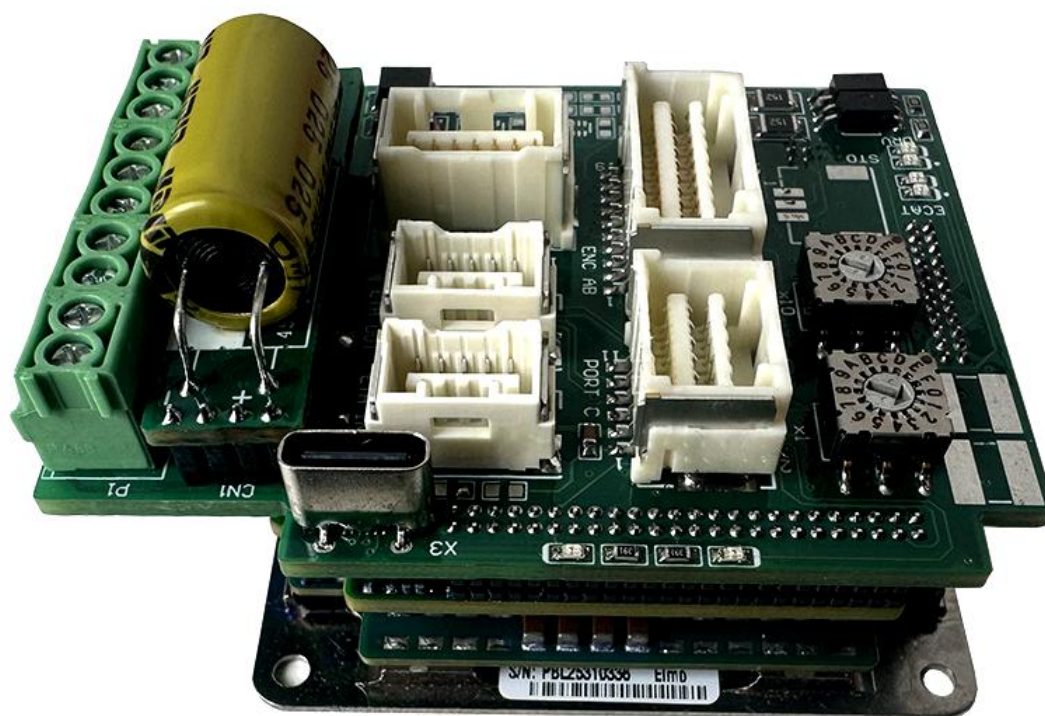


Platinum Bell Digital Servo Drive Installation Guide



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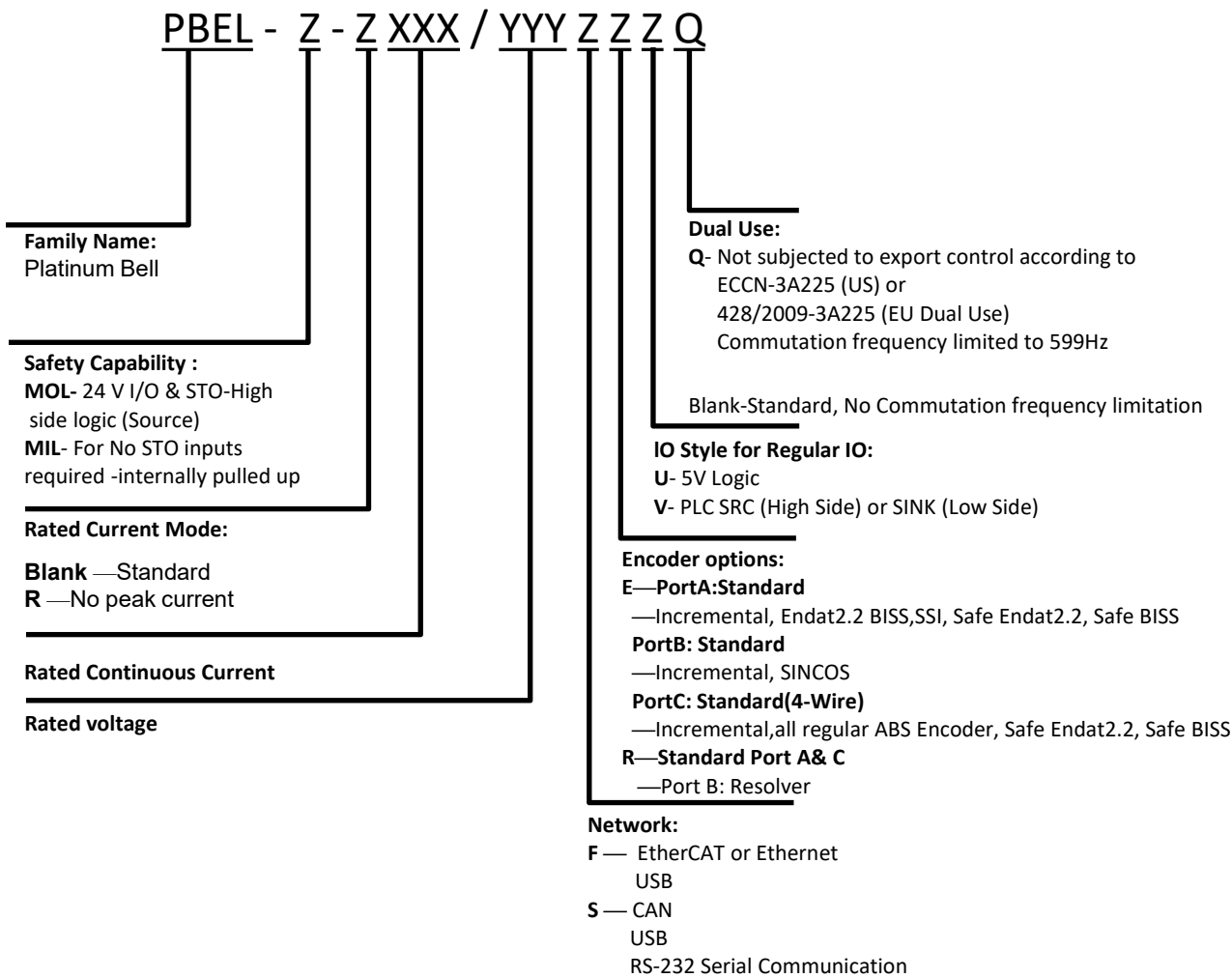


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chapter1: This Installation Guide

This installation Guide details the technical data, pinouts, and power connectivity of the Platinum Bell. **For a comprehensive specification and detailed description of the functions, refer to the Platinum Safety Drive Manual.**

chapter2: Functional Safety

The modules of the Platinum Bell servo drives support Functional Safety. It is necessary to implement the instructions in the Platinum Safety Drive Manual regarding using STO, Feedbacks, IOs and Power supplies with Functional Safety.

chapter3: Safety Information

In order to achieve the optimum, safe operation of the Platinum Bell, 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 Bell 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 Bell 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.

3.1 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 Bell 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.
- STO and EtherCAT circuits are separated from power circuits by reinforced insulation and can be supplied by SELV power supply. Other Control and communication level circuits are separated from power circuits by functional insulation. These circuits shall have insulation to their surroundings and other control or communication circuits based on the Working Voltage and requirements of the end use application.



Capacitance Discharge

After shutting off the power and removing the power source from your equipment, wait at least 10 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.

3.2 Cautions

- The maximum DC power source connected to the instrument must comply with the parameters outlined in this guide.
- When connecting the Platinum Bell to an approved control 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 Bell, 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.

3.3 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 date of shipment. No other warranties expressed or implied — and including a warranty of merchantability and fitness for a particular purpose — extend beyond this warranty.

chapter4: Product Description

The Platinum Bell is an advanced high power density servo drive, delivering up to 2 kW of continuous power or 4 kW of peak power in a compact package (66.0 x 58.5 x 34.3 mm (2.60" x 2.30" x 1.35")). The Platinum Bell is designed to be mounted on a PCB by soldering its pins directly to the PCB.

The Platinum Bell is powered by dual isolated power supplies from the Main, main DC power 10 V to 195 V and a Control power supply for the logic.

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 Bell drive is easily set up and tuned using the Elmo Application Studio (EASII) software tools. As part of the Platinum product line, it is fully programmable with the Elmo motion control language. For more information about software tools refer to the Elmo Application Studio (EASII) User Guide.

chapter5: Technical Information

5.1 Physical Specifications

Feature	Units	All Types
Weight	g (oz)	~100 g (3.53 oz)
Dimension	mm (in)	66.0 x 58.5 x 34.3 mm (2.60" x 2.30" x 1.35")
Mounting method		PCB mount
Degrees of Protection		IP00

5.2 Technical Data

5.2.1 100V Models

Feature	Units	1/100	5/100	10/100	25/100
Minimum supply voltage	VDC	10			
Nominal supply voltage	VDC	85			
Maximum supply voltage	VDC	95			
Maximum continuous power output	W	80	400	800	2000
Efficiency at rated power (at nominal conditions)	%	> 99			
Maximum output voltage		Up to 95% of DC bus voltage			
Amplitude sinusoidal/DC continuous current	A	1.0	5	10	25
Sinusoidal continuous RMS current limit (Ic)	A	0.7	3.5	7	17.5
Peak current limit	A	2 x Ic			

Table 1: Technical Data



Note (on current ratings):

The current ratings of the Platinum Bell are given in units of DC amperes (ratings that are used for trapezoidal commutation or DC motors). The RMS (sinusoidal commutation) value is the DC value divided by 1.41.

5.2.2 200V Models

Elmo offers a 200 VDC maximum output rating selection of Platinum Bell, according to the following technical data:

Feature	Units	9/200
Minimum supply voltage	VDC	20
Nominal supply voltage	VDC	170
Maximum supply voltage	VDC	195
Maximum continuous power output	W	1450
Efficiency at rated power (at nominal conditions)	%	>99
Maximum output voltage		Up to 95% of DC bus voltage
Amplitude sinusoidal/DC continuous current	A	9
Sinusoidal continuous RMS current limit (Ic)	A	6.3
Peak current limit	A	2 x Ic

5.3 Control Supply

Feature	Units	Details
Control supply input voltage	V	Isolated DC source: 12 to 60V
24V Control supply input power consumption	Without encoder	W ≤4
	With encoder up to 400mA@5V	W ≤6
	With encoder up to 300mA@11V	W ≤7

5.4 Product Features

5.4.1 General Product Features

Main Feature	Details	Presence and No
Feedback	Standard Port A, B, and C	√
Communication Option	USB	√
	EtherCAT or	√
	CAN	√
	RS-232 TTL level	√
Analog Input	Differential ±10V	1

5.4.2 Encoder Supply

Feature	Details
5V supply	5V Nominal, 4.75V±5.25V up to 400mA

5.4.3 STO

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

5.4.4 Digital Input

I/O Style	U	V
Safety/Regular	Regular IO 5V Logic	Regular IO PLC Source or Sink
Input	IN1, IN2, IN3, IN4, IN5, IN6	

5.4.5 Digital Output and Current

Refer to the Safety Capability in the P/N for the relevant IO capability.

I/O Style	U	V
Safety/Regular	Regular IO	Regular IO
Voltage	5V Logic	PLC
VDD_24	4 to 30V	19.6 to 30V
OUT1	15mA	1000mA
OUT2	15mA	1000mA
OUT7	15mA	1000mA

OUT8 (PLC SINK)	15mA	1000mA
Total Current¹		1250mA

¹¹ **NOTE:** The total output current of the four digital outputs must not exceed the values shown in this table.

5.5 Environmental Conditions

You can guarantee the safe operation of the Platinum Bell by ensuring that it is installed in an appropriate environment. The Functional Safety of the servo drive is certified according to the environmental conditions in the following table.

Feature	Details
Operating ambient temperature	0 °C to 55 °C (32 °F to 131 °F)  Remark: Functional Safety is applicable to the above operating temperature.
Storage temperature	-40 °C to +85 °C (-40 °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
Pollution Degree	Pollution Degree 1

5.6 Certifications and Standards

The following table describes the Main Standards of the Platinum Bell servo drive. For further details refer to Chapter 22 in the Platinum Safety Drive Manual.

5.6.1 Functional Safety

Standard	Item
IEC 61800-5-2:2017	Adjustable speed electrical power drive systems Safety requirements Functional
EN ISO 13849-1:2015	Safety of machinery Safety-related parts of control systems.
EN 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems
EN 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems
IEC 61784-3:2016	Functional Safety Filed Bus - FSOE

5.6.2 Electrical Safety

Specification	Details
IEC/EN 61800-5-1:2007	Adjustable speed electrical power drive systems Part 5-1: Safety requirements Electrical, thermal and energy
In compliance with UL 61800-5-1	Adjustable speed electrical power drive systems: Safety requirements Electrical, thermal and energy
In compliance with CSA C22.2 NO. 274-17	Adjustable speed drives

5.6.3 Electromagnetic Compatibility

Specification	Details
EN 61800-3:2004/A1:2011	Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods
EN 61800-5-2: 2017 Annex E	Adjustable speed electrical power drive systems Part 5-2: Safety requirements Functional

5.6.4 Environmental

Specification	Details
IEC60068-2-78	Damp heat, steady state
IEC60068-2-6	Vibration (sinusoidal)
IEC60068-2-2	Dry heat
IEC60068-2-27	Shock
IEC60068-2-1	Cold Test

5.6.5 Other Compliant Standards

For other compliant standards refer to the [Platinum Safety Drive Manual Section 22.5](#) or refer to the Elmo website:

<https://www.elmomc.com/capabilities/standards-compliance/platinum-family/>

5.6.6 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.

chapter6: Installation

The Platinum Bell must be installed in a suitable environment and properly connected to its voltage supplies and the motor.

6.1 Unpacking the Drive Components

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

- The Platinum Bell servo drive
- The Elmo Application Studio (EASII) software

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

To unpack the Platinum Bell:

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 Bell you have unpacked is the appropriate type for your requirements, locate the part number sticker on the side of the Platinum Bell. It looks like this:

P/N:PBEL-MOL-5/100FEV



S/N: M25120424



Mada In Israel

P/N:PBEL-MIL-5/100FEV



S/N: M25120424



Mada In Israel

4. Verify that the Platinum Bell type is the one that you ordered and ensure that the voltage meets your specific requirements.
5. The part number at the top provides the type designation. Refer to the appropriate part number in the sectionCatalog Numberat the beginning of the installation guide.

6.2 Over-Current and Short-Circuit Protection

A serial fuse or circuit breaker should be installed Rated for drive s continuous current rating.

