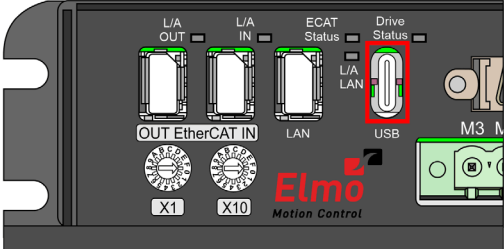
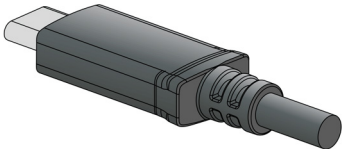
Pin (X3)	Signal	Function
A1	COMRET	Common return
A4	USB_VBUS	USB VBUS 5 V
A5	Not Connected	
A6	USBD+	USB _P line
A7	USBD-	USB _N line
A9	USB_VBUS	USB VBUS 5 V
A12	COMRET	Common return
B1	COMRET	Common return
B4	USB_VBUS	USB VBUS 5 V
B5	Not Connected	
B6	USBD+	USB _P line
B7	USBD-	USB _N line
B9	USB_VBUS	USB VBUS 5 V
B12	COMRET	Common return
Pin Positions		Cable Connector
 <p>P-String-010A-G</p>		 <p>P-String-001A-C</p>

Table 13: USB Device Type C - Pin Assignments

6.10 EtherCAT and LAN Pinouts (X1, X2, X6)

Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Platinum String Quad (Quartet) supports the EtherCAT fieldbus type industrial network protocol.

6.10.1 EtherCAT IN Connector Pinouts (X1)

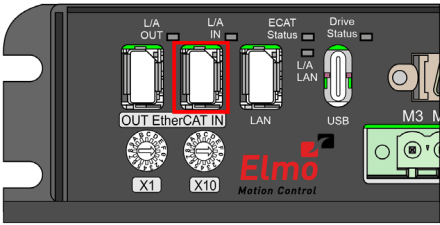
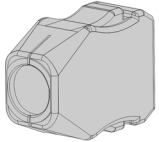
Pin (X1)	Signal	Function
1	ECAT_IN_TX+	EtherCAT in Transmit+
2	ECAT_IN_TX-	EtherCAT in Transmit-
3	Not Connected	
4	Not Connected	
5	Not Connected	
6	ECAT_IN_RX+	EtherCAT in Receive+
7	ECAT_IN_RX-	EtherCAT in Receive-
8	Not Connected	
9	Not Connected	
10	Not Connected	
Pin Positions		Cable Connector
 <p>P-String-010A-C</p>		 <p>P-String-001B-H</p>

Table 14: EtherCAT IN Pin Assignments

6.10.2 EtherCAT OUT Connector Pinouts (X2)

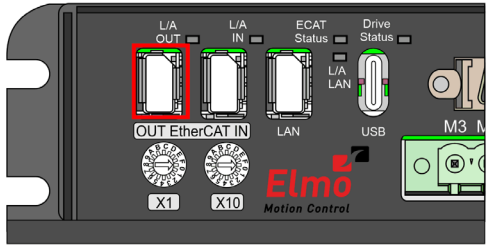
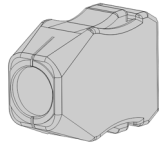
Pin (X2)	Signal	Function
1	EtherCAT_OUT_TX+	EtherCAT out transmit +
2	EtherCAT_OUT_TX-	EtherCAT out transmit -
3	Not Connected	
4	Not Connected	
5	Not Connected	
6	EtherCAT_OUT_RX+	EtherCAT out receive +
7	EtherCAT_OUT_RX-	EtherCAT out receive -
8	Not Connected	
9	Not Connected	
10	Not Connected	
Pin Positions		Cable Connector
 <p>P-String-010A-D</p>		 <p>P-String-001B-H</p>

Table 15: EtherCAT OUT Pin Assignments

6.10.3 LAN Connector Pinouts (X6)

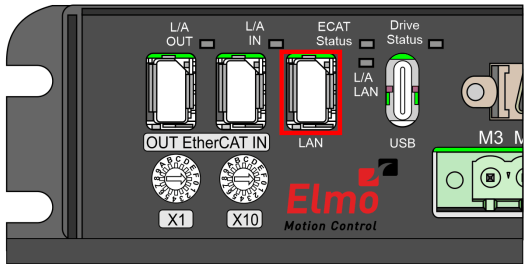
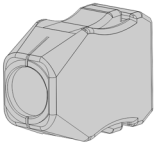
Pin (X6)	Signal	Function
1	LAN_TX+	Ethernet Transmit+
2	LAN_TX-	Ethernet Transmit-
3	Not Connected	
4	Not Connected	
5	Not Connected	
6	LAN_RX+	Ethernet Receive+
7	LAN_RX-	Ethernet Receive-
8	Not Connected	
9	Not Connected	
10	Not Connected	
Pin Positions		Cable Connector
 <p>P-String-010A-F</p>		 <p>P-String-001B-H</p>


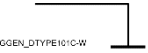
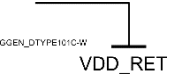
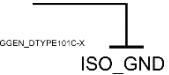
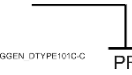
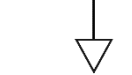
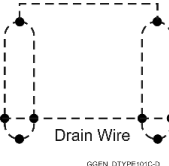
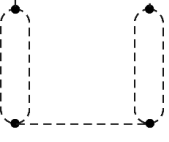
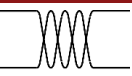
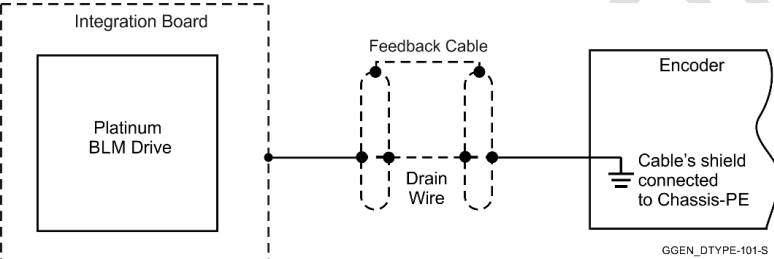
Table 16: LAN Pin Assignments

Chapter 7: Wiring

7.1 Wiring Legend

Once the product is mounted, you are ready to wire the device. Proper wiring, grounding and shielding are essential for ensuring safe, immune and optimal servo performance of the drive.

The following table legend describes the wiring symbols detailed in all installation guides.

Wiring Symbol	Description
	Earth connection (PE)
 GGEN_DTYPE101C-W	User Side: This symbol signifies that any type of grounding may be used on the user side
 GGEN_DTYPE101C-W VDD_RET	VDD Return
 GGEN_DTYPE101C-X ISO_GND	Isolated Ground
 GGEN_DTYPE101C-C PR	Power Return
 GGEN_DTYPE101C-S	COMRET Common at the Drive
 GGEN_DTYPE101D-D Drain Wire	Shielded cable with drain wire. The drain wire is a non-insulated wire that is in direct contact with the braid (shielding). Shielded cable with drain wire significantly simplifies the wiring and earthing.
 GGEN_DTYPE101C-E	Shielded cable braid only, without drain wire.
 GGEN_DTYPE101C-F	Twisted-pair wires
 GGEN_DTYPE-101-S Encoder Earthing. The cable's shield is connected to the chassis (PE) in the connector. The servo drive shield is connected to Earth.	

7.2 The Platinum String Quad (Quartet) Connection Diagram

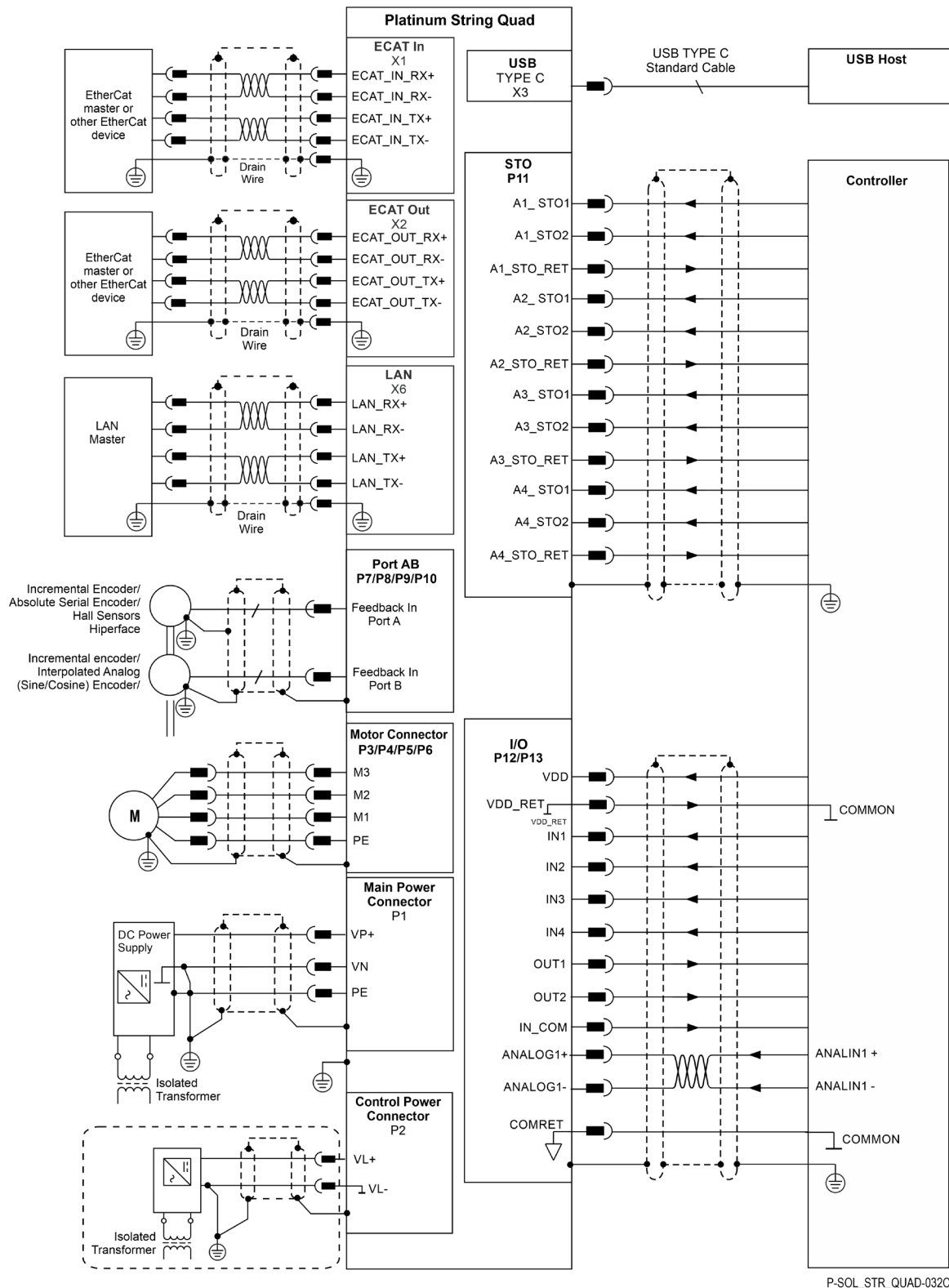


Figure 9: Platinum String Quad (Quartet) EtherCAT Connection Diagram

7.3 Motor Power (P3, P4, P5, P6)

For Motor connections to 4 axes, use the following connection diagrams and procedure, depending on the motor type.

