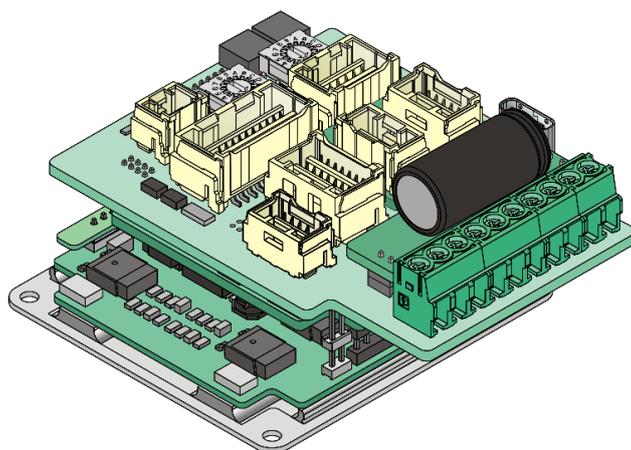
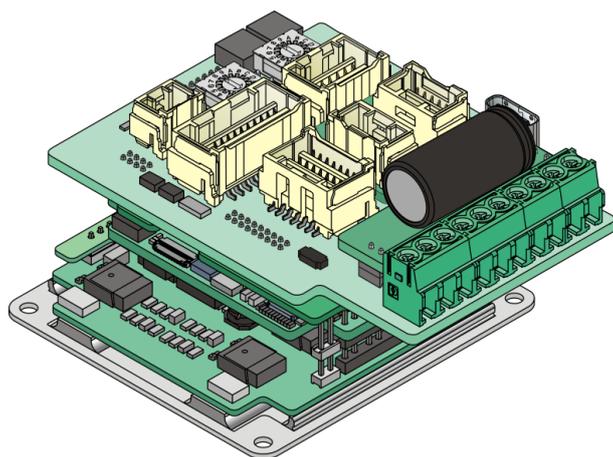


Platinum Solo Bell Digital Servo Drive Installation Guide

Functional Safety
Safety Capability: F, S, T
EtherCAT and CANopen



January 2021 (Ver. 2.009)

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Document no. MAN-P-SOLBEL_IG-EC (Ver. 2.009)

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Revision History

Version	Date	Version	Date
Ver. 2.000	June 2020	Ver. 2.007	Dec 2020
Ver. 2.001	July 2020	Ver. 2.008	Jan 2021
Ver. 2.002	Aug 2020	Ver. 2.009	Jan 2021
Ver. 2.003	Aug 2020		
Ver. 2.004	Aug 2020		
Ver. 2.005	Oct 2020		
Ver. 2.006	Oct 2020		

Catalog Number

PBEL-Sz-zXXX/YYYzzzQ

Family Name:
Platinum Bell

Mounting Version:
S — SOLO

Safety Capability :

F — Functional Safety with SafeIO
S — Functional Safety without SafeIO
T — Hardware STO only

Rated Voltage

Rated Continuous Current

Rated Current Mode:
Blank — Standard
R — No peak current

Dual Use:

Q — Dual Use Compliance 428/2009, ECCN3A225
 (Consult Factory)

IO Style for Non-SafeIO:

U — 5V Logic
V — PLC SRC (High Side) or SINK (Low Side)

IO Style for SafeIO:

K — VDD=24V, All Outputs
L — VDD=24V, Outputs 1,2,3,4
 VDD=48V, Outputs 7,8
N — VDD=48V, Outputs 7,8

Encoder Port B options:

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

Network for Safety Capability F, or S:

F — EtherCAT with Switches or Ethernet
 USB

Network for Safety Capability T:

F — EtherCAT with Switches or Ethernet
 USB
S — CAN (available within the near future)
 USB
 RS-232
T — CAN + RS-422 Serial Communication (Differential RS-232)
 (available within the near future)
 USB
 RS-422 Serial Communication (Differential RS-232)

Cable Kit

The following cable kit may be ordered within the near future

Catalog number: CBL-PSOLWHIKIT01 - EtherCAT Cable kit

For further details, see the MAN-P-SOLWHIBEL-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 Solo Bell.

For a comprehensive specification and detailed description of the functions, refer to the Platinum Safety Drive.

Chapter 2: Functional Safety

The Platinum Solo BEL 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.

Chapter 3: Safety Information

In order to achieve the optimum, safe operation of the Platinum Solo 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 Solo 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 Solo 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 Solo 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.
- All connectors except STO, EtherCAT/Ethernet, Digital Inputs, Digital Outputs operating at voltage greater than ELV, require an isolation for working voltage 170VDC.