PWHI- zz-zXXX/YYYzzz-z XXX = rated continues current [A]	Fuse	Circuit Breaker
1, 2.5, 5, 10, 15, 20, 25 / 100v	Fast Acting	Type B
3, 6, 9, 10 / 200v	Fast Acting	
Rated short - circuit breaking capacity 5kA		

PL/CL protection: Peak and Continues Limitation

The peak current of servo drive limit for a given application is programmed to the parameter **PL[1]** amperes. **PL[1]**: Value for peak current limit protection. Please refer to the “Platinum Administrative Guide”.

6.3 Mounting the Platinum Bell

The Platinum Bell was designed for mounting on a surface. When integrating the Platinum Bell into a device, be sure to leave about 1 cm (0.4") outward from the heat-sink to enable free air convection around the drive. If the Platinum Bell is enclosed in a metal chassis, we recommend that the Platinum Bell be screw-mounted to it to help with heat dissipation. The Platinum Bell has screw-mount holes on each corner of the heat-sink for this purpose – see below

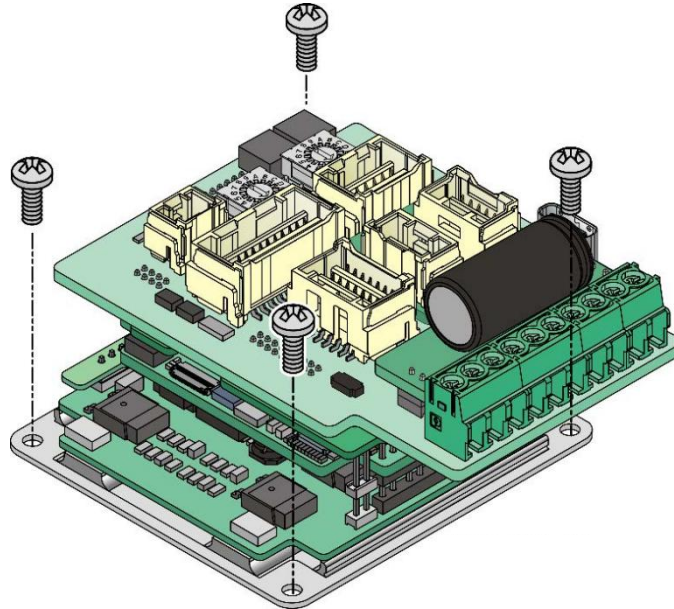


Figure 1: Mounting the Platinum Bell

When the Platinum Bell is not connected to a metal chassis, the application's thermal profile may require a solution for heat dissipation due to insufficient air convection. In this case, we recommend that you connect an external heat sink. Elmo has an external heat sink (Catalog number: Fin-WHI) that can be ordered for this purpose (see figure at side).

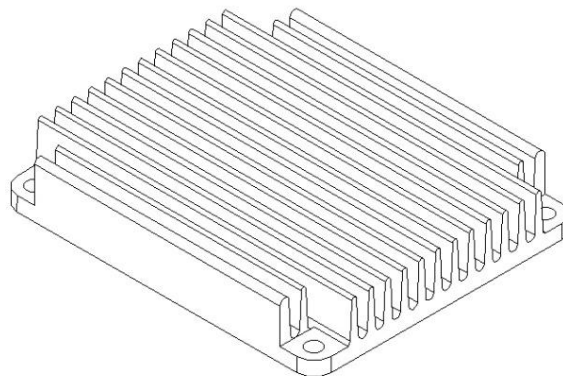


Figure 2: Platinum Bell External Heat-sink

Chapter 7: Connector Types, Pinouts, and LEDs

The Platinum Bell has twelve connectors.

Port	No Pins	Type	Function
M1 M1, M2, M3, M4, PE	5	Phoenix: CON TH TB Straight, 3.5mm pitch. Conductor cross-section is 26 up to 16 AWG	Motor phases
P1 VP+, PR, PE	3	Phoenix: CON TH TB Straight, 3.5mm pitch. Conductor cross-section is 26 up to 16 AWG	Power
P2 PR, VL+	2	Phoenix: CON TH TB Straight, 3.5mm pitch. Conductor cross-section is 26 up to 16 AWG	Control Power
J1	2x10	Molex CLIK-Mate, 20 pins, 1.5 mm pitch	Feedback Port A/B
J2	2x6	Molex CLIK-Mate, 12 pins, 1.5 mm pitch	Feedback Port C
J3	2x7	Molex CLIK-Mate, 14 pins, 1.5 mm pitch	I/O
X3	24	USB Type C	USB
J4	1x3	Molex CLIK-Mate, 3 pins, 1.5 mm pitch	STO
EtherCAT Version			
X1	1x5	Molex, CLIK-Mate, 5 pins, 1.5 mm pitch	EtherCAT IN
X2	1x5	Molex, CLIK-Mate, 5 pins, 1.5 mm pitch	EtherCAT OUT

7.1 Mating Connector

Connector	Mating Connector Type	Mating Crimping Pins
J1 Feedback Port A/B	CON CLIK-MATE HOUSING FE 20PIN (2X10) P=1.5 mm pitch plug	MOLEX CRIMP TERMINAL FE 24-28AWG FOR CLIK-MATE 1.5 mm
J2 Feedback Port C	CON CLIK-MATE HOUSING FE 12PIN(2X6) P=1.5 mm pitch plug	
J3 I/O	CON CLIK-MATE HOUSING FE 14PIN(2X7) P=1.5 mm pitch plug	
J4 STO	CON CLIK-MATE HOUSING FE 3PIN(1X3) P=1.5 mm pitch plug	
X1, X2 EtherCAT IN/OUT	CON CLIK-MATE HOUSING FE 5PIN(1X5) P=1.5 mm pitch	
X3	Standard USB type C cable	

7.2 Connector Locations

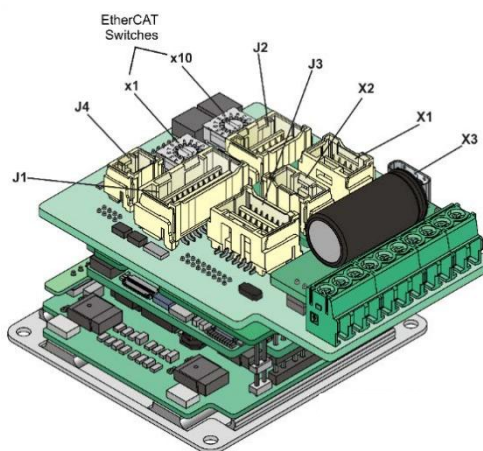


Figure 3: Connector Locations for EtherCAT Version

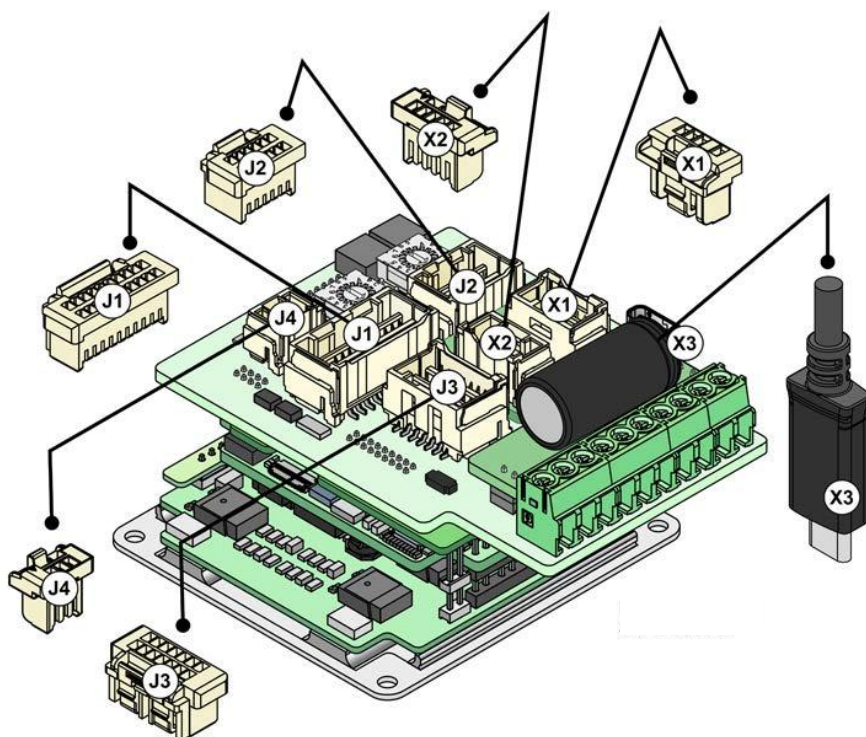


Figure 4: Connectors and Connector Locations – EtherCAT

Table 2: Connector Types

The pinouts in Chapter 8: Wiring describe the function of each pin in the Platinum Bell connectors that are listed in Table 2.

7.3 Board Indicator Labelling

The following diagram describes the board indicator labelling for the Platinum Bell.

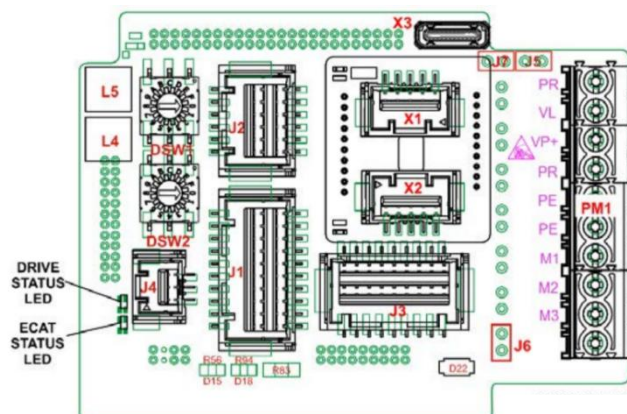


Figure 5: Platinum Bell Board Indicator Labelling

7.4 Motor Power Connector Pinouts (M1)

For further details, refer to [Chapter 10 Input Power Supply](#) in the [Platinum Safety Drive Manual](#). It should be noted that to connect the Brushed DC Motor, there are two options:

- M1 and M2, and PE

OR

- M3 and M4, and PE

Pin (M1) Signal	Function	Cable – Wires			
		Brushless Motor	Brushed DC Motor		Stepper Motor
PE	Protective earth	Motor	Motor	Motor	Motor
M1	Motor phase	Motor	No Connection	Motor	Motor
M2	Motor phase	Motor	No Connection	Motor	Motor
M3	Motor phase	Motor	Motor	No Connection	Motor
M4	Motor phase	No Connection	Motor	No Connection	Motor
Pin Positions					

Table 3: Main Power and Motor Connections

7.5 Main Power Connector Pinouts (P1)

Pin (P1) Signal	Function	Cable
PE	Protective Earth	DC Power
PR	Power Return	DC Power
VP+	Positive Power Input	DC Power

Pin Positions

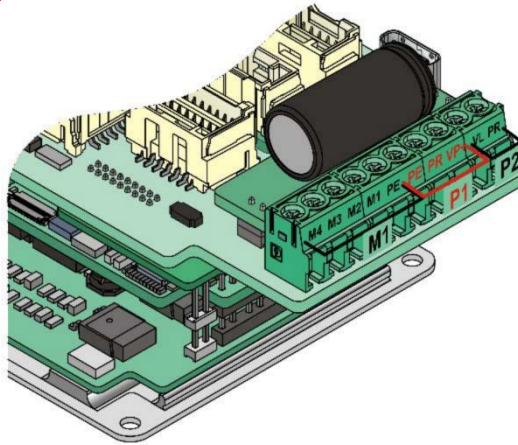


Table 4: Main Power Connections

7.6 Control Power Supply Connector Pinouts (P2)

Pin (P2)	Signal	Function
1	PR	Control Supply Return
2	VL+	Control Supply Input

Pin Positions

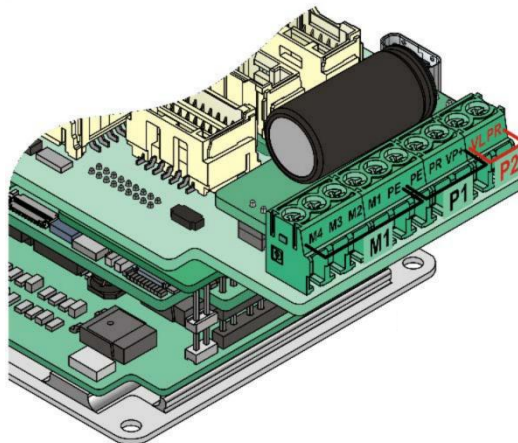


Table 5: Control Supply Pins

7.7 Drive Status Indicator

Figure 6 shows the position of the red/green dual LED, which is used for immediate indication of the Initiation and Working states.

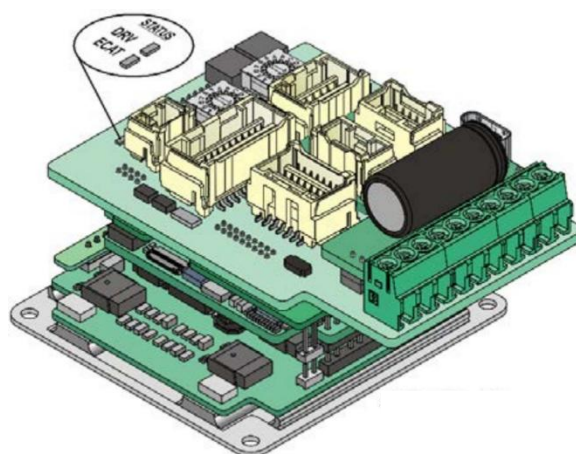


Figure 6: Drive Status Indicator

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

- Initiation state: In this state the LED indicates whether the drive is in the boot state (blinking red) or in the operational state (steady red).
- Working state: In this state the LED indicates whether the drive is in an amplifier failure state (red) or is ready to enable the motor (green).