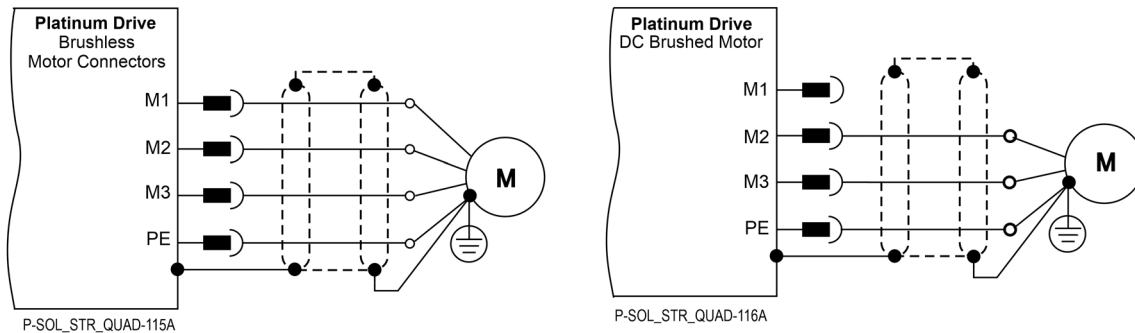


Figure 10: Brushless and Brushed Motor Power Connections Diagrams

To connect the motor power:

1. Ensure that the motor chassis is properly earthed.
2. Connect the appropriate wire from the Motor Power cables to the M1, M2, M3, and PE terminals on the Platinum String Quad (Quartet).
Make sure not to bundle the wires.
3. The phase connection is arbitrary as Elmo Application Studio (EAS II) will establish the proper commutation automatically during setup. When tuning a number of drives, you can copy the setup file to the other drives and thus avoid tuning each drive separately. In this case the motor-phase order must be the same as on the first drive.
4. For high EMI environment, it is highly recommended to use a 4-wire shielded (not twisted) cable for the motor connection. The gauge is determined by the actual RMS current consumption of the motor.
5. Connect the cable shield to the closest ground connection at the motor end.
For better EMI performance, the shield should be connected to Earth Connection (heat sink mounting holes).

7.4 Main (P1) and Control Power (P2)

The Platinum String Quad (Quartet) receives power from Main and Control supplies and delivers power to the motor.

7.4.1 Main Supply

The DC power for the Platinum String Quad (Quartet) is delivered from a separated rectifying unit (supplied by the user). Elmo recommends using the Tambourine rectifier specifically designed for use with Elmo drives which offers a range of versatile options.

The following sections contain topology recommendations for implementing three-phase supply chain.

The power stage of the Platinum String Quad (Quartet) is fully isolated from the other sections of the Platinum String Quad (Quartet), such as the control-stage and the heat sink. **This isolation allows the user to connect the common of the control section to the PE, a connection that significantly contributes to proper functionality, safety and EMI immunity, leading to better performance of the Platinum String Quad (Quartet).**

In addition, this isolation simplifies the requirements of the DC power supply that is used to power the DC bus of the Platinum String Quad (Quartet), by allowing it to operate with a non-isolated DC power source (a direct-to-mains connection) which eliminates the need for a bulky and expensive isolation transformer.

However, as well as operating from a non-isolated/direct-to-mains DC power supply, the Platinum String Quad (Quartet) can also operate from an isolated power supply or batteries.

When rectifying the AC voltage source, the AC voltage-level must be limited as follows:

Drive Model (V)	AC voltage-level limit (VAC)	DC Maximum (VDC)
400	270	390

7.4.1.1 Direct-to-Mains Power Source

This section relates to the configuration of the drive, which is connected directly to the mains.

To connect the non-isolated DC power supply:

1. For best immunity, it is highly recommended to use twisted cables for the DC power supply cable. A 3-wire shielded cable should be used. The gauge is determined by the actual current consumption of the motor.
2. Connect both ends of the cable shield to the closest ground connection, one end near the power supply and the other end to the PE terminal on the Platinum String Quad (Quartet)'s heat sink.
3. Do not connect the VN- of the power supply to the ground connection in the power supply side. This connection is only for isolated connections.
4. Connect the appropriate terminal lugs from the DC Power Input cables to the VP+, VN-, and PE terminals on the Platinum String Quad (Quartet).

7.4.1.1.1 Three-Phase Direct-to-Mains Connection Topology

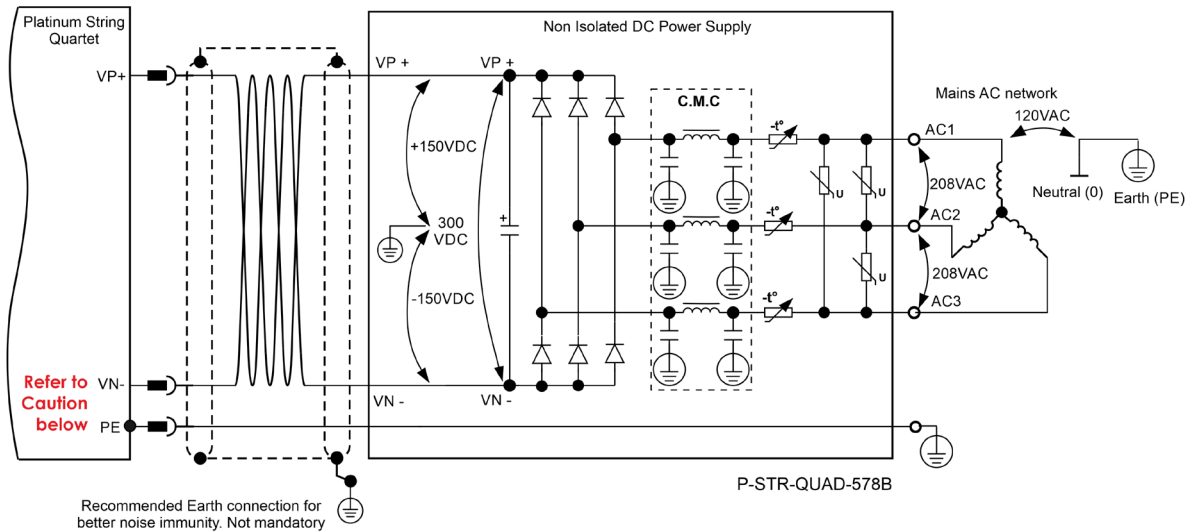


Figure 11: Non-Isolated Three-Phase Connection Topology



Caution:

- Do not connect VN- to PE. In a direct-to-mains connection the VN- must *not* be connected to the PE, as this will cause irreparable damage to the system.
- Take care and note that in a direct-to-mains connection the Neutral point is *not* the most negative voltage level. It is the mid-point level of the rectified DC bus.

7.4.1.1.2 Single-Phase Direct-to-Mains Connection Topology

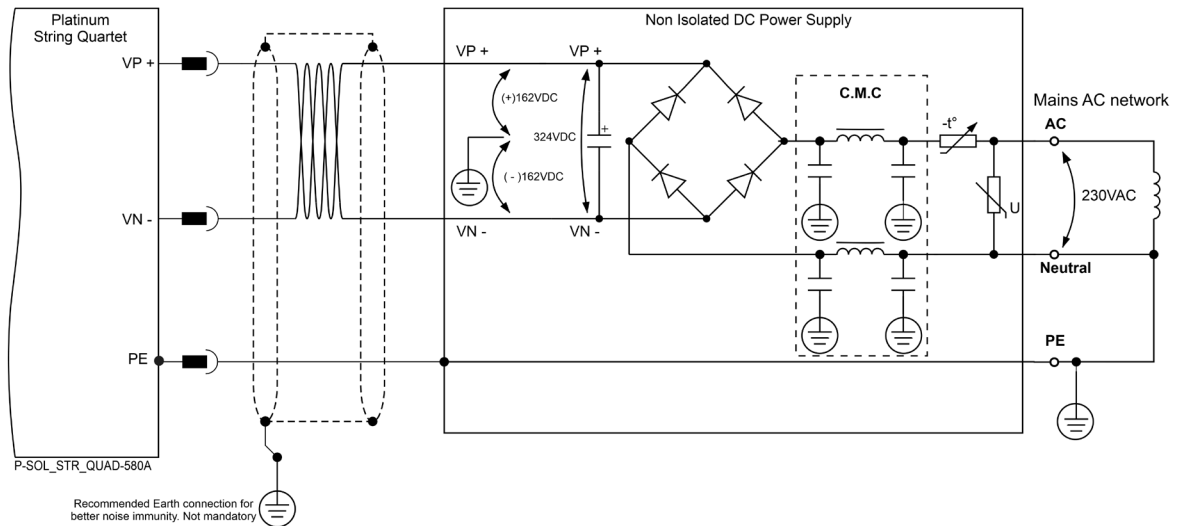


Figure 12: Non-isolated Single-Phase Connection Topology

The Power Supply is connected directly to the mains AC line.

7.4.1.2 Isolated DC Power Supply

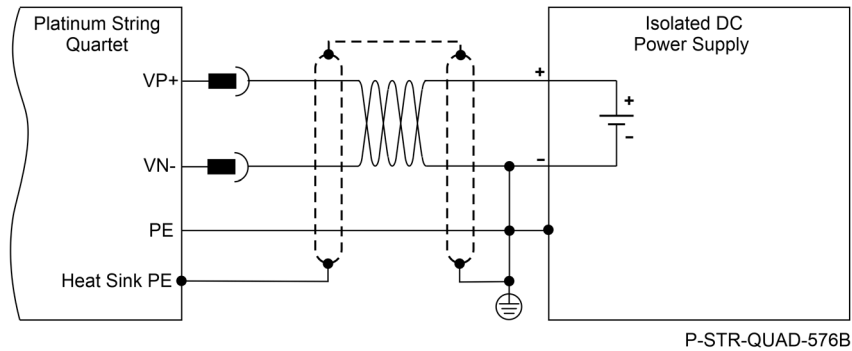


Figure 13: Isolated DC Connection Topology



Caution: When using an isolated DC power supply, it is recommended to connect the negative pole to the PE.