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 supply connected to the instrument must comply with the parameters outlined in this guide.
- When connecting the Platinum Solo Bell 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 Solo 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 CE Marking Conformance

The Platinum Solo Bell 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 Solo Bell 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.

3.4 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 4: Product Description

The Platinum Solo Bell is an integrated solution delivering up to **1.6 kW of continuous power** or **3.2 kW of peak power** in a compact package (66.0 x 58.5 x 37.0 mm (2.60" x 2.30" x 1.46")), and designed to simply and efficiently connect Elmo's Platinum Solo Bell servo drive directly to the application. The solution consists of the Platinum Solo Bell together with a convenient connection interface, which either eliminates or reduces development time and resources when designing an application's PCB board.

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 Solo Bell is provided in three safety configurations:

- **Functional Safety with Safe IO (PBEL-zF):** Servo drive with Function Safety and Safe IO – This configuration of Servo drives includes safe Digital IO which support Safe Digital Inputs and Outputs including Brakes. This configuration supports the operation of the safety function either via FSOE or via the Safe I/O.
- **Functional Safety with regular IO (PBEL-zS):** Servo drive with Function Safety excluding Safe IO – This configuration of Servo drives includes regular Digital IO. This configuration permits operation of safety functions only via FSOE (Fail Safe over EtherCAT).
- **STO Only (PBEL-zT):** Servo drive with STO – The servo drive supports only STO

The Platinum Solo Bell is powered by dual isolated power supplies from the Main, main DC power 10 V – 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 Solo Bell drive is easily set up and tuned using 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 about software tools refer to the Elmo Application Studio Inline-Help.

4.1 Accessories

The following cable kit may be ordered within the near future

Catalog number: CBL-PSOLWHIKIT01 - EtherCAT Cable kit

For further details, see the MAN-P-SOLWHIBEL-CBLKIT cable kit manual.

Chapter 5: Technical Information

5.1 Physical Specification

Feature	Units	All Types
Weight	g (oz.)	~100 g (3.53 oz)
Weight with Safe IO Board	g (oz.)	~110 g (3.88 oz)
CAN and Non Function Safety EtherCAT Version Dimensions	mm (in)	66.0 x 58.5 x 34.3 mm (2.60" x 2.30" x 1.35")
Function Safety with IO Version Dimensions	mm (in)	66.0 x 58.5 x 37.0 mm (2.60" x 2.30" x 1.46")
Mounting method		Panel Mounted
Degrees of Protection		IP=00

5.2 Technical Data

5.2.1 100V Models

Feature	Units	1/100	2.5/100	5/100	10/100	15/100	20/100	25/100
Minimum supply voltage	VDC	10						
Nominal supply voltage	VDC	85						
Maximum supply voltage	VDC	95						
Maximum continuous power output	W	80	200	400	800	1200	1600	2000
Efficiency at rated power (at nominal conditions)	%	> 99						
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz						
Control supply	VDC	12 to 60V for functional Safety (up to 6 VA inc. 5 V/2 x 200 mA for Encoder)						
Amplitude sinusoidal/DC continuous current	A	1.0	2.5	5	10	15	20	25
Sinusoidal continuous RMS current limit (Ic)	A	0.7	1.8	3.5	7	10.6	14.1	17.5
Peak current limit	A	2 x Ic						

Table 1: Technical Data



Note (on current ratings):

The current ratings of the Platinum Solo 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 now offers a 200 VDC maximum output rating selection of Platinum Solo Bell, according to the following technical data:

Feature	Units	3/200	6/200	9/200
Minimum supply voltage	VDC	20		
Nominal supply voltage	VDC	170		
Maximum supply voltage	VDC	195		
Maximum continuous power output	W	480	960	1450
Efficiency at rated power (at nominal conditions)	%	> 99		
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz		
Control power supply	VDC	12 to 60V for functional Safety (up to 6 VA inc. 5 V/2 x 200 mA for encoder)		
Amplitude sinusoidal/DC continuous current	A	3	6	9
Sinusoidal continuous RMS current limit (Ic)	A	2.1	4.2	6.3
Peak current limit	A	2 x Ic		

5.3 Control Supply

Feature	Details
Control supply input voltage for Safety	Isolated DC Source: 12 to 60 V
Control supply input power	≤4 VA without external loading ≤6 VA with full external loading

5.4 Product Features

5.4.1 Feedback

Feature	Details	Presence and No.
Feedback	Standard Port A, B, & C	√

5.4.2 Encoder Supply

Feature	Details
5V supply	5V Nominal, 4.75V÷5.25V up to 400mA
11V supply only with Safety Capability: F	11V Nominal, 10.6V÷11.5V up to 300mA