7.8 STO (Safe Torque Off) Connector Pinouts (J4)

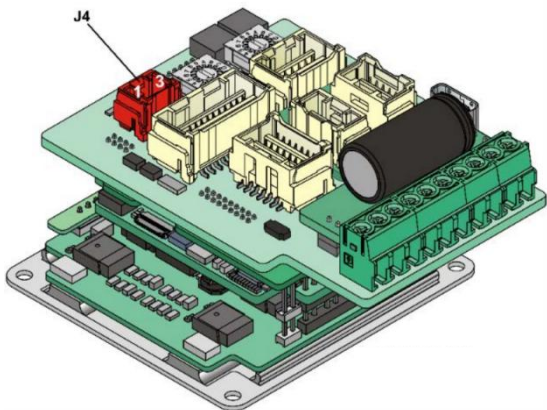
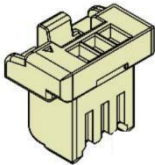
Pin (J4)	Signal	Function
1	STO1	STO 1 input
2	STO2	STO 2 input
3	STO_RET	STO signal return
Pin Positions		Cable Connector
		 CLIK-MATE FE ST 3PIN(1x3) P=1.5MM

Table 6: STO Input Pin Assignments

7.9 Port A and Port B and Power Connector Pinouts (J1)

7.9.1 J1 Port A

Pin (J1) Port A		Incremental Encoder	Absolute Serial Encoder
	Signal	Function	Function
5	PortA_A+	Channel A +	Absolute encoder clock+
7	PortA_A-	Channel A -	Absolute encoder clock-
9	PortA_B+	Channel B+	Absolute encoder data+
11	PortA_B-	Channel B -	Absolute encoder data -
13	PortA_Index+	Channel_Index+	
15	PortA_Index-	Channel_Index-	

Table 7: J1 Port A Pin Assignments

7.9.2 J1 Hall Sensors

Pin (J1) Hall	Signal	Function
17	HALL A	Hall A Input
18	HALL B	Hall B Input
19	HALL C	Hall C Input

Table 8: J1 Hall Sensors Pin Assignments

7.9.3 J1 Port B

Pin (J1) Port B		Incremental Encoder	Interpolated Analog Encoder	Resolver
	Signal	Function	Function	Function
		PBEL-SX-XXX/YYYYEEX		PBEL-SX-XXX/YYYYERX
6	PortB_A+	Channel A+	Sine+	Sine+
8	PortB_A-	Channel A -	Sine-	Sine-
10	PortB_B+	Channel B+	Cosine+	Cosine+
12	PortB_B-	Channel B-	Cosine-	Cosine-
14	PortB_INDEX+	Channel_Index+	Analog_Index+	RESOLVER_OUT+
16	PortB_INDEX-	Channel_Index-	Analog_Index-	RESOLVER_OUT-

Table 9: J1 Port B Pin Assignments

7.9.4 J1 Power Pins

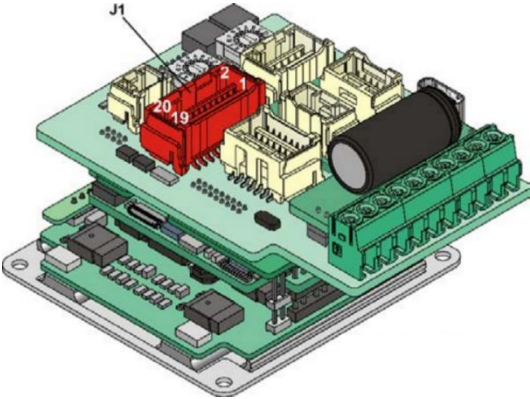
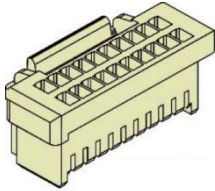
J1 Power Pin	Signal	Function
1	+11V	Encoder +11V supply Note: +11V is only available with Safe IO. For Regular IO this pin is not connected and must remain reserved.
2	+5VE	Encoder +5V supply
3	COMRET	Common Return
4	COMRET	Common Return
20	COMRET	Common Return
Pin Positions		Cable Connector
		 CLIK-MATE HOUSING FE 20PIN(2x10) P=1.5MM

Table 10: Power Pin Assignments

7.10 Port C Connector Pinouts (J2)

Pin (J2)		Incremental Encoder	Absolute Serial Encoder	General Outputs
Signal		Function	Function	Function
1	COMRET	Common return		
2	PortC_A+	Channel A +	Absolute encoder clock+	General Output A+
3	+5VE	Encoder +5V supply		
4	PortC_A-	Channel A -	Absolute encoder clock-	General Output A-
5	+11V	Encoder 11V Supply		
6	PortC_B+	Channel B+	Absolute encoder data+	General Output B+
7	ANALOG1+	Analog Input		
8	PortC_B-	Channel B -	Absolute encoder data -	General Output B-
9	ANALOG1-	Analog Input complement		
10	PortC_Index+	Index+	Reserved	General Output Index+

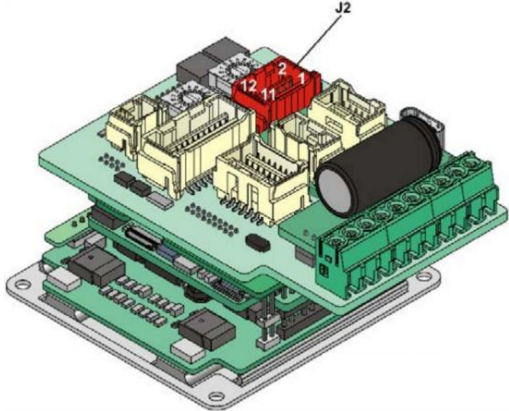
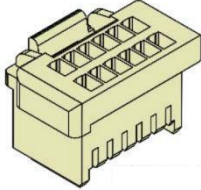
11	COMRET	Common return		
12	PortC_Index-	Index-	Reserved	General Output Index-
Pin Positions			Cable Connector	
			 CLIK-MATE HOUSING FE 12PIN(2x6) P=1.5MM	

Table 11 Port C Pin Assignments

7.11 Digital I/Os Connector Pinouts (J3)

7.11.2 IO TYPE = U, V

Pin (J3)	Signal	TYPE U	TYPE V
1	VDD_RET	VDD Return	
2	IN1	Input	
3	VDD	4V to 30V	19.6V to 30V
4	IN2	Input	
5	IN6	Input	
6	IN3	Input	
8	IN4	Input	
9	OUT7	Output	
10	OUT1	Output	
11	OUT8	Output	
12	OUT2	Output	
13	IN_COM	Digital Input Return	For Source: 0 - Source Control For Sink: VDD
14	IN5	Input	
Pin Positions			Cable Connector

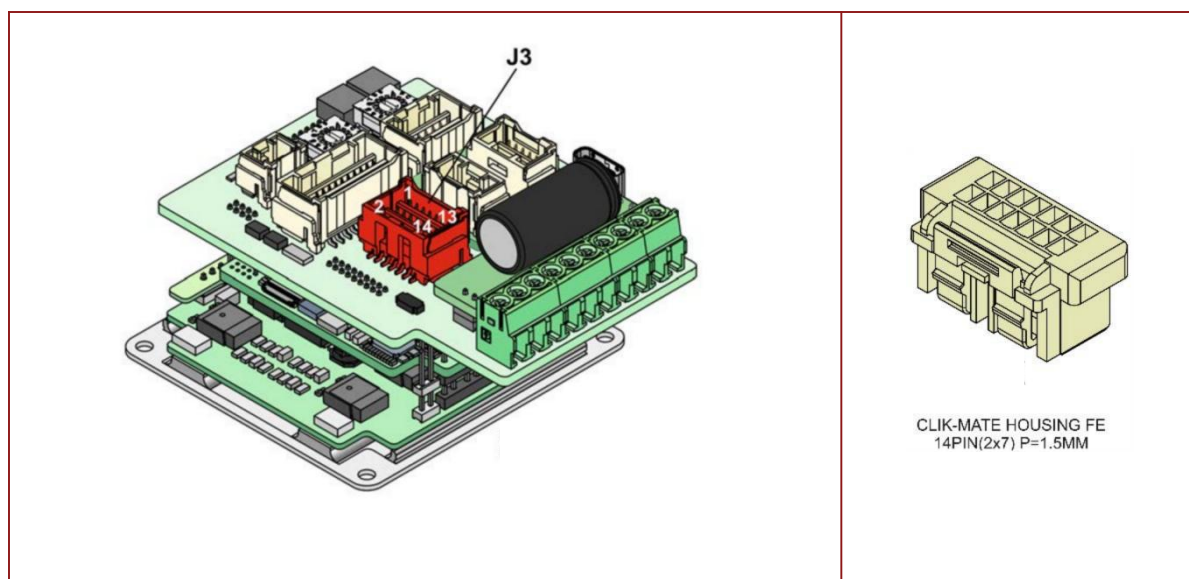


Table 12: Regular Digital I/O Pin Assignments for IO TYPE = U, V

7.12 USB 2.0 Connector Pinouts (X3)

Pin (X3)	Signal	Function
A1	COMRET	Common return
A2	Not Connected	
A3	Not Connected	
A4	USB_VBUS	USB VBUS 5 V
A5	Not Connected	
A6	USBD+	USB_P line
A7	USBD-	USB_N line
A8	Not Connected	
A9	USB_VBUS	USB VBUS 5 V
A10	Not Connected	
A11	Not Connected	
A12	COMRET	Common return
B1	COMRET	Common return
B2	Not Connected	
B3	Not Connected	
B4	USB_VBUS	USB VBUS 5 V
B5	Not Connected	
B6	USBD+	USB_P line
B7	USBD-	USB_N line
B8	Not Connected	
B9	USB_VBUS	USB VBUS 5 V

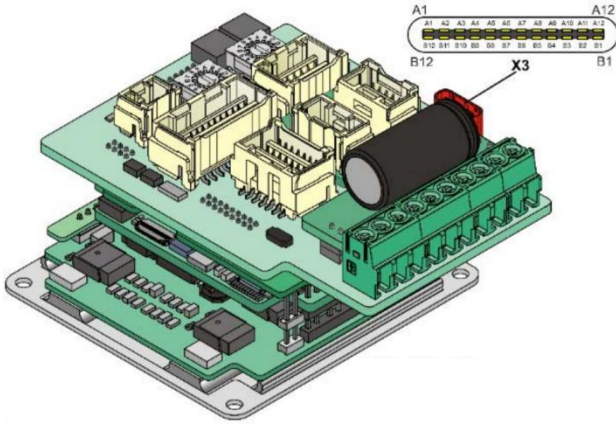
B10	Not Connected	
B11	Not Connected	
B12	COMRET	Common return
	COMRET	Supply, Connector body
Pin Positions		Cable Connector
		 USB TYPE C CABLE

Table 13: USB Device Type C - Pin Assignments

7.13 EtherCAT IN Connector Pinouts (X1)

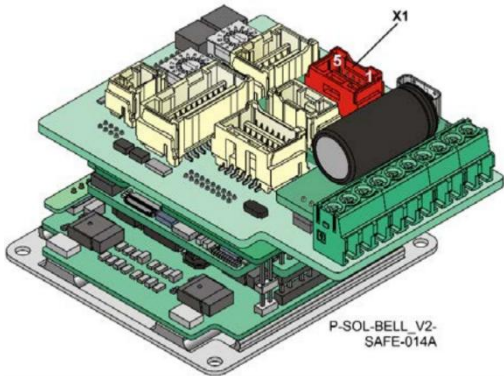
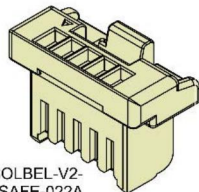
Pin (X1)	Signal	Function
1	EtherCAT_IN_TX+	EtherCAT IN
2	EtherCAT_IN_TX-	EtherCAT IN
3	EtherCAT_IN_RX+	EtherCAT IN
4	EtherCAT_IN_RX-	EtherCAT IN
5	PE	Shield drain wire
Pin Positions		Cable Connector
		 P-SOLBEL-V2-SAFE-022A CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM

Table 14: EtherCAT IN Pin Assignments

7.14 EtherCAT OUT/Ethernet Connector Pinouts (X2)

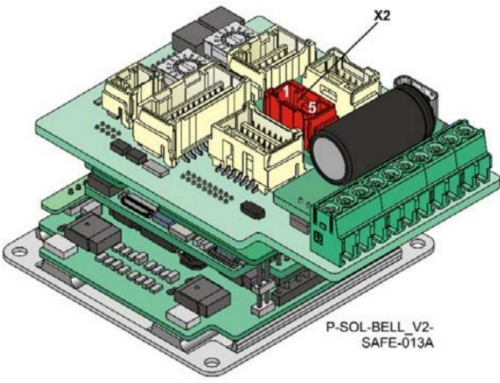
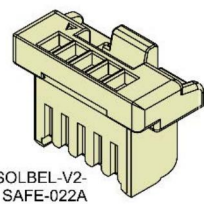
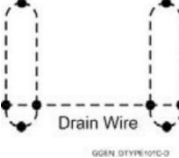
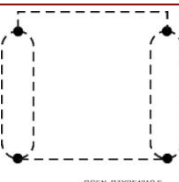
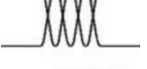
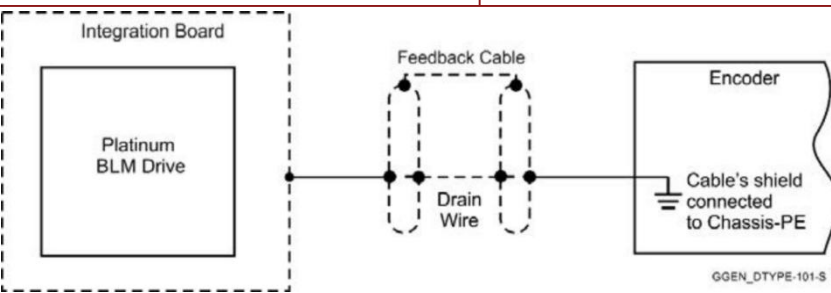
Pin (X2)	Signal	Function
1	EtherCAT_OUT_TX+/Ethernet_TX+	EtherCAT OUT /Ethernet transmit +
2	EtherCAT_OUT_TX-/Ethernet_TX-	EtherCAT OUT /Ethernet transmit -
3	EtherCAT_OUT_RX+/Ethernet_RX+	EtherCAT OUT /Ethernet receive +
4	EtherCAT_OUT_RX-/Ethernet_RX-	EtherCAT OUT /Ethernet receive -
5	PE	Shield drain wire
Pin Positions		Cable Connector
 P-SOL-BELL_V2-SAFE-013A		 P-SOLBEL-V2-SAFE-022A CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM

Table 15: EtherCAT OUT/Ethernet Pin Assignments

chapter8: Wiring

Wiring Symbol	Description
	Earth connection (PE)
	User Side: This symbol signifies that any type of grounding may be used on the user side
	VDD Return
	Isolated Ground
	Power Return
	COMRET Common at the Drive
	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.
	Shielded cable braid only, without drain wire.
	Twisted-pair wires
 Encoder Earthing. The cable's shield is connected to the chassis (PE) in the connector. The servo drive shield is connected to Earth.	