7.4.2 Control Supply

To connect the VL+ and VL- to the control supply:

1. The source of the control supply must be isolated from the Mains.
2. For safety reasons, connect the return (common) of the control supply source to the closest earth connection near the control supply source.
3. Connect the cable shield to the closest earth connection near the control supply source.
4. Before applying power, verify the polarity of the connection.

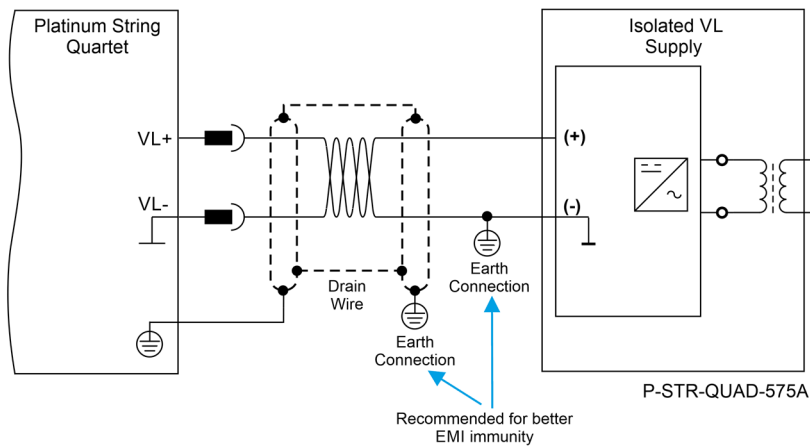


Figure 14: 24 VDC Control Supply VL Connection Diagram

7.5 STO (Safe Torque Off) (P11)

7.5.1 Source Mode – PLC Voltage Level

Refer to the diagrams below for the PLC Source option connection.

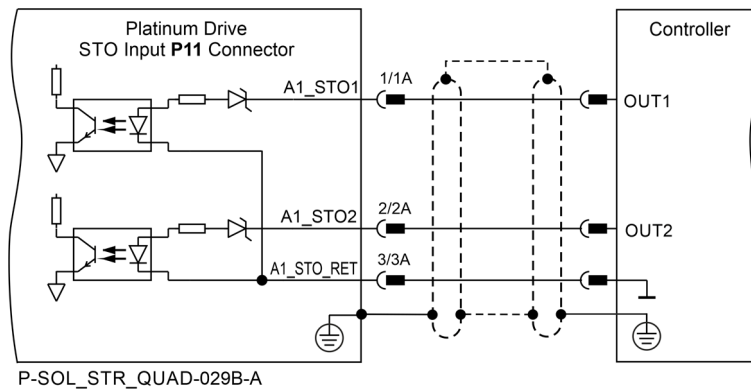


Figure 15: STO Input Connection – PLC Source Option for Axis A1

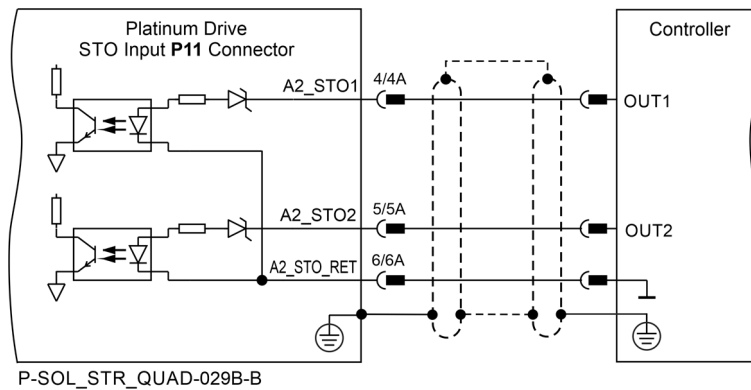


Figure 16: STO Input Connection – PLC Source Option for Axis A2

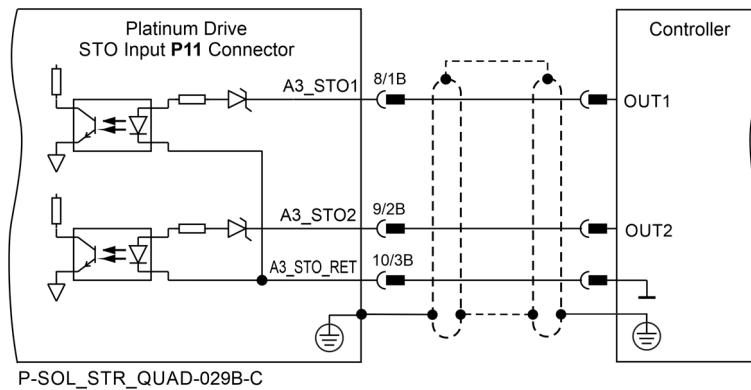


Figure 17: STO Input Connection – PLC Source Option for Axis A3

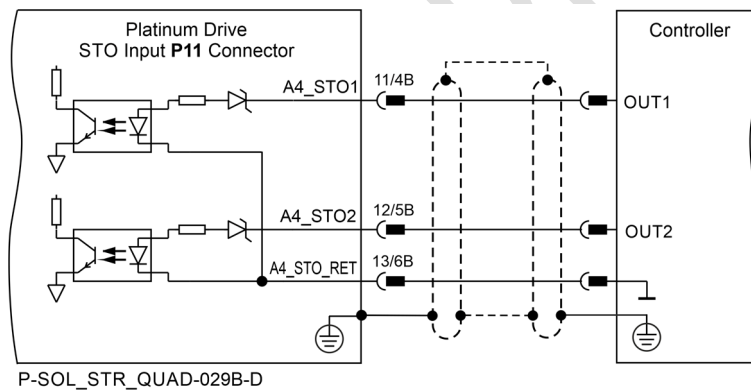


Figure 18: STO Input Connection – PLC Source Option for Axis A4

7.5.2 TTL Mode – TTL Voltage Level

Refer to the diagrams below for TTL option connection.

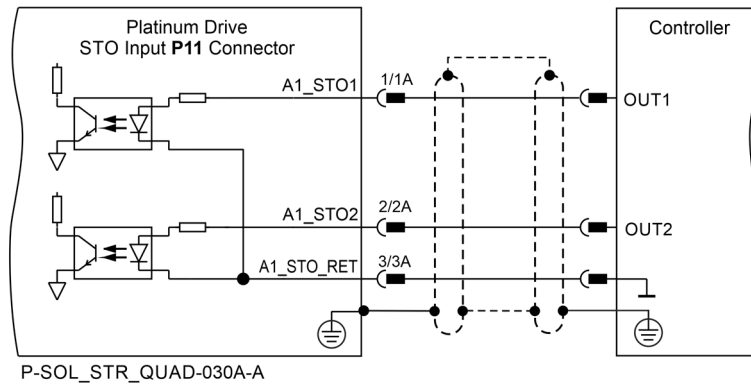


Figure 19: STO Input Connection – TTL Option for Axis 1

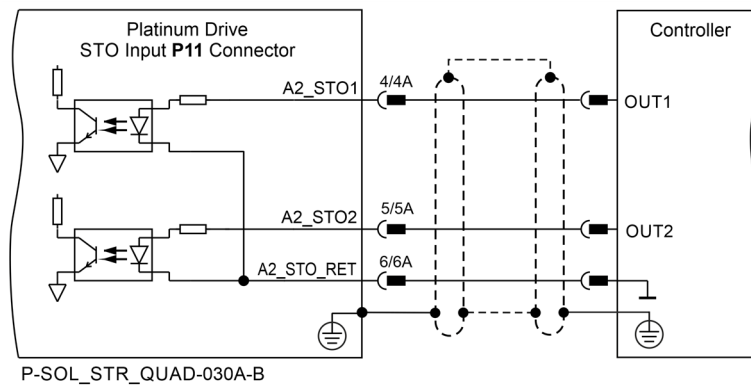


Figure 20: STO Input Connection – TTL Option for Axis 2

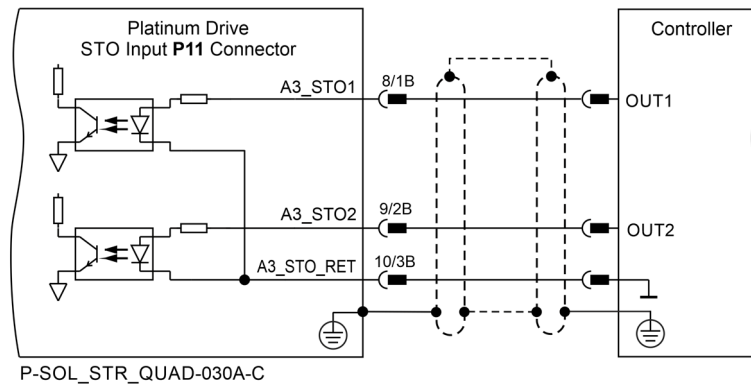


Figure 21: STO Input Connection – TTL Option for Axis 3

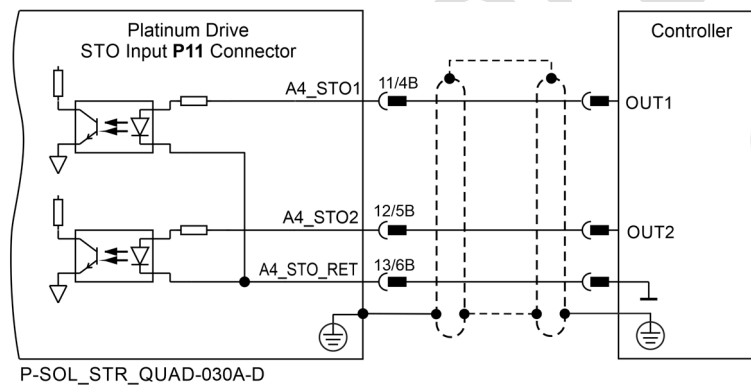


Figure 22: STO Input Connection – TTL Option for Axis 4

7.6 Feedbacks (P7, P8, P9, P10)

7.6.1 Feedback Port A

Port A supports the following sensor inputs:

- Incremental Encoder or absolute serial Encoder
- Differential pulse-width modulation (PWM) signal input
- Differential Pulse & Direction signal inputs