8.1 Wiring Connectors

8.1.1 Wiring Female CON CLIK-MATE Connectors

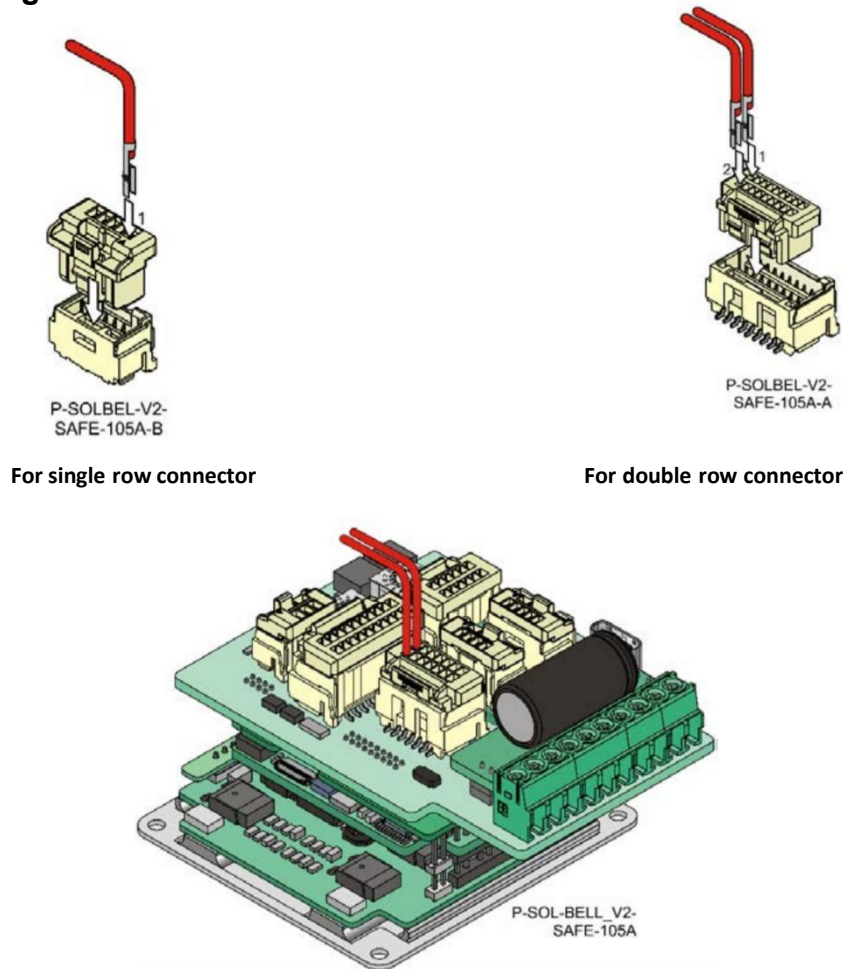


Figure 7: Inserting a wire/pin to the Female CON CLIK-MATE Connector

To insert a wire/pin to the female CON CLIK-MATE connectors do the following:

1. Select the relevantly colored wire to insert to a specific rectangular compartment on the female connector.
2. Use the appropriate Molex crimping plier (Molex P/N 63819-4600) to fasten a pin connector to the end of the wire.
3. Place the connector on a flat surface, in the orientation as shown in Figure 7. Notice that the rectangular slot has a niche at the bottom of the slot.
4. Insert the wire connector to the slot as shown in Figure 7. Make sure that the connector protrusion is inserted to the bottom of the rectangular slot. When inserting the wire connector to a slot in the second row, make sure to orientate the wire pin in the direction shown in Figure 7.
5. Repeat the same procedure for all other wire connections.

8.2 The Platinum Bell Connection Diagrams

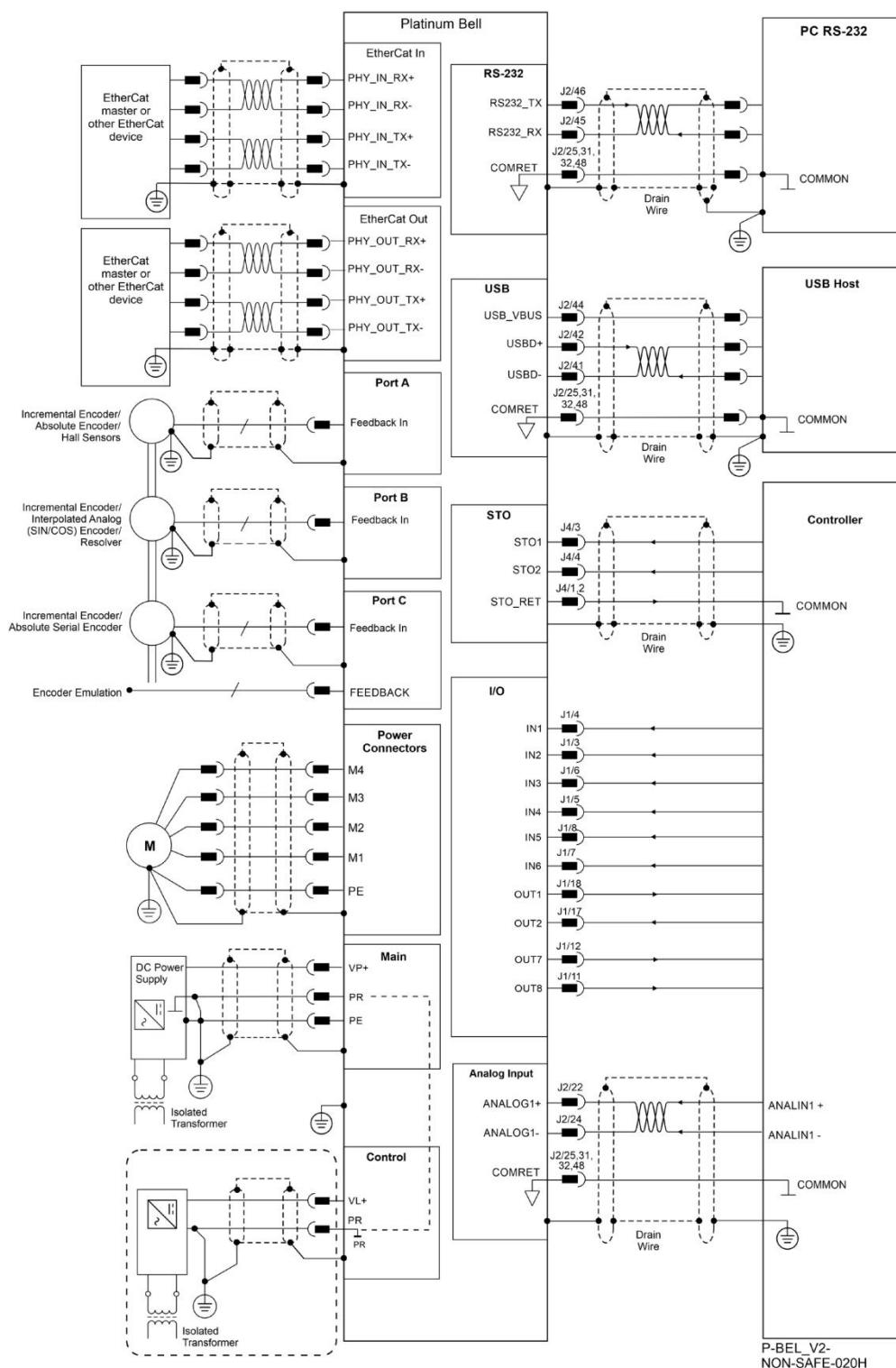


Figure 8: The Platinum Bell Connection Diagram – EtherCAT

8.3 Motor Power (M1)

When connecting several drives to several similar motors, all should be wired in an identical manner. This will enable the same settings to run on all drives.

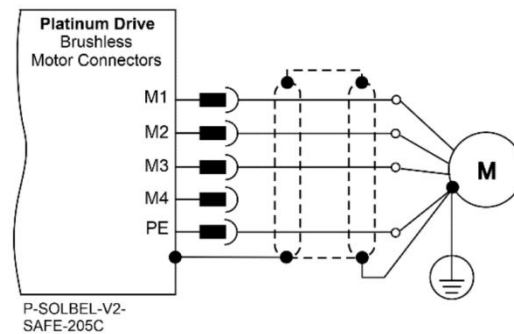


Figure 9 : Brushless Motor Power Connection Diagram

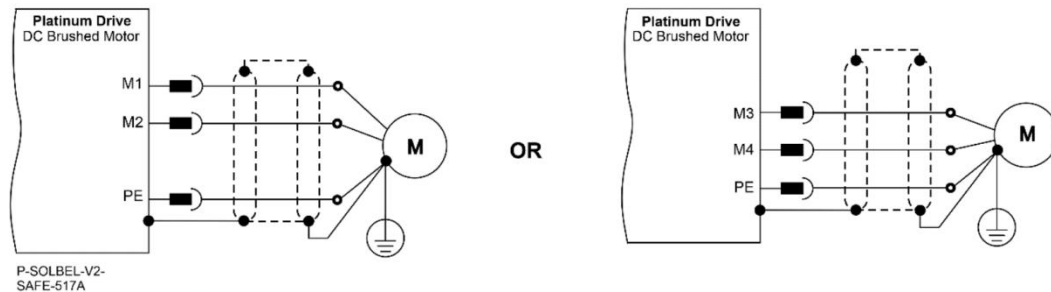


Figure 10: Brushed DC Single Motor Power Connection Diagrams

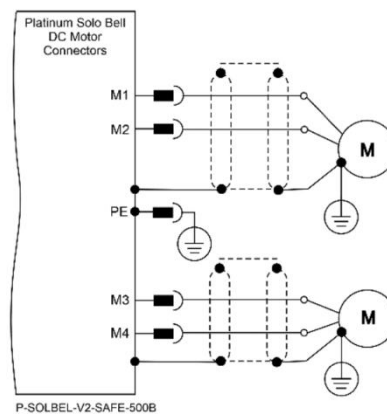


Figure 11: Two Motor Power Connection Diagram

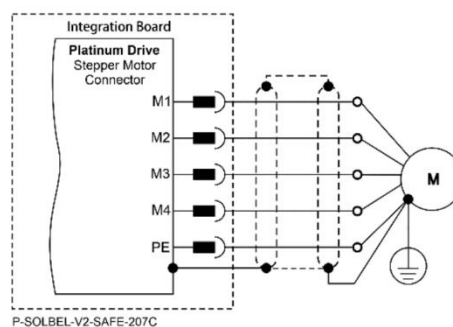


Figure 12: Stepper Single Motor Power Connection Diagram

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, M4 and PE terminals on the Platinum Bell.
3. Make sure not to bundle the wires.
4. 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.
5. For high EMI environment, it is highly recommended to use a 5-wire shielded (not twisted) cable for the motor connection. The gauge is determined by the actual RMS current consumption of the motor.
6. 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).

8.4 Main and Control Power

There are two power ratings for the Platinum Bell:

- 100V is for the 10 to 95 VDC
- 200V is for the 20 to 195 VDC

For power rating 200V

Two DC power sources are required, a DC power source of 20 to 195V isolated from the Mains, and a control supply 12 to 60 VDC (isolated from the Mains) for the logic.

For power rating of 100V

Two DC power sources are required, a DC power source of 10 to 95V isolated from the Mains, and a control supply 12 to 60 VDC (isolated from the Mains) for the logic.



Note: The Main power supply (10V to 95VDC or 20V to 195VDC) and Control supply (12 to 60VDC) must be isolated from the Mains.

Connect the DC power source cable to the VP+ and PR terminals on the main power connector.

To connect to the main power:

1. The DC power supply source must be isolated from the Mains.
2. For best immunity, it is highly recommended to use twisted and shielded cables for the DC power source. A 3-wire shielded cable should be used. The gauge is determined by the actual current consumption of the motor.
3. Connect the cable shield to the closest earth connection near the power supply.
4. Connect the PE to the closest earth connection near the power supply.
5. Connect the PR to the closest earth connection near the power supply.
6. Before applying power, first verify the polarity of the connection.

8.4.1 Control Supply

The Control Power (VL) for Safety configuration must be 12V to 60V. Refer to the Safety Power Configuration and to **Chapter 8 Input Power Supply in the MAN-P Safety Drive Manual**.

To connect your integration board 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.

8.4.2 Dual Power Supply for Safety Configuration

Two DC power sources are required for the Platinum Bell, a DC power source, and a control supply for the logic:

- Main power isolated from the Mains
 - Main power 20 to 195 V DC for 200 V module
 - Main power 10 to 95 V DC for 100 V module
- Control Power supply must be 12V to 60V (isolated from the Mains)

The following figure describes the connection of main power and control.

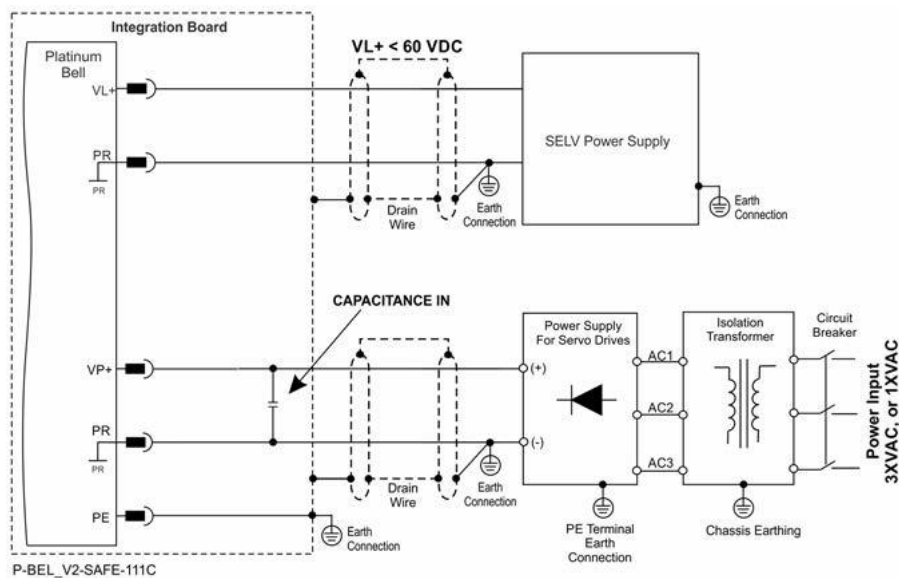


Figure 13: Power Supply Connection Diagram for Safety Configuration



Note:

Make sure to connect the PR to the closest earth connection near the power supply.

8.4.3 DC Bus Capacitance

CAPACITANCE IN for 100V: A DC Bus Capacitance must be connected between the VP+ and the PR in the integration board as shown in the following figure. It is recommended to use a combination of ceramic capacitor (up to 50uF) and electrolytic capacitor of 150uF.

An additional Capacitance of 900uF must be connected for the P-WHI modules 20/100 and 25/100.

CAPACITANCE IN for 200V: A DC Bus Capacitance must be connected between the VP+ and the PR in the integration board as shown in the following figure. It is recommended to use a combination of ceramic capacitor (up to 6uF) and electrolytic capacitor of 50uF.

8.5 Feedbacks (J1 and J2)

8.5.1 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

8.5.1.1 Incremental Encoder

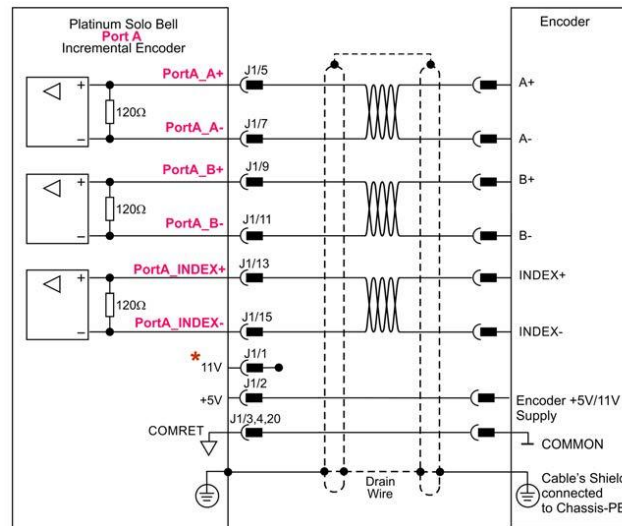


Figure 14: Port A Incremental Encoder Input – Recommended Connection Diagram

8.5.1.2 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:

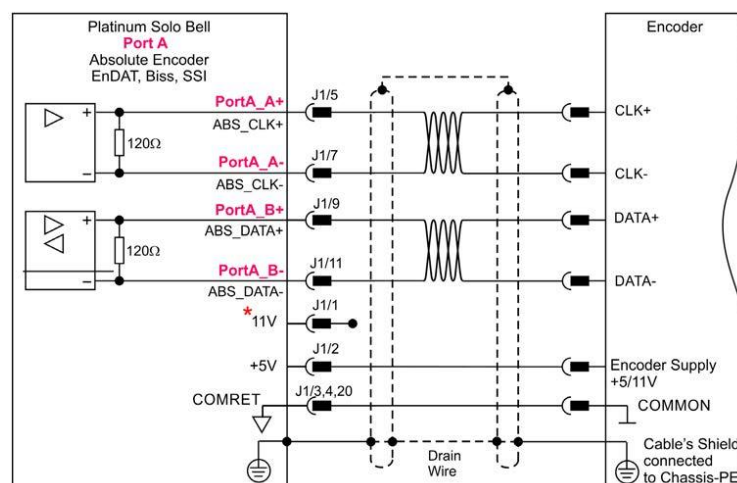


Figure 15: Absolute Serial Encoder – Recommended Connection Diagram for EnDat, Biss, SSI

8.5.1.3 Hiperface

Hiperface that requires power of 7-12V can be used with external power supply for non-safety application. The following figure describes the connection diagram.

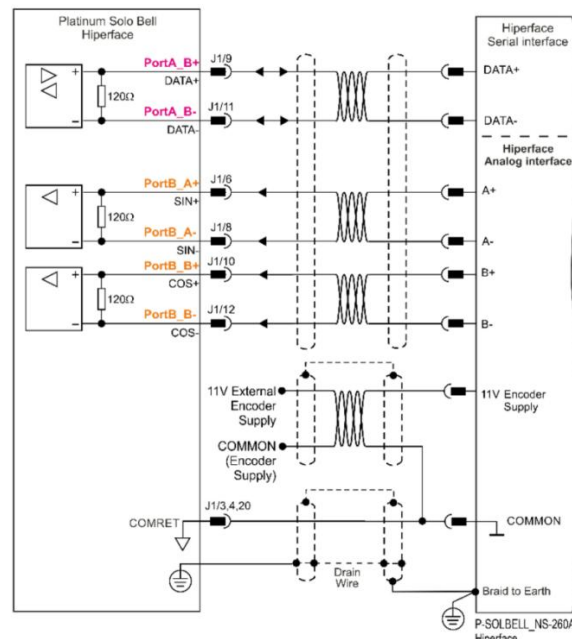


Figure 16: Absolute Serial Encoder – Recommended Connection Diagram for Hiperface

8.5.2 Feedback Port B

Port B supports any of the following sensors:

- Incremental Encoder, interpolated analog Encoder or analog Hall sensors

Or

- Resolver (separate hardware option)

Differential PWM signal input can be connected to port B

Differential Pulse & Direction signal inputs can be connected to port B.

8.5.2.1 Incremental Encoder

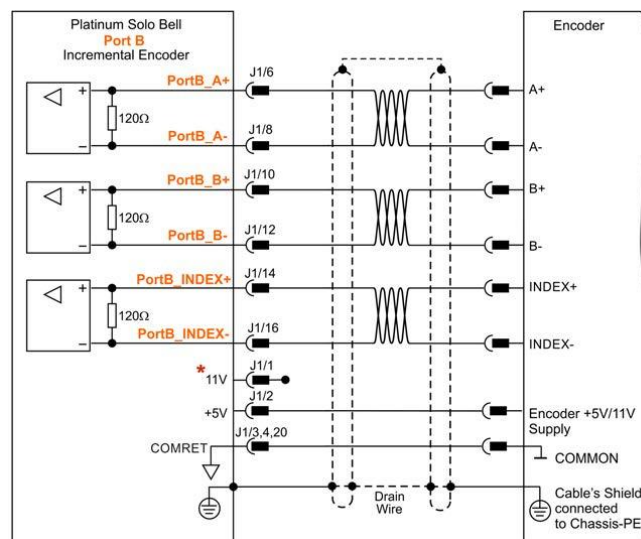


Figure 17: Port B Incremental Encoder Input – Recommended Connection Diagram

8.5.2.2 Interpolated Analog (Sine/Cosine) Encoder

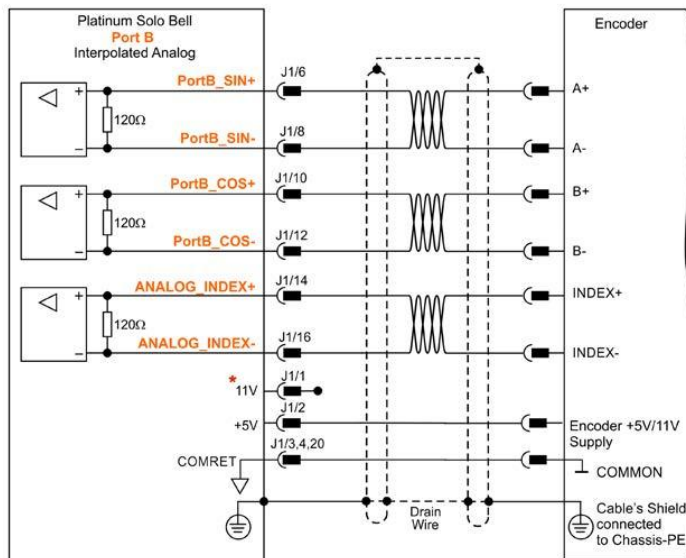


Figure 18: Port B - Interpolated Analog Encoder Connection Diagram

8.5.2.3 Resolver

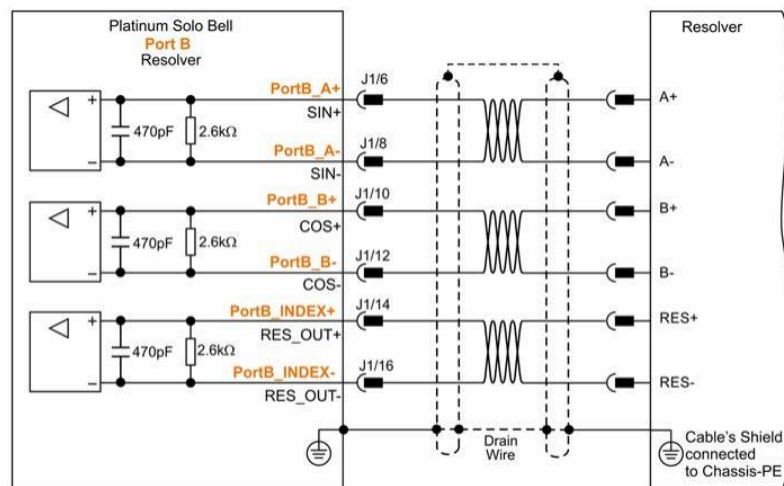


Figure 19: Port B – Resolver Connection Diagram

8.5.3 Feedback - Hall Sensors

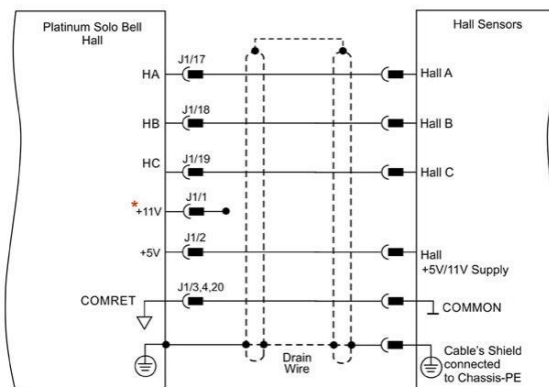


Figure 20: Hall Sensors Connection Diagram

8.5.4 Feedback Port C

Port C provides:

- Incremental Encoder feedbacks
- Absolute Serial Encoder feedbacks
- Emulated Encoder output derived from port A, port B feedback inputs, or from internal variables

8.5.4.1 Incremental Encoder

The following Incremental Encoder types are supported:

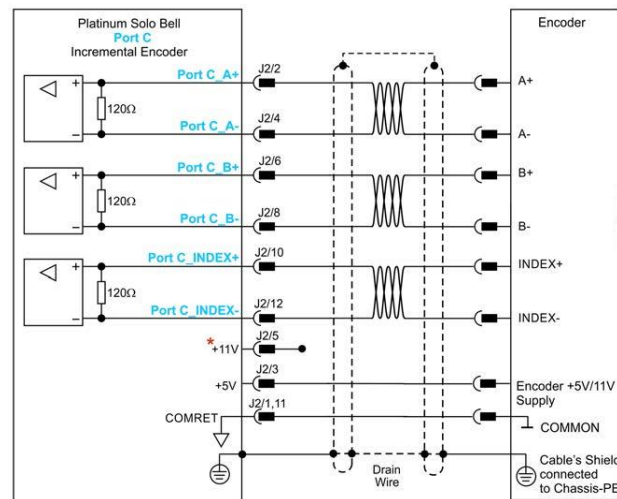


Figure 21: Port C Incremental Encoder Input – Recommended Connection Diagram

8.5.4.2 Absolute Serial Encoder

Port C supports the following ABS feedback:

- EnDat 2.2
- Biss C and Biss B
- SSI
- Panasonic
- Tamagawa

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

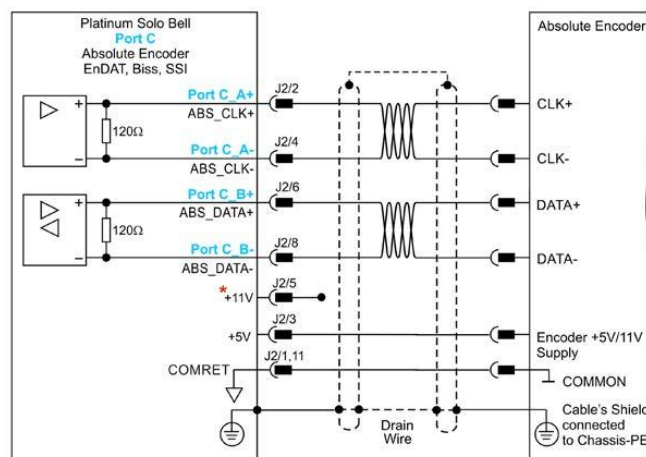


Figure 22: Absolute Serial Encoder – Recommended Connection Diagram for EnDat, Biss, SSI

The following is the feedback diagram connection for Panasonic, Tamagawai, and Sanyo-Danki:

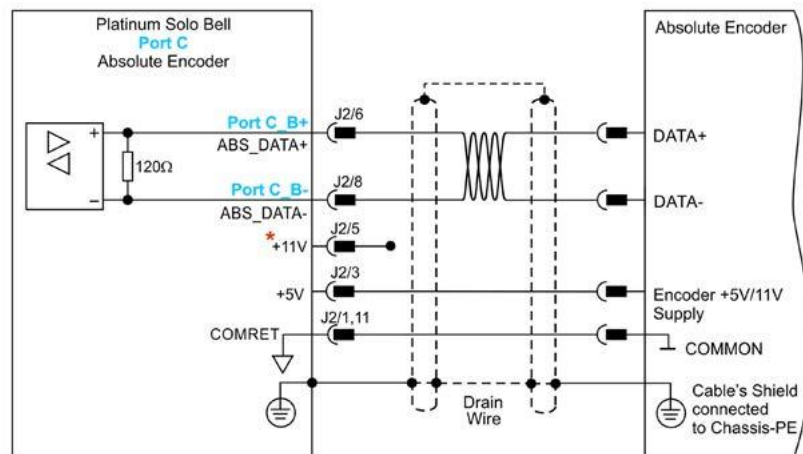


Figure 23: Absolute Serial Encoder–Recommended Connection Diagram for Panasonic, Tamagawai, Sanyo-Danki