7.6.1.1 Incremental Encoder

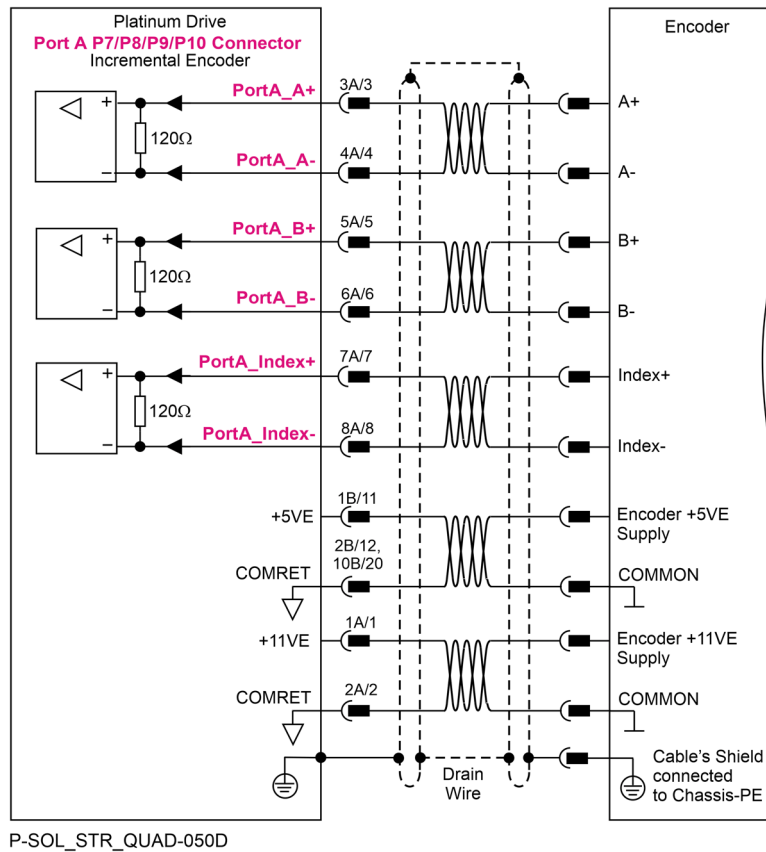


Figure 23: Port A Incremental Encoder Input – Recommended Connection Diagram

7.6.1.2 Absolute Serial Encoder

The following Absolute Encoder types are supported:

- EnDat 2.2
- Biss C and Biss B
- SSI
- Hiperface

The following is the diagram connection of the EnDat, Biss, SSI:

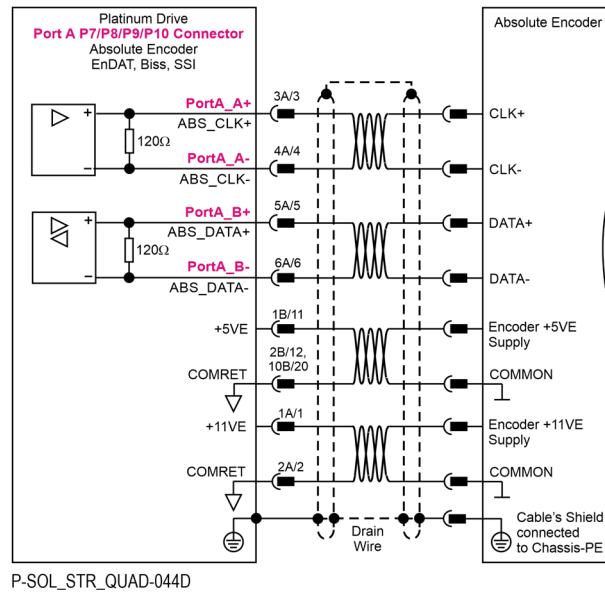


Figure 24: Absolute Serial Encoder – Recommended Connection Diagram for EnDat, Biss, SSI

7.6.1.3 Hiperface

The following figure describes the connection diagram.

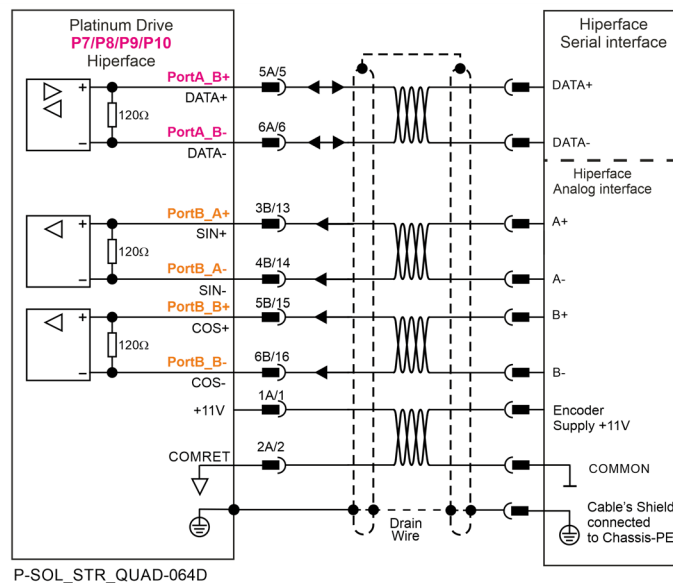


Figure 25: Absolute Serial Encoder – Recommended Connection Diagram for Stegmann Hiperface

7.6.2 Feedback Port B

Port B supports any of the following sensors:

- Incremental Encoder
- Interpolated analog Encoder
- Analog Hall sensors

Differential PWM signal input can be connected to port B

7.6.2.1 Incremental Encoder

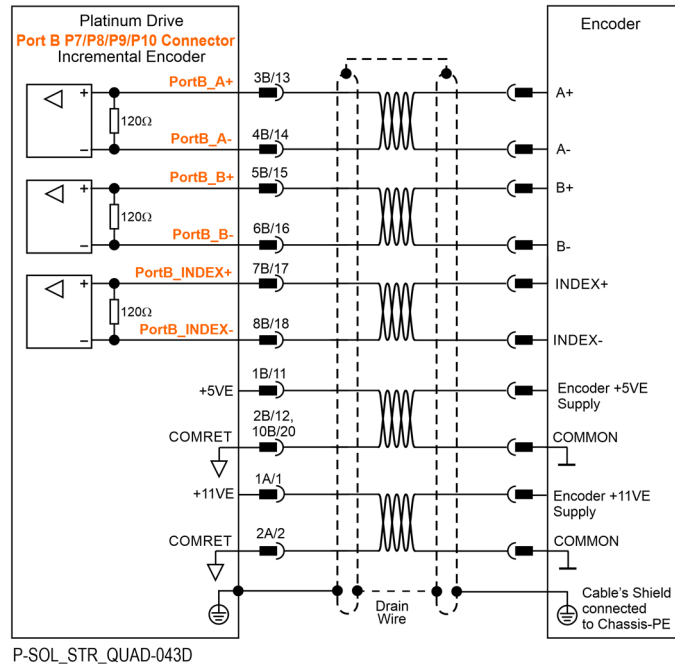


Figure 26: Port B Incremental Encoder Input – Recommended Connection Diagram

7.6.2.2 Interpolated Analog (Sine/Cosine) Encoder

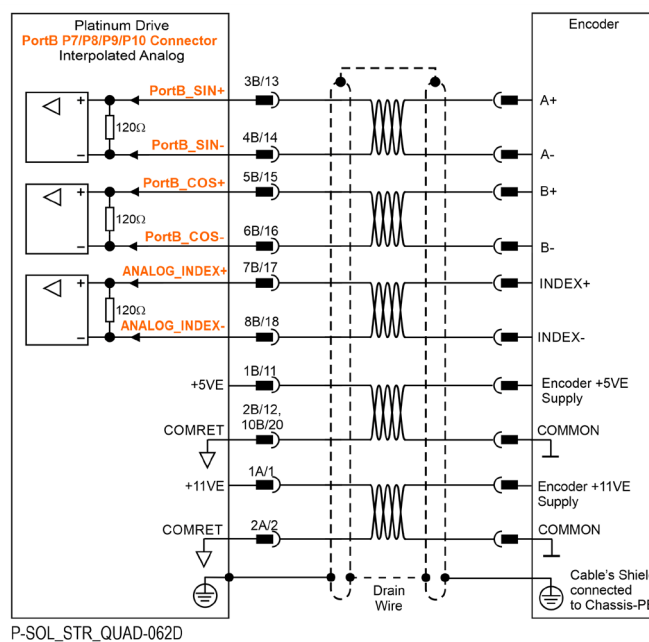


Figure 27: Port B - Interpolated Analog Encoder Connection Diagram

7.6.3 Feedback - Hall Sensors

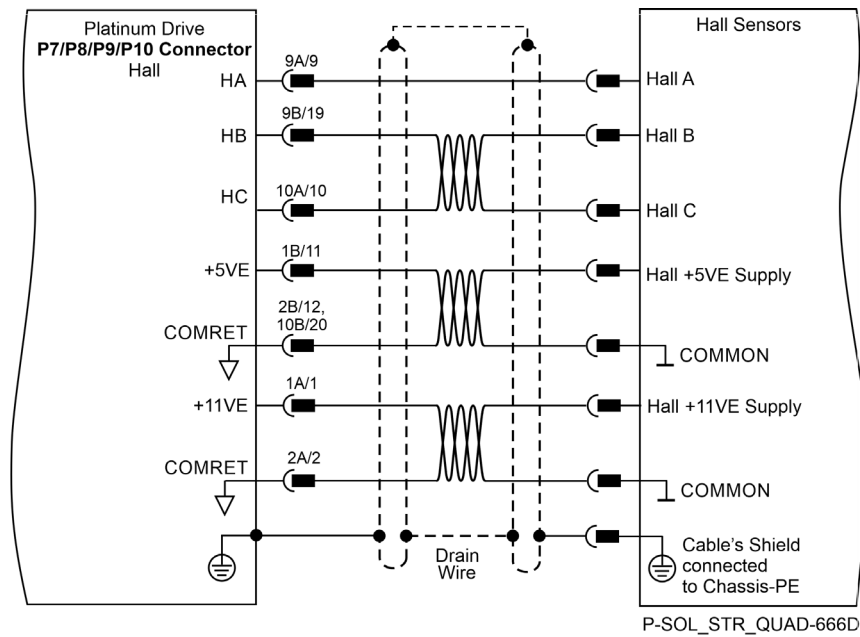


Figure 28: Hall Sensors Connection Diagram

7.7 Digital I/Os (P12, P13)

The following connection diagrams describe the Digital IO connections.

7.7.1 Digital IO PLC Source and Sink Mode (IO Type: V)

7.7.1.1 Digital Input and Output PLC Source Mode

The following figures describe the connections at the I/O Port for the Digital Input and Output PLC Source Mode for A1 and A2.