8.5.4.3 Emulated Encoder Output

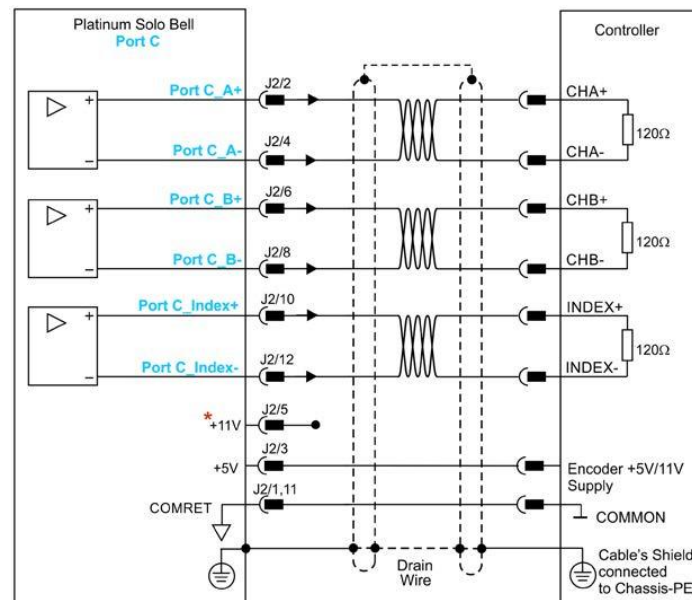


Figure 24: Emulated Encoder Differential Output – Recommended Connection Diagram

8.5.4.4 Analog Input

- Analog Input 1 – Differential ± 10 V

The following circuit describes the internal interface of the Analog input

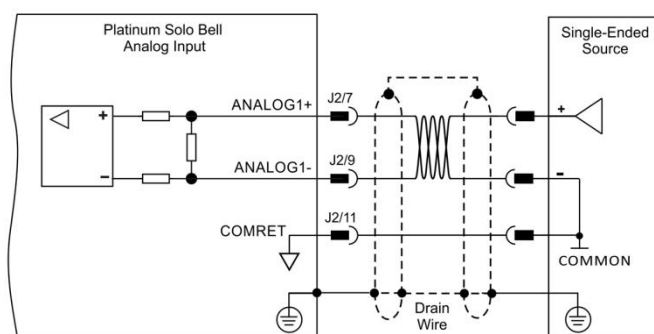


Figure 25: Differential Analog Input

8.6 STO (Safe Torque Off) (J4)

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

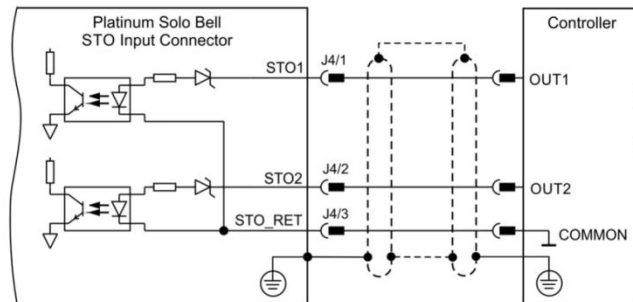


Figure 26: STO Type Connection – PLC Source Option

8.7 Regular Digital I/Os (J3)

8.7.1 Input and Output 5V Logic (IO Type: U)

The following figures describes the connections at the I/O Port for the Digital Input and Output 5V Logic.

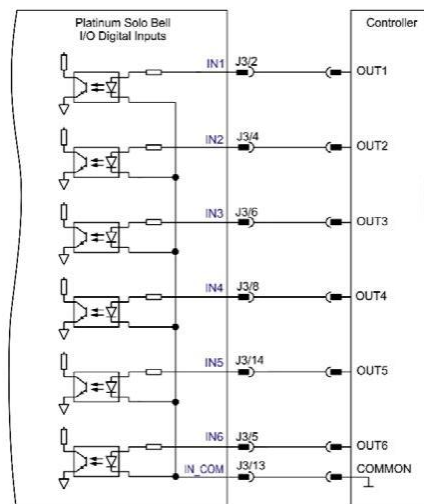


Figure 27: Regular Digital Input 5V Logic Connection Diagram

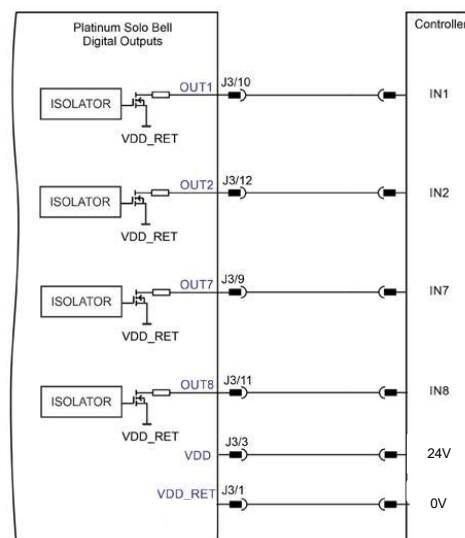


Figure 28: Regular Digital Output Connection Diagram – 5V Logic Option

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

8.7.2.1 Digital Input and Output PLC Source Mode

The following figures describes the connections at the I/O Port for the Digital Input and Output PLC Mode.

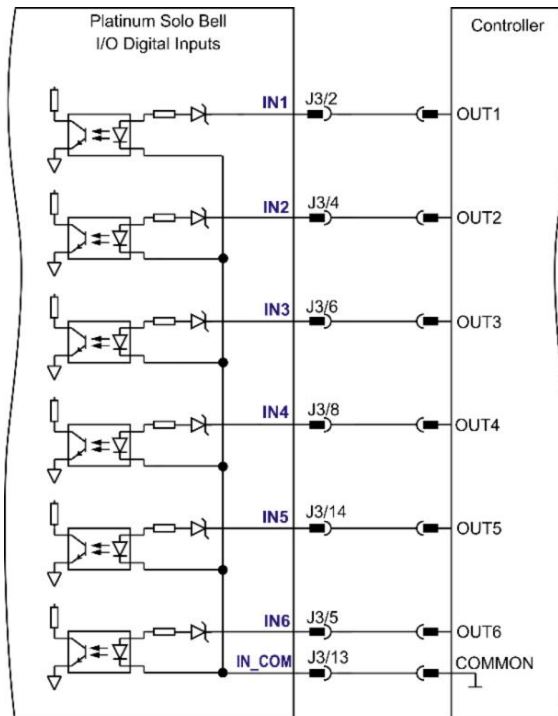


Figure 29: Regular Digital Input Connection Diagram – PLC Source Option

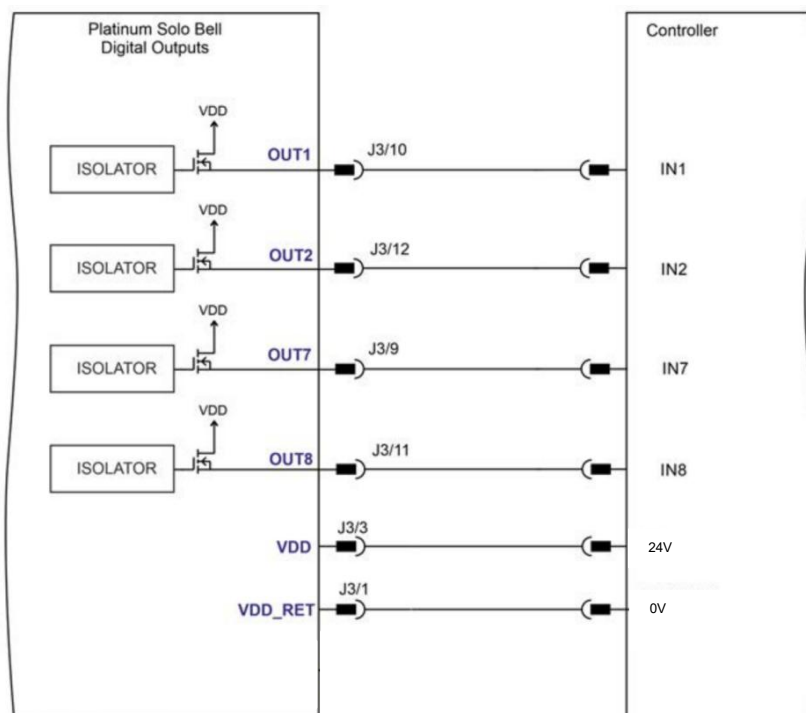


Figure 30: Regular Digital Output Connection Diagram – PLC Source Option

8.7.2.2 Digital Input and Output PLC Sink Mode

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

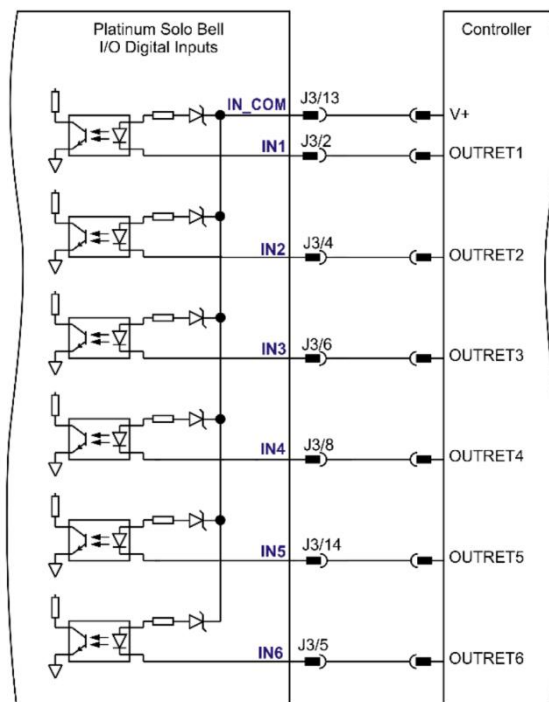


Figure 31: Regular Digital Input Connection Diagram – PLC Sink Option

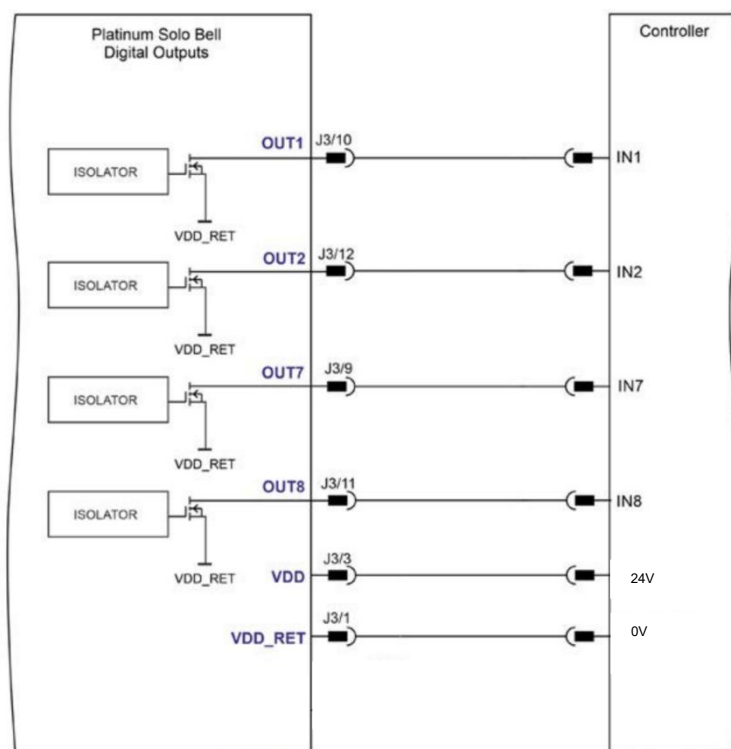


Figure 32: Regular Digital Output Connection Diagram – PLC Sink Option

8.8 Communication

8.8.1 USB 2.0 (X3)

Use a standard USB 2.0 Type C cable and connector to connect the USB. Refer to section 17.1 in the [Platinum Safety Drive Manual](#).

8.8.2 EtherCAT (X1 and X2)



Note: The EtherCAT OUT port can be configured to an Ethernet Port

8.8.2.1 EtherCAT Connection

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

The Platinum Bell 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.

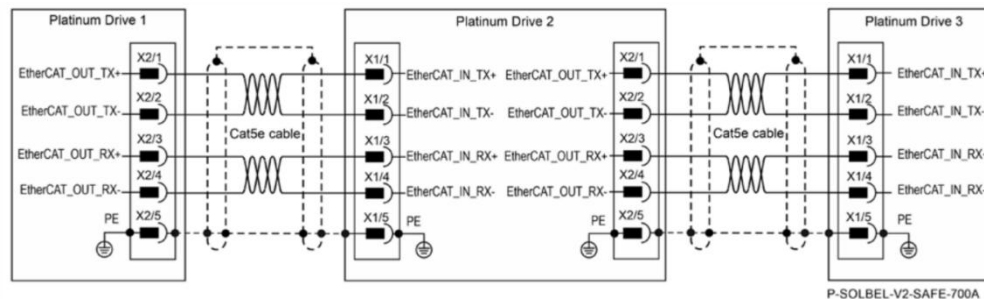


Figure 33: EtherCAT Connection Schematic Diagram



Note: Always use CAT5e cables.

8.8.2.2 EtherCAT Status Indicator

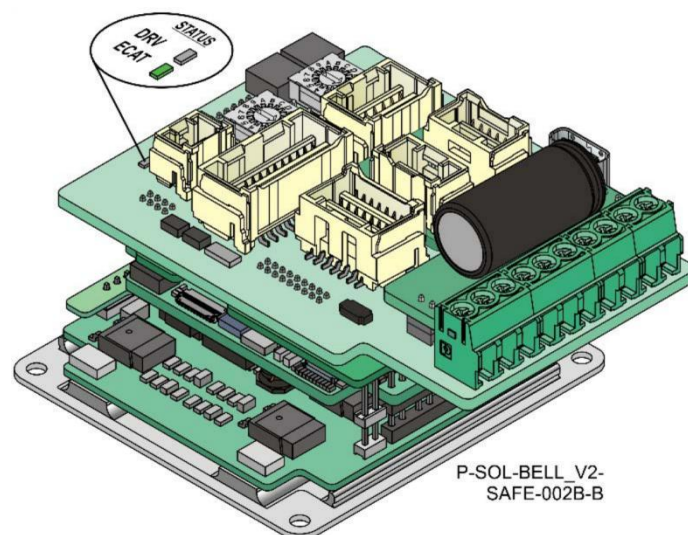


Figure 34: EtherCAT Status LED

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.

8.8.2.3 EtherCAT Link Indicators

Each of the EtherCAT Ports has a LED; EtherCAT In and EtherCAT Out, which are shown in Figure 47.