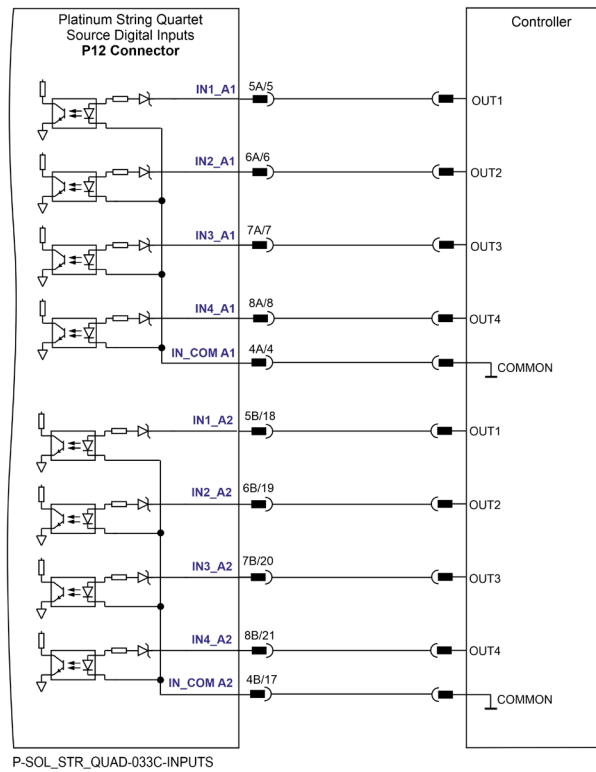


Figure 29: Digital Inputs Connection Diagram for A1 and A2 – Source Option PLC

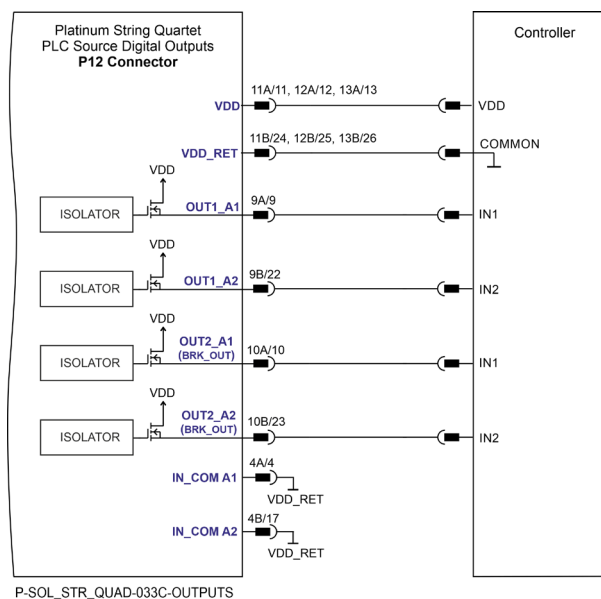


Figure 30: Digital Outputs Connection Diagram for A1 and A2 – Source Option PLC

The following figures describe the connections at the I/O Port for the Digital Input and Output PLC Source Mode for A3 and A4

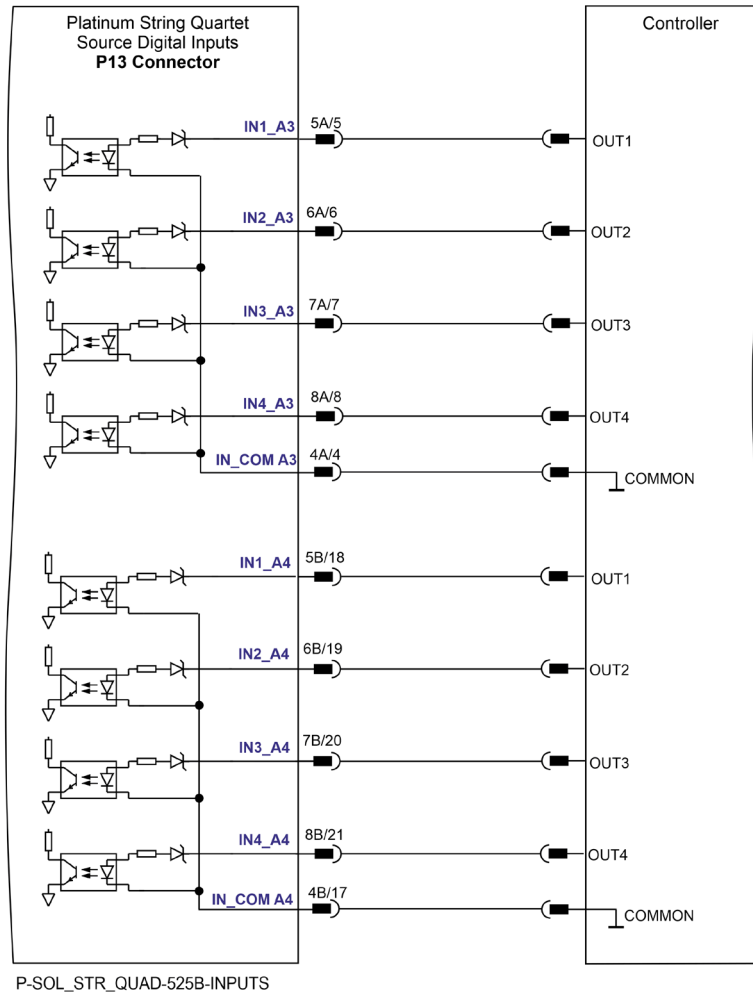


Figure 31: Digital Inputs Connection Diagram for A3 and A4 – Source Option PLC

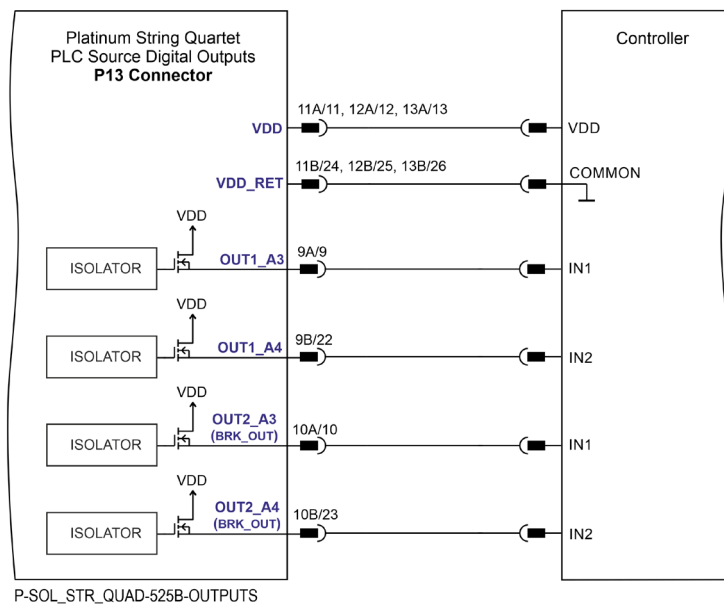


Figure 32: Digital Outputs Connection Diagram for A3 and A4 – Source Option PLC

7.7.1.2 Digital Input and Output PLC Sink Mode

The following figures describe the connections at the I/O Port for the Digital Input and Output PLC Sink Mode for A1 and A2.

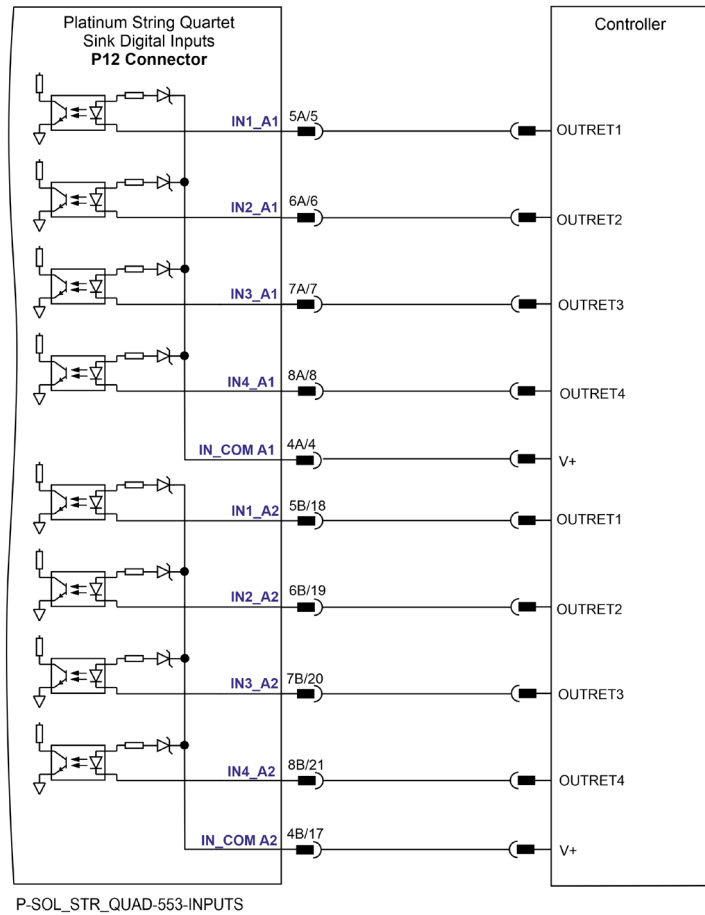


Figure 33: Digital Inputs Connection Diagram, P12 Connector – PLC Sink Option

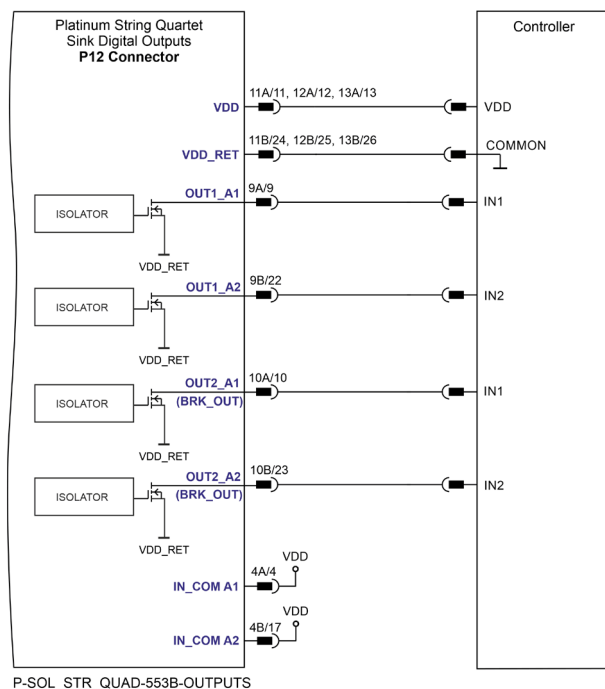


Figure 34: Digital Outputs Connection Diagram, P12 Connector – PLC Sink Option

The following figures describe the connections at the I/O Port for the Digital Input and Output PLC Sink Mode for A3 and A4.