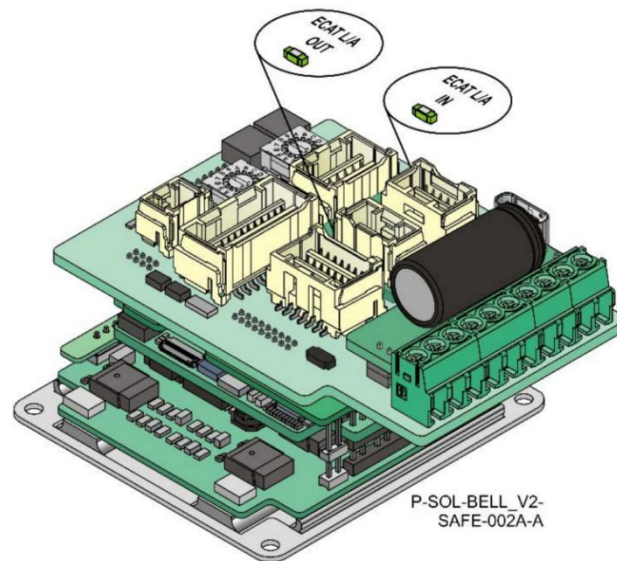


Figure 35: Ethernet Connector LEDs

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, both for the Link Act IN, and Link Act OUT.

8.8.2.4 EtherCAT Address Switches

The Platinum Solo Bell has two rotary switches that allow the user to define a unique node ID to the slave.

EtherCAT address switches set the ECAT address (LOW is ADD low, HIGH is ADD high). The two rotary switches offer up to 255 addresses, with the 0-setting referring to No alias address.

Figure 48 displays the switches available in the EtherCAT Version. Refer to section 17.2.5 EtherCAT Switches in the Platinum Safety Drive Manual for full details.

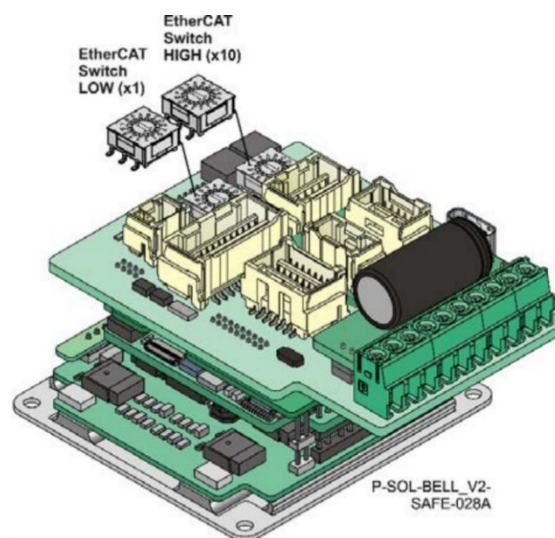


Figure 36: EtherCAT Address Switches

The positions of the switches on the drive are shown in Figure 48. Use a screwdriver to set the low and high bytes values of the drive EtherCAT address. This address is only retrieved after power-up.

chapter9: Powering Up



After the Platinum Bell 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.

9.1 Initializing the System

After the Platinum Bell 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.

9.2 Heat Dissipation

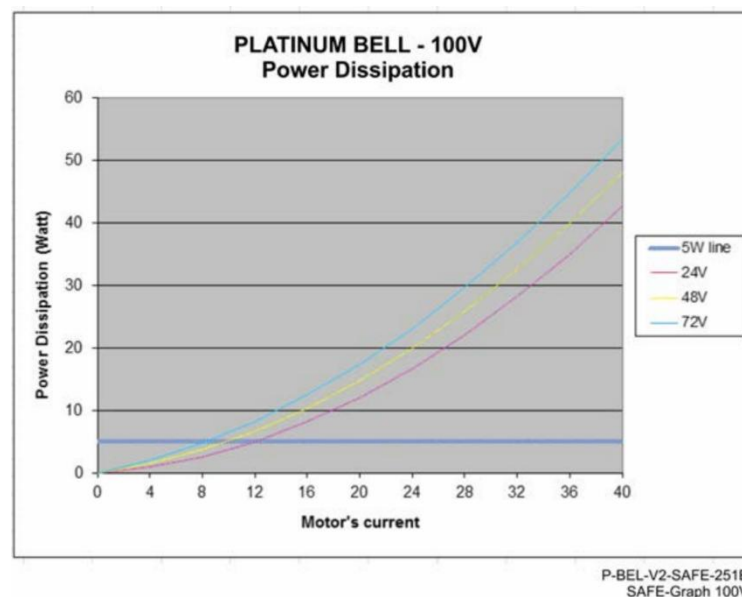
The best way to dissipate heat from the Platinum Bell is to mount it so that its heat-sink faces up. For best results leave approximately 10 mm of space between the Platinum Bell's heat-sink and any other assembly.

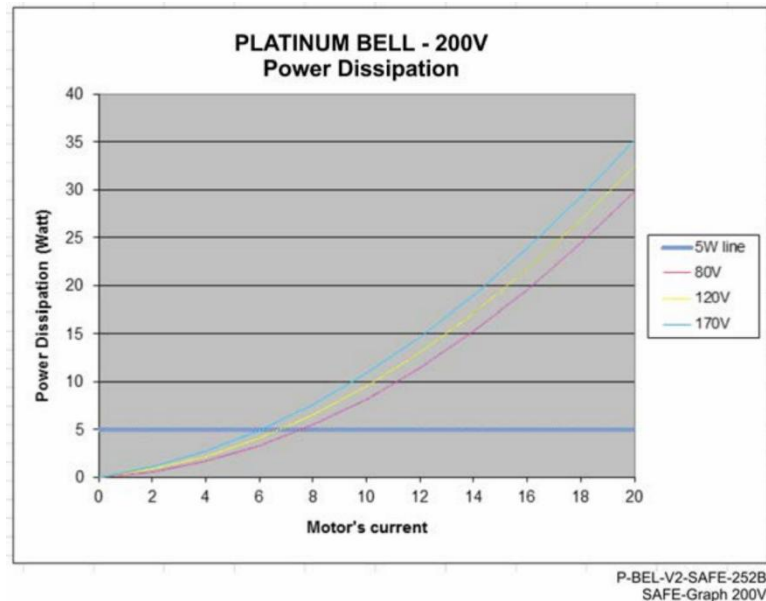
9.2.1 Thermal Data

- Heat dissipation capability (θ): Approximately 10 °C/W
- Thermal time constant: Approximately 240 seconds (thermal time constant means that the Platinum Bell will reach 2/3 of its final temperature after 4 minutes)
- Shut-off temperature: 86 °C to 88 °C (measured on the heat sink)

9.2.2 Heat Dissipation Data

Heat Dissipation is shown in graphically below:





9.2.3 How to Use the Charts

The above charts indicate the net power conversion losses and exclude the control losses.

To determine if your application heat dissipation requires a heat sink:

1. Determine the power dissipation according to the "continuous current" and the DC bus voltage curve.
2. If the DC bus is not one of the two curves above, estimate the dissipation by interpolation. The estimation error is not critical.
3. The chart is calculated for continuous current operation, if the actual operation is pulsed current, add 25% to 30% to the power dissipation of the average (RMS) current.
4. When the Heat-Sink temperature reaches $\approx 85^{\circ}\text{C}$, the Platinum Bell will shut down. Design the system for continuous operation so that the maximum Heat Sink temperature should be no higher than between 80°C to 82°C .
5. For model **PWHI-Mz-zXXX/YYYzzM**

If the average heat dissipation is less than $\approx 4\text{W}$ to 5W (Average operating power of 300W to 600W) there will be no requirement for an additional external heat sink. If the average Heat dissipation is higher than 4W then an additional heat dissipation means is required, usually by connecting to an additional external heat-sink.

6. When an external Heat-Sink is required, calculate the thermal resistance of the heat sink according to:

$$\theta_{\text{C/W}} = \frac{80^{\circ}\text{C} - T_{\text{Ambient}}}{\text{Heat Dissipation}}$$

chapter10: Dimensions

This chapter provides detailed technical dimensions regarding the Platinum Bell.

10.1 EtherCAT

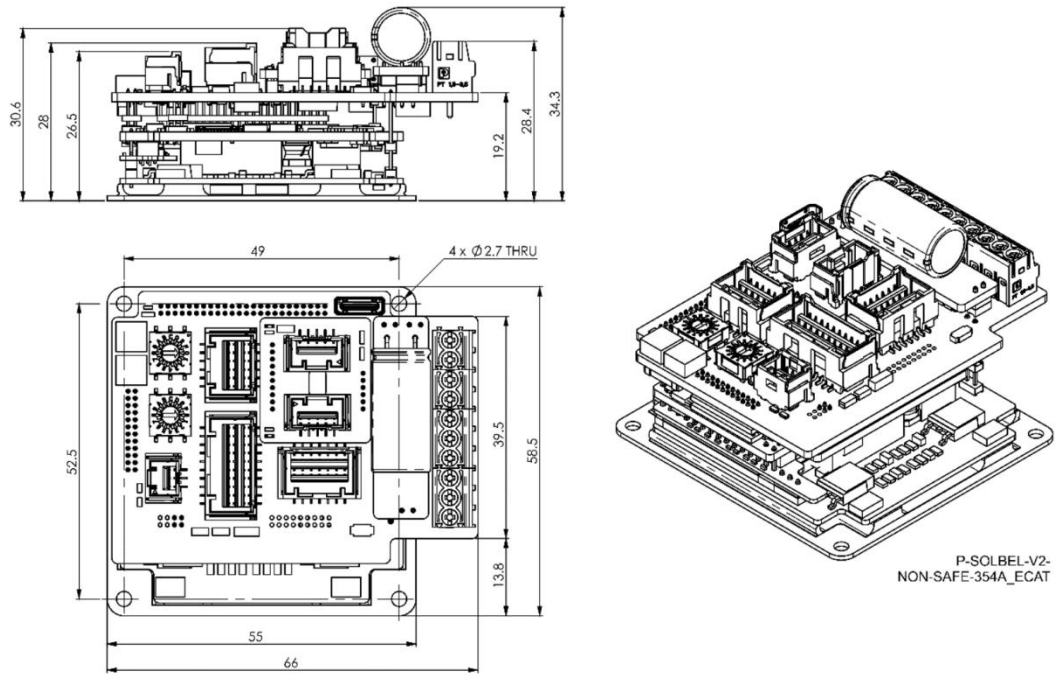


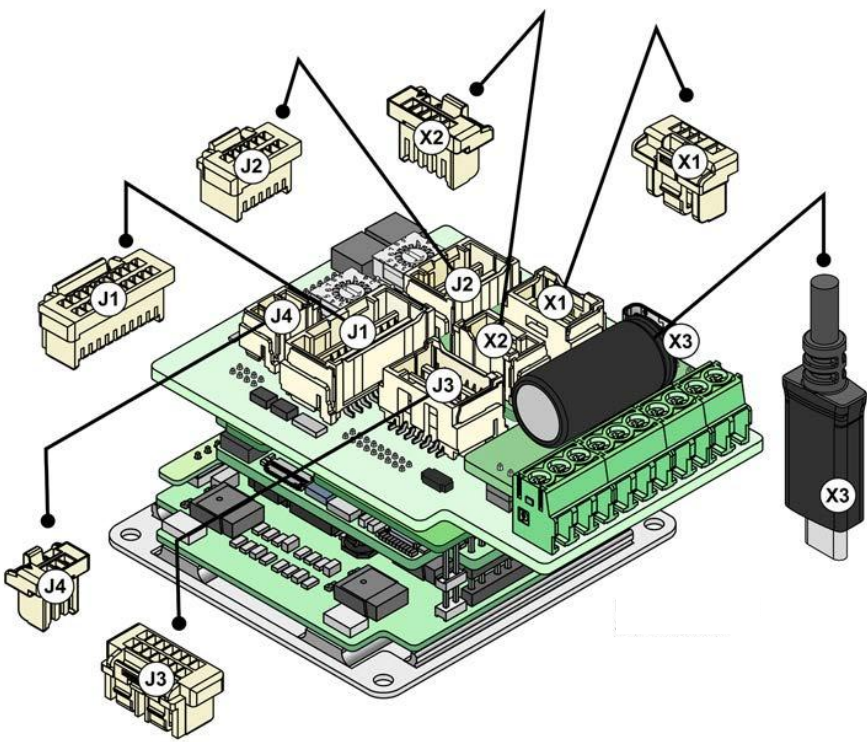
Figure 37: Platinum Bell

Chapter 11: Platinum MOL Bell Cable Kit

CBL-PMOLBELEKIT

11.1 P-MOLBEL Connectors

The table below presents the connector panel of the P-MOLBEL drive and specifies the cable connectors.

Function	Description
Port A&B	503149-2000
Port C	503149-1200
I/O	503149-1400
USB	Standard USB type C
STO Version	
STO	502578-0300
EtherCAT Version	
EtherCAT IN	5025780500
EtherCAT OUT	5025780500
Connector Locations	
	

11.2 PORT A Cable,PORT B Cable

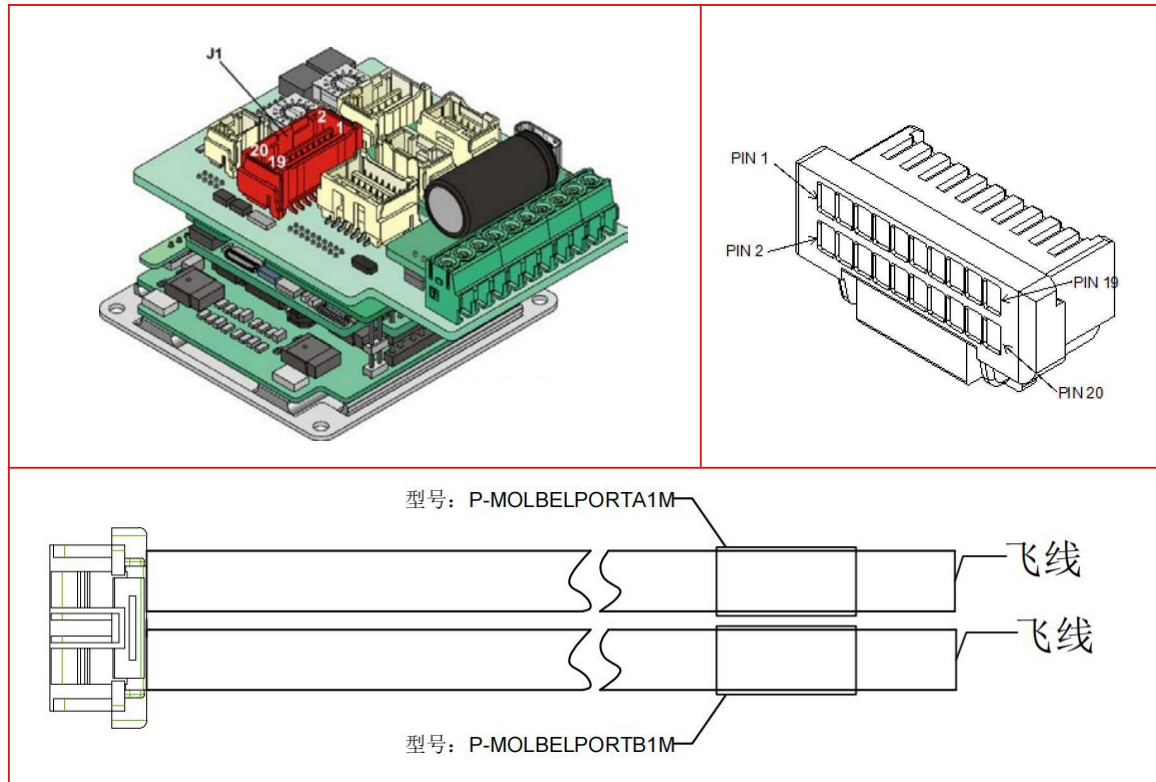
This is a composite cable consisting of PORT A Cable,PORT B Cable. Customers can select different models according to their requirements.

The PORT A Cable section: 1 piece of 6-pair twisted-pair cable,Model:P-MOLBELPORTA1M.

The PORT B Cable section: 1 piece of 4-pair twisted-pair cable,Model:P-MOLBELPORTB1M.It is connected using a CON CLIK-MATE HOUSING FE 20PIN (2X10) P=1.5 mm pitch plug.The feedback port A & B cable is open on the motor side so that it can be connected to the motor-feedback connector.

The general pinout of the Port A&B cable is as follows:

Pin No.	Signal	Color	Twisted & Shielded Wire
P-MOLBELPORTA1M			
2	5V	Brown	Twisted Pair 1
3	5V-RET	black	
5	PortA_ENC_A+	Green	Twisted Pair 2
7	PortA_ENC_A-	Yellow	
9	PortA_ENC_B+	Blue	Twisted Pair 3
11	PortA_ENC_B-	purple	
13	PortA_ENC_INDEX+	Red	Twisted Pair 3
15	PortA_ENC_INDEX-	orange	
17	HA	Pink	
18	HB	gray	
19	HC	white	
P-MOLBELPORTB1M			
6	PortC_ENCO_A+	Green	Twisted Pair 1
8	PortC_ENCO_A-	Yellow	
10	PortC_ENCO_B+	Blue	Twisted Pair 2
12	PortC_ENCO_B-	purple	
14	PortC_ENCO_Index+	Red	Twisted Pair 3
16	PortC_ENCO_Index-	orange	
20	5V-RET	Black	
Pin Positions			



11.3 PORT C Cable,ANALOG Cable

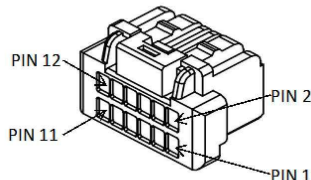
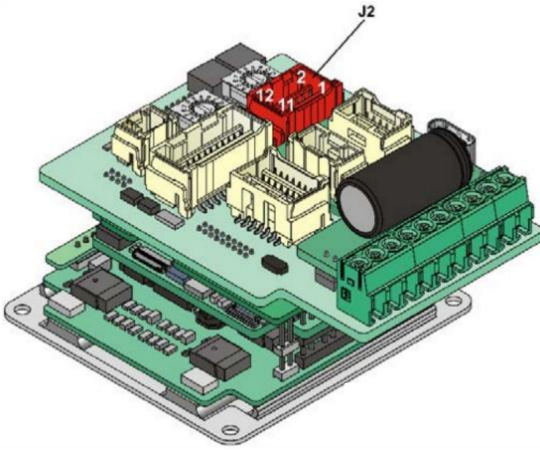
This is a composite cable consisting of PORT C Cable,ANALOG Cable. Customers can select different models according to their requirements.

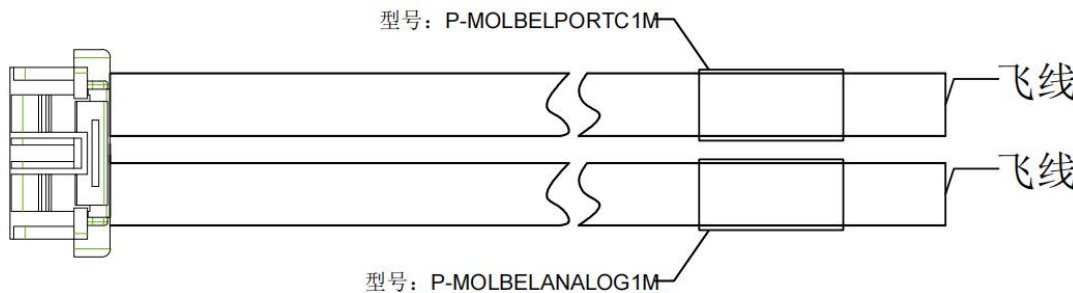
The PORT C Cable section: 1 piece of 6-pair twisted-pair cable,Model:P-MOLBELPORTC1M.

The ANALOG Cable section: 1 piece of 4-pair twisted-pair cable,Model:P-MOLBELANALOG1M.It is connected using a CON CLIK-MATE HOUSING FE 12PIN (2X6) P=1.5 mm pitch plug.The cable is open on the motor side so that it can be connected to the motor-feedback connector.

Pin No.	Signal	Color	Twisted & Shielded Wire
1	5V-RET	black	Twisted Pair 1
3	5VDC	Brown	
5	11VDC	White	
2	PortC_ENCO_A+	Green	Twisted Pair 2
4	PortC_ENCO_A-	Yellow	
6	PortC_ENCO_B+	Blue	Twisted Pair 3
8	PortC_ENCO_B-	purple	
10	PortC_ENCO_Index+	Red	Twisted Pair 4
12	PortC_ENCO_Index-	orange	

Pin Positions

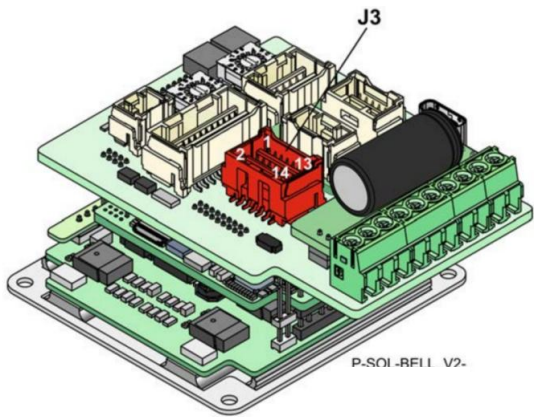
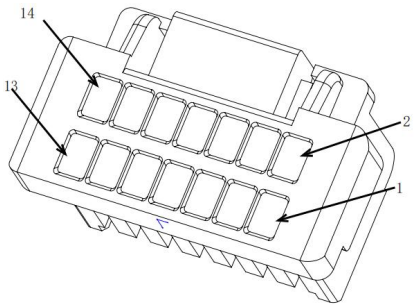
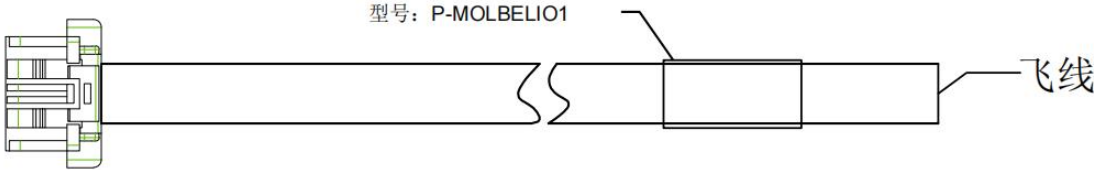




11.4 IO Cable

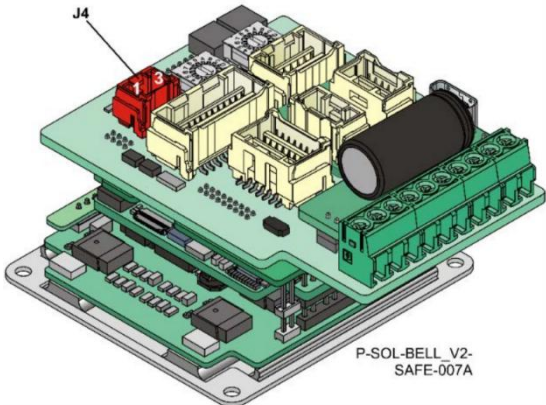
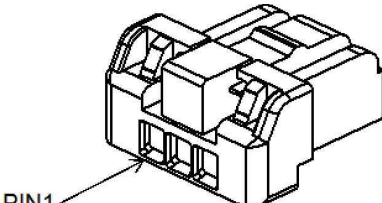
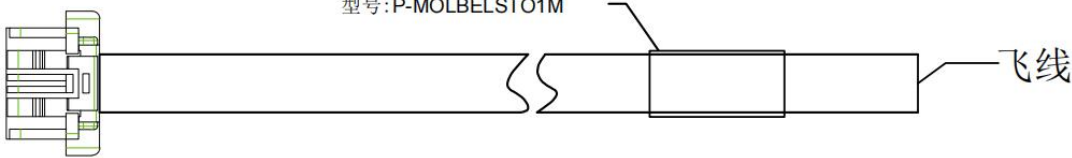
It is connected using a CON CLIK-MATE HOUSING FE 14PIN (2X7) 1.5 mm pitch plug.

The cable is open on the end side so that it can be connected to the controller interface connector.

Pin No.	Signal	Color
CBL- GDBTWIDO1		
1	VDD-RET	Black
3	VDD	Brown
5	IN6	
7	SRC or SINK CONTROL	Pink
9	OUT7	Orange
11	OUT8	White
13	IN-COM	Cyan
2	IN1	Green
4	IN2	Blue
6	IN3	Red
8	IN4	Gray
10	OUT1	Yellow
12	OUT2	Purple
14	IN5	
Pin Positions		
		
		

11.5 STO Cable

Pin No.	Signal	Color
0V	STO-RET	Brown
1	STO1	Red
2	STO2	Black

Pin Positions	
 P-SOL-BELL V2-SAFE-007A	 PIN1
 型号: P-MOLBELSTO1M 飞线	

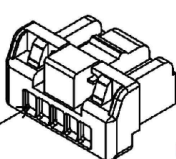
11.6 Communication Cables

- USB
- EtherCAT(EtherCAT IN &EtherCAT OUT)
- CAN open (CAN in & CAN out)

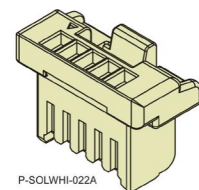
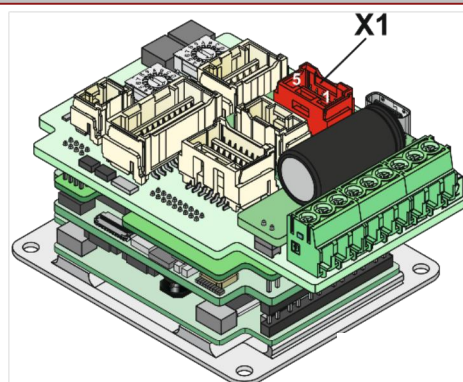
11.6.1 USB Communication Cable(P-MOLUSB)



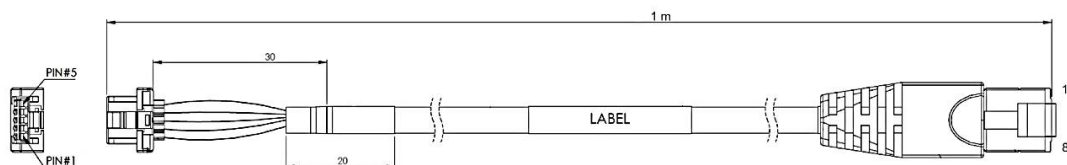
11.6.2 EtherCAT Communication Cable(P-MOLBELETH1MR)

Pin No	To Pin No	Signal	Color	Twisted & Shielded Wire	Plug
1	1	EtherCAT_IN_TX+	Brown	Twisted Pair	 CON CLIK-MATE HOUSING FE 5PIN(1X5)
2	2	EtherCAT_IN_TX-	Black		
3	3	EtherCAT_IN_RX+	Red	Twisted Pair	
4	6	EtherCAT_IN_RX-	Orange		
5	RJ-45 Body	PE	Drain wire		

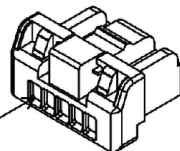
Pin Positions

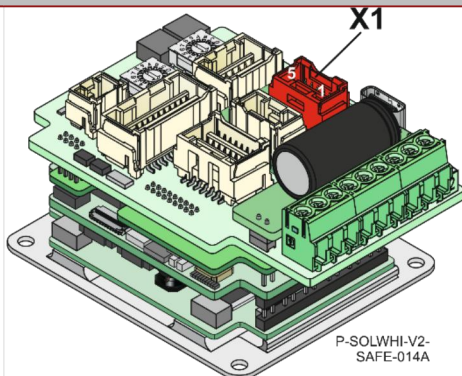
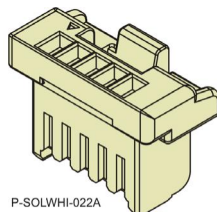


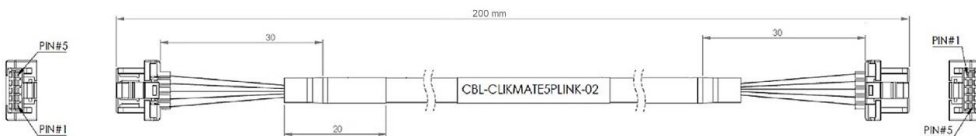
CLIK-MATE HOUSING FE
5PIN(1x5) P=1.5MM



11.6.3 EtherCAT Link Cable(P-MOLBELETH1M)

Pin No	Signal	Color	Twisted & Shielded Wire	Plug
1	EtherCAT_IN_TX+	Green	Twisted Pair	 PIN 1 CON CLIK-MATE HOUSING FE 5PIN(1X5)
2	EtherCAT_IN_TX-	Yellow		
3	EtherCAT_IN_RX+	White	Twisted Pair	
4	EtherCAT_IN_RX-	Brown		
5	PE	Drain wire		

Pin Positions	
 X1 P-SOLWHI-V2-SAFE-014A	 P-SOLWHI-022A CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM

 200 mm 30 20 30 CBL-CLIKMATE5PLINK-02 PIN#5 PIN#1 PIN#1 PIN#5

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