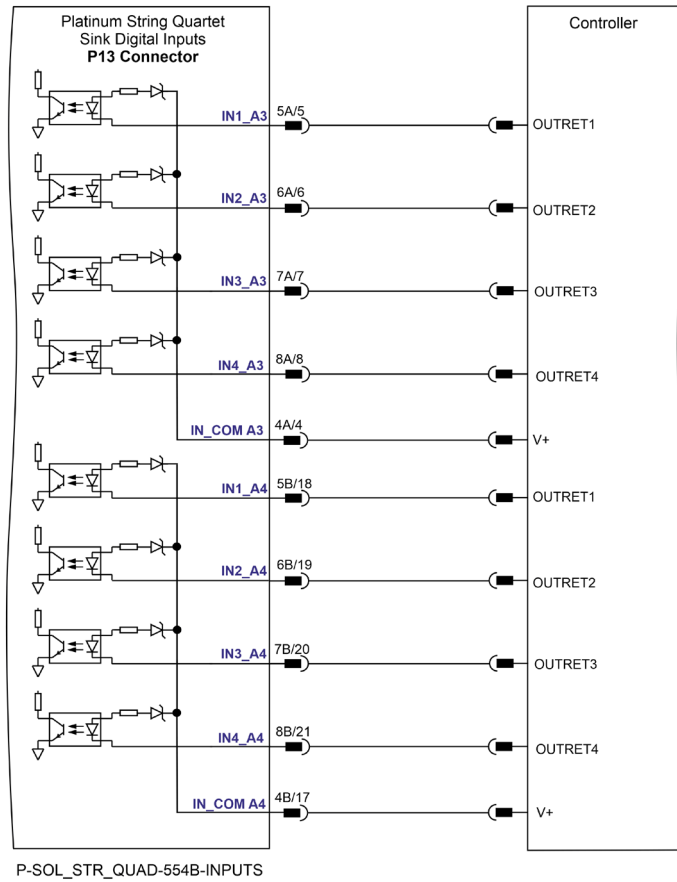


Figure 35: Digital Inputs Connection Diagram, P13 Connector – PLC Sink Option

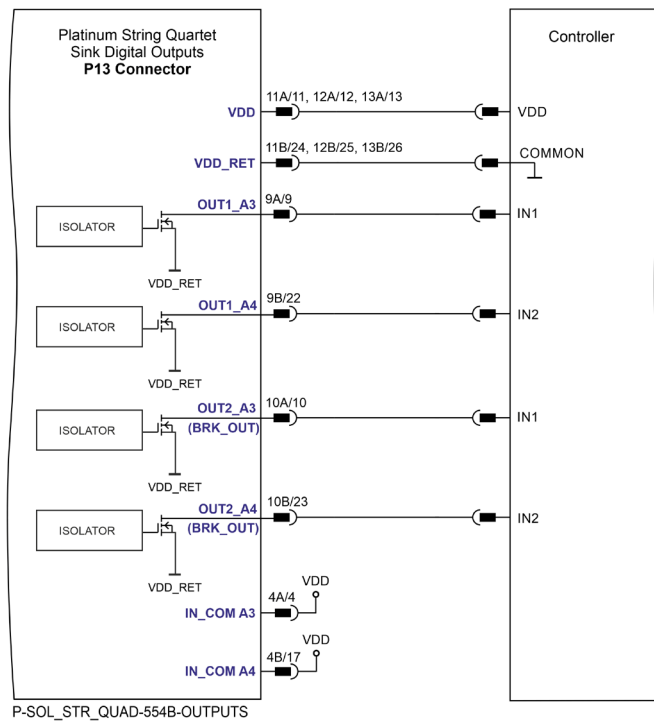


Figure 36: Digital Outputs Connection Diagram, P13 Connector – PLC Sink Option

7.7.2 Digital IO 5V Logic (IO Type: U)

The following figures describe the connections at the I/O Port for the Digital Input and Output 5V Logic Mode for A1 and A2.

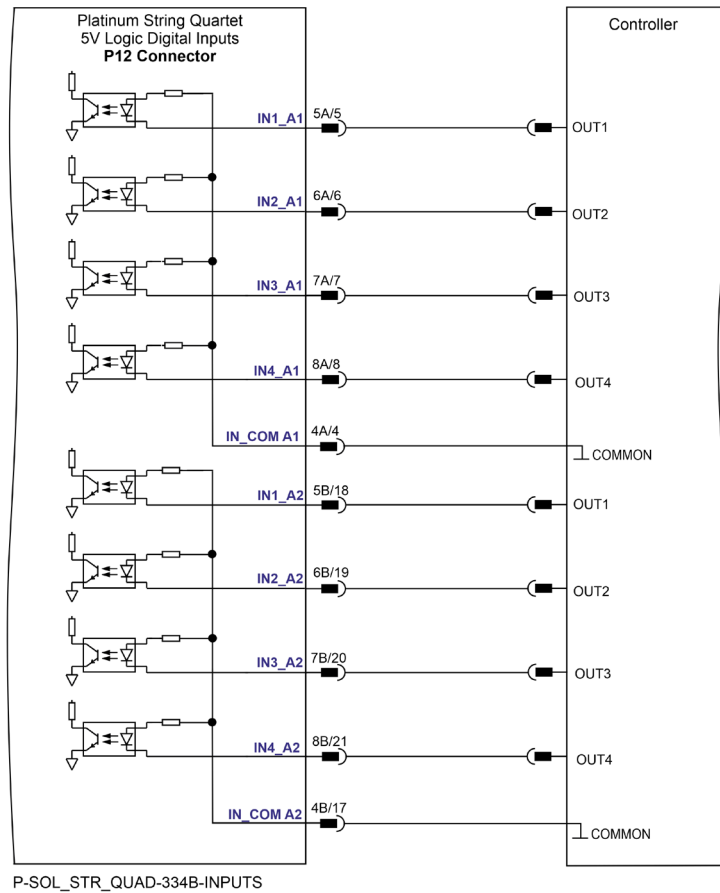


Figure 37: Regular Digital Inputs 5V Logic Mode Connection Diagram - P12 Connector

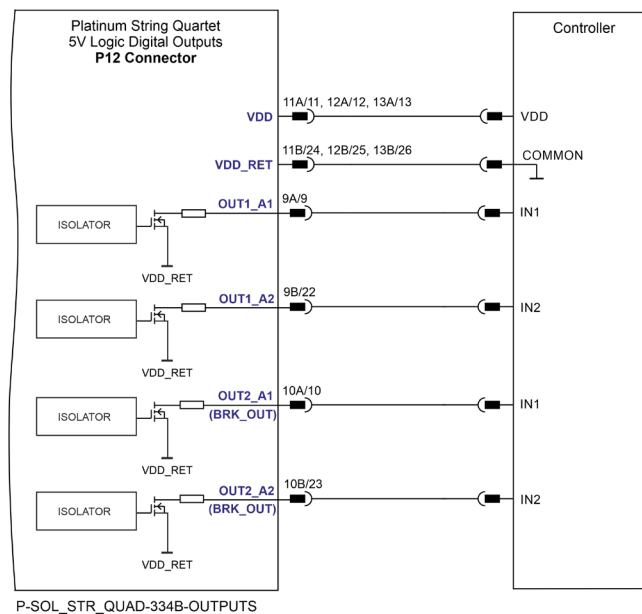


Figure 38: Regular Digital Outputs 5V Logic Mode Connection Diagram - P12 Connector

The following figures describe the connections at the I/O Port for the Digital Input and Output 5V Logic Mode for A3 and A4

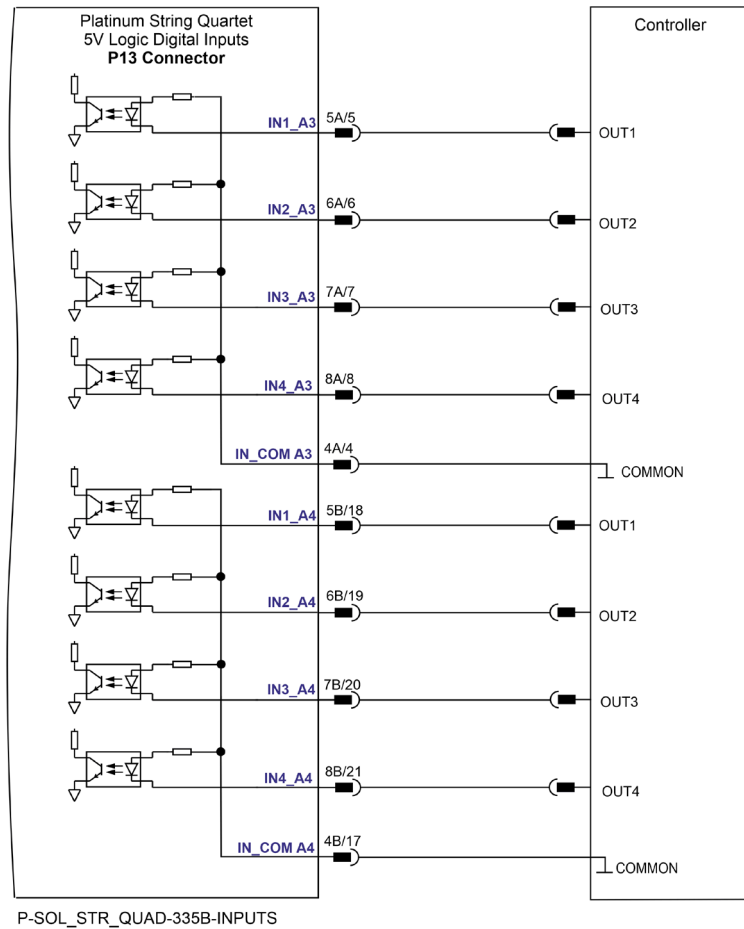


Figure 39: Regular Digital Inputs 5V Logic Mode Connection Diagram - P13 Connector

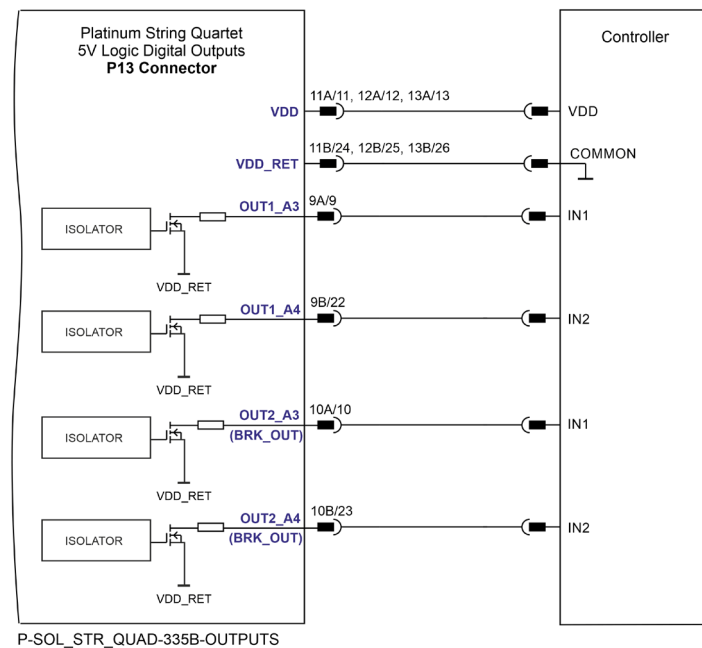


Figure 40: Regular Digital Outputs 5V Logic Mode Connection Diagram - P13 Connector

7.8 Analog Input -Differential (P12, P13)

The following circuit describes the internal interface of the Analog input for Ports 1 and 2.

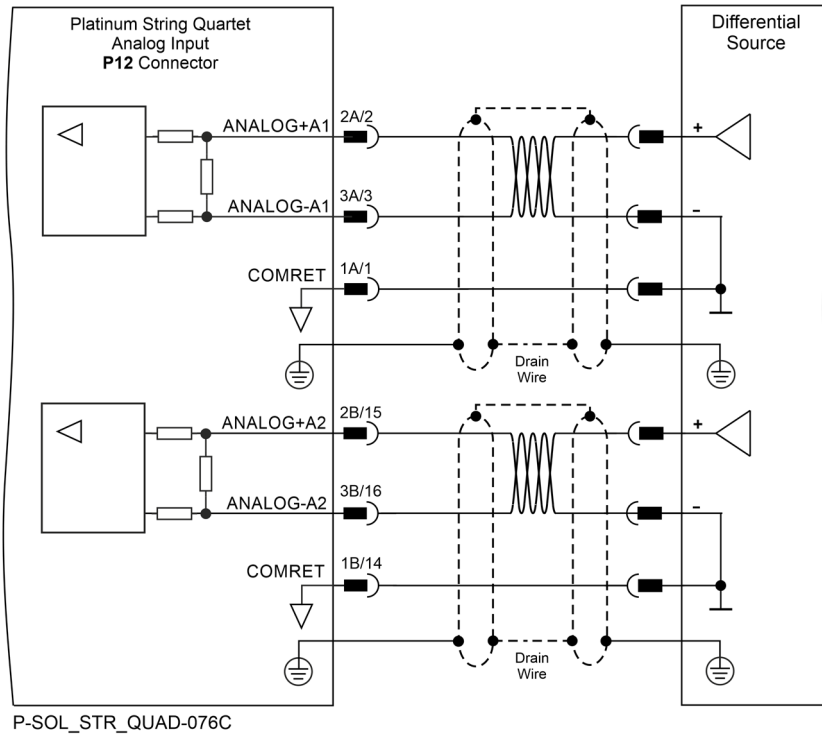


Figure 41: Differential Analog Input for A1 and A2

The following circuit describes the internal interface of the Analog input for Ports 3 and 4.

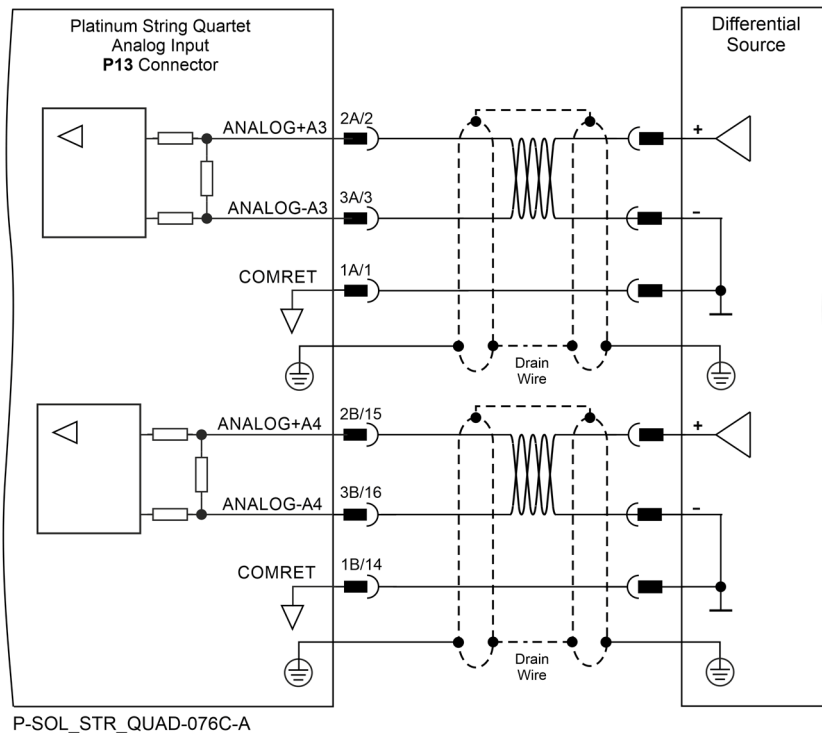


Figure 42: Differential Analog Input for A3 and A4

7.9 Communication

7.9.1 USB 2.0 (X3)

Use a standard USB Type C cable and connector to connect the USB.

7.9.2 EtherCAT (X1 and X2)

7.9.2.1 EtherCAT Connection

The Platinum String Quad (Quartet) can serve as an EtherCAT slave device. For this purpose it has two Ports X1 and X2, which are designated as EtherCAT In and EtherCAT Out.

The following drawing describes the EtherCAT communication, and the pinout drawing of the connector.

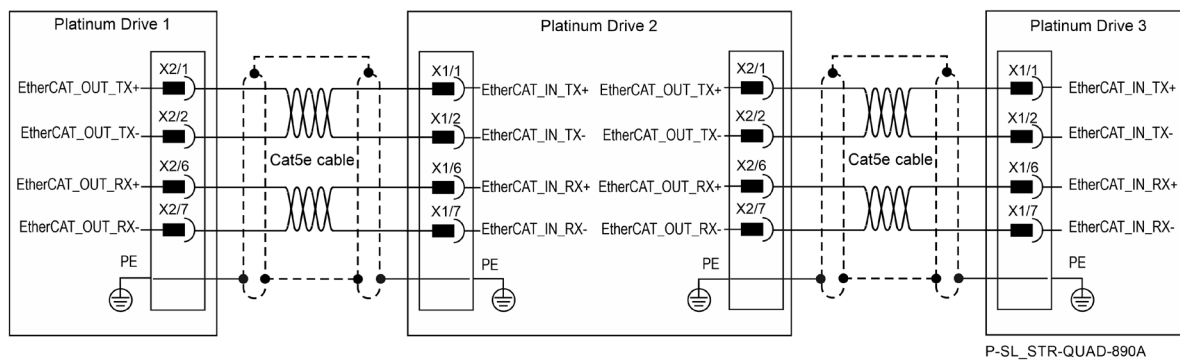


Figure 43: EtherCAT Schematic Diagram for Platinum to Platinum drive connections



Note:

Always use CAT6e cables.

7.9.2.2 EtherCAT Status Indicator

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.

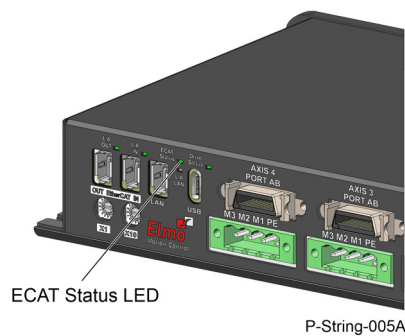


Figure 44: EtherCAT Status LED Indicator

7.9.2.2.1 EtherCAT Link Indicators

The Platinum String Quad (Quartet) can serve as an EtherCAT slave device. For this purpose, it has two Ports X1 and X2, which are designated as EtherCAT In and EtherCAT Out. Each of these Ports has a status LED; EtherCAT In and EtherCAT Out, which are shown in Figure 45 and Figure 46.

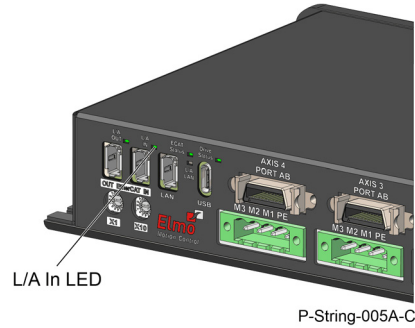


Figure 45: EtherCAT IN Indicator

The green LEDs are the link/activity indicators. They show the state of the applicable physical link and the activity on that link; blinking green.

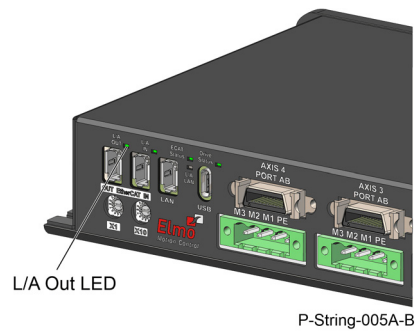


Figure 46: EtherCAT OUT Indicator

7.9.2.3 EtherCAT Address Switches

The EtherCAT address (of each axis), is specified by two switches. Using a screwdriver, you can set the low and the high bytes of the EtherCAT address.

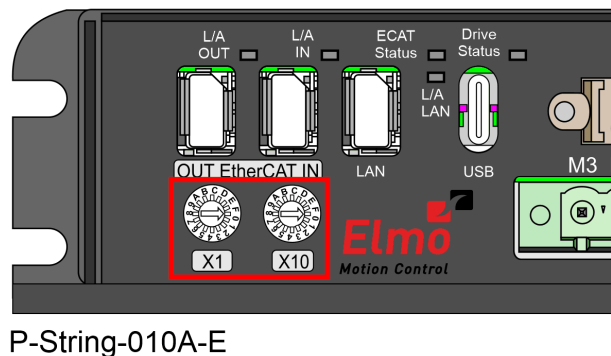


Figure 47: EtherCAT Address Switches

7.9.3 LAN (X6)

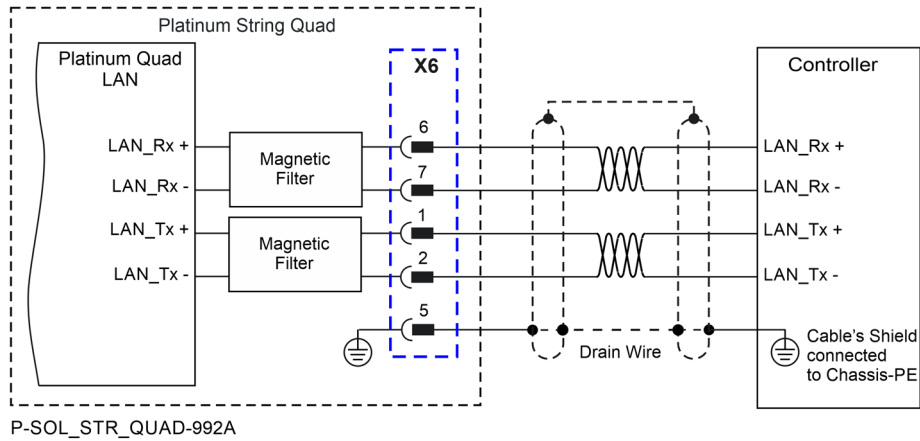


Figure 48: LAN Connection Schematic Diagram



Note:

Always use CAT6e cables.

7.9.3.1 LAN Activity Indicator

Figure 49 shows the position of the green LED.

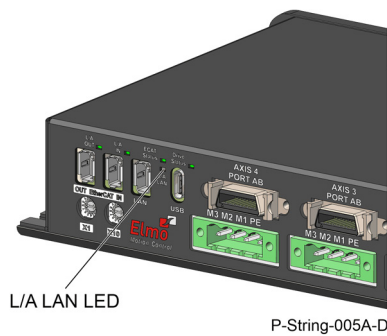


Figure 49: LAN Link Active Indicator

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

LED	State	
Link/Activity	Off	No Connection
	On	Connection Established (Link)
	Blinking	Data Transmission Activity (Act)

Chapter 8: Powering Up

After the Platinum String Quad (Quartet) is connected to its device, it is ready to be powered up.



Caution:

Before applying power, ensure that the DC supply is within the specified range and that the proper plus-minus connections are in order.

8.1 Initializing the System

After the Platinum String Quad (Quartet) has been connected and mounted, the system must be set up and initialized. This is accomplished using the *EASII*, Elmo's Windows-based software application. Install the application and then perform setup and initialization according to the directions in the *EASII User Manual*.

8.2 Heat Dissipation

The best way to dissipate heat from the Platinum String Quad (Quartet) is to mount it so that its heat-sink is attached to the machine chassis. If mounted with its heat-sink suspended, then for best results mount the servo drive faced upwards and leave approximately 10 mm of space between the Platinum String Quad (Quartet)'s heat-sink and any other assembly.

8.2.1 Heat Dissipation Data

Heat dissipation is shown graphically below:

TBD

8.2.2 How to Use the Charts

TBD

Chapter 9: Dimensions

This chapter provides detailed technical dimensions regarding the Platinum String Quad (Quartet).

9.1 Dimensions for Platinum String Quartet L-Shape

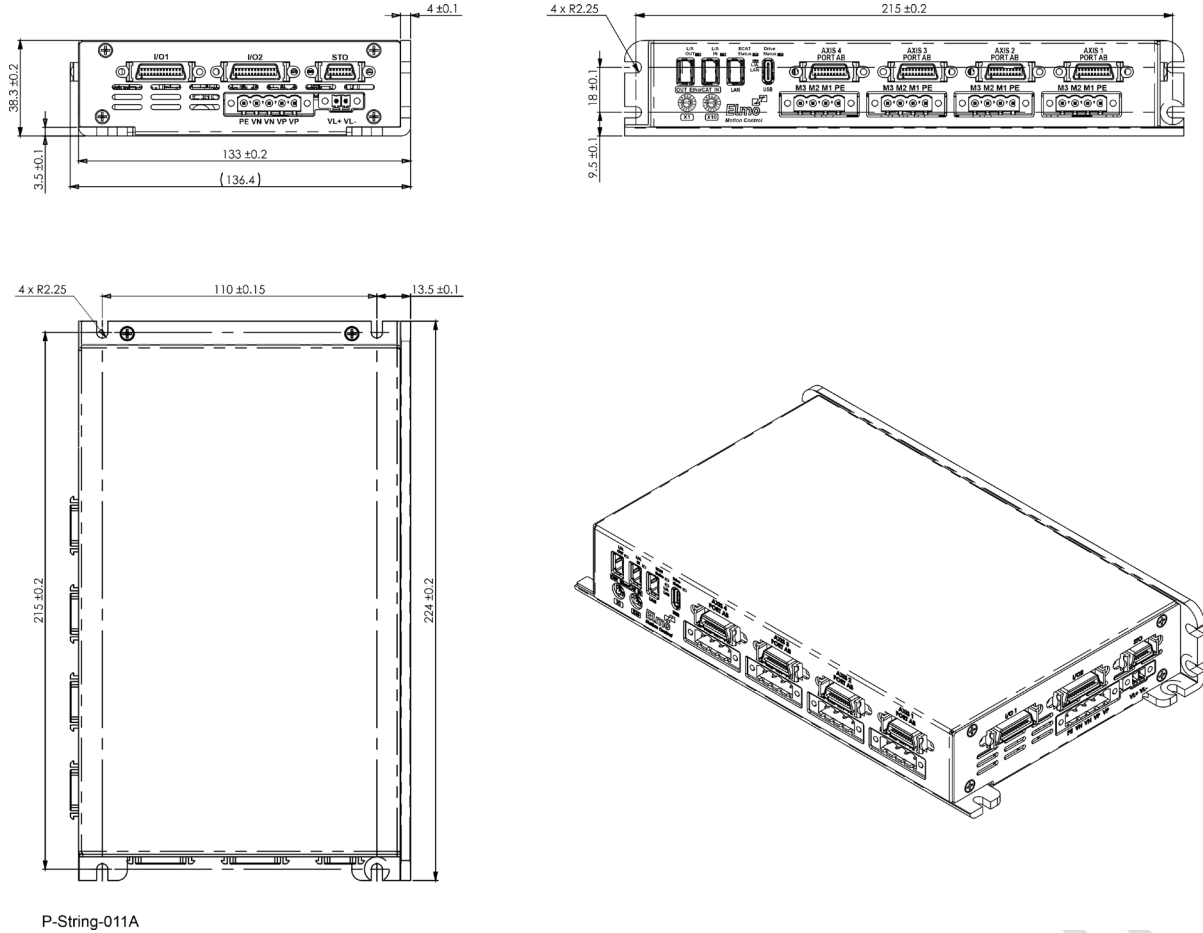


Figure 50: Platinum String Quad (Quartet) L-Shape

9.2 Dimensions for Platinum String Quartet Fins and Fan

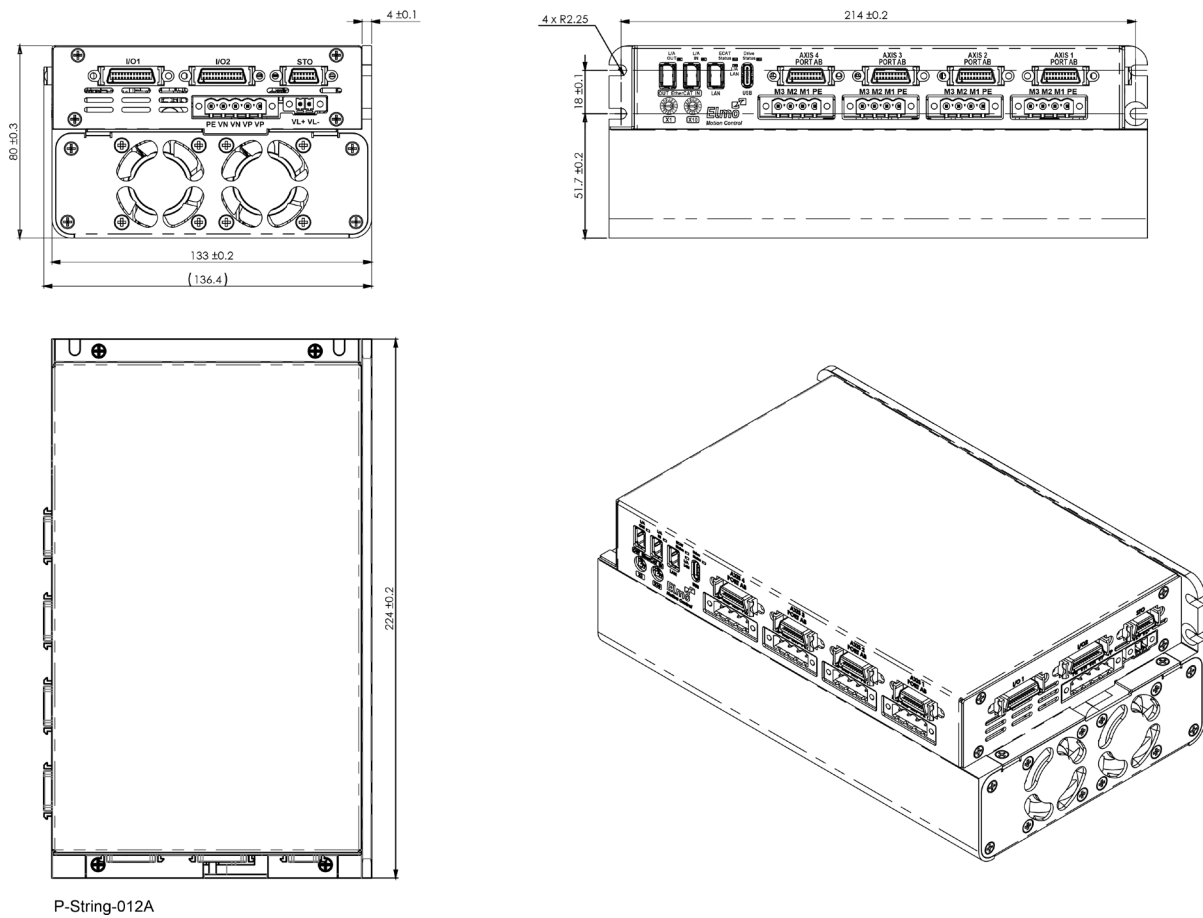


Figure 51: Platinum String Quad (Quartet) Fins and Fan

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