5.4.3 Communication

Feature	Details	Presence and No.	
Communication Options	USB	√	
	EtherCAT <i>or</i>	√	
	CAN (Available in the future)	√	
	RS-232 <i>or</i>	√	Available only for network S or T
	RS-422 (Differential RS-232)	√	

5.4.4 Analog Input

Feature	Details	Presence and No.
Analog Input	Differential ±10V	√

5.4.5 STO

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

5.4.6 Safe IO Features: IO TYPE = K, L, N

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

Feature	Details	Max. Values	Presence / No.
Digital Input	PLC Source, Isolated (IN1, IN2, IN3, IN4)		4
Safe Digital Output	Isolated PLC Source (OUT3, OUT4)	$I_{out} (max) \leq 250 \text{ mA per Output}$	2
	Isolated PLC Source (OUT 7)	$I_{out} (max) \leq 500 \text{ mA per Output}$	1
	Isolated PLC Sink (OUT8)	$I_{out} (max) \leq 500 \text{ mA per Output}$	1
Regular Digital Output	Isolated PLC Source OUT1, OUT2	$I_{out} (max) \leq 250 \text{ mA per Output}$	2
VDD_24V	Power supply for OUT1, OUT2, OUT3, OUT4	19.6V to 30V	√
VDD_48V	Power supply for OUT7, OUT8,	19.6V to 60V	√

5.4.7 Regular IO Features: IO TYPE = U, V

5.4.7.1 IO TYPE = U

Feature	Details	Max. Values	Presence / No.
Digital Input	5V logic (IN1, IN2, IN3, IN4, IN5, IN6)		6
Digital Output	5V logic (OUT1, OUT2, OUT7, OUT8) <i>or</i>	Maximum 15 mA	4
VDD	Power supply for Outputs	4V to 30V	4

5.4.7.2 IO TYPE = V

Feature	Details	Max. Values	Presence / No.
Digital Input	PLC Source <i>or</i> PLC Sink, Isolated		6
Digital Output	PLC Source or Sink, Isolated (OUT1, OUT2) <i>or</i>	$I_{out} (max) \leq 500 \text{ mA per Output 1}$ (or other designated Output)	2
	PLC Source or Sink, Isolated (OUT7, OUT8)	$I_{out} (max) \leq 250 \text{ mA per other}$ Outputs each, usually 2 to 4	2
VDD	Power supply for Outputs	19.6V to 30V	

5.5 Environmental Conditions

You can guarantee the safe operation of the Platinum Solo Bell by ensuring that it is installed in an appropriate environment.

Feature	Details
Operating ambient temperature according to IEC60068-2-2	0 °C to 55 °C (32 °F to 131 °F)  Remark: Functional Safety is applicable to the above operating temperature. In some products, power derating is required to operate above 50°C. Refer to the specific installation guide.
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
Pollution Degree	Pollution Degree 2

5.6 Standards and Certifications

The following table describes the Main Standards of the Platinum Solo Bell servo drive. For further details, refer to Chapter 22 in the [Platinum Safety Drive Manual](#).

Main Standards	Item
The related standards below apply to the performance of the servo drives as stated in the environmental conditions in section Environmental Conditions above.	
IEC 61800-5-2:2016	Adjustable speed electrical power drive systems – Safety requirements – Functional
EN ISO 13849-1:2015	Safety of machinery — Safety-related parts of control systems.
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
IEC 61508	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems (E/E/PE, or E/E/PES)
In compliance with UL61800-5-1	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
In compliance with CSA C22.2 NO. 274	Industrial Control Equipment
Conformity with CE 2006/95/EC	Low-voltage directive 2006/95/EC
IEC 61800-5-2:2016	Adjustable speed electrical power drive systems – Safety requirements – Functional
EN ISO 13849-1:2015	Safety of machinery — Safety-related parts of control systems.

5.6.1 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 6: Installation

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

6.1 Unpacking the Drive Components

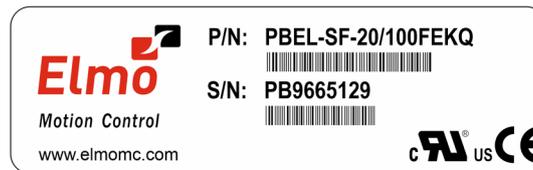
Before you begin working with the Platinum Solo Bell, verify that you have all of its components, as follows:

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

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

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



4. Verify that the Platinum Solo 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 section Catalog Number at 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.

PBEL-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 Solo Bell

The Platinum Solo Bell was designed for mounting on a surface. When integrating the Platinum Solo 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 Solo Bell is enclosed in a metal chassis, we recommend that the Platinum Solo Bell be screw-mounted to it to help with heat dissipation. The Platinum Solo Bell has screw-mount holes on each corner of the heat-sink for this purpose – see below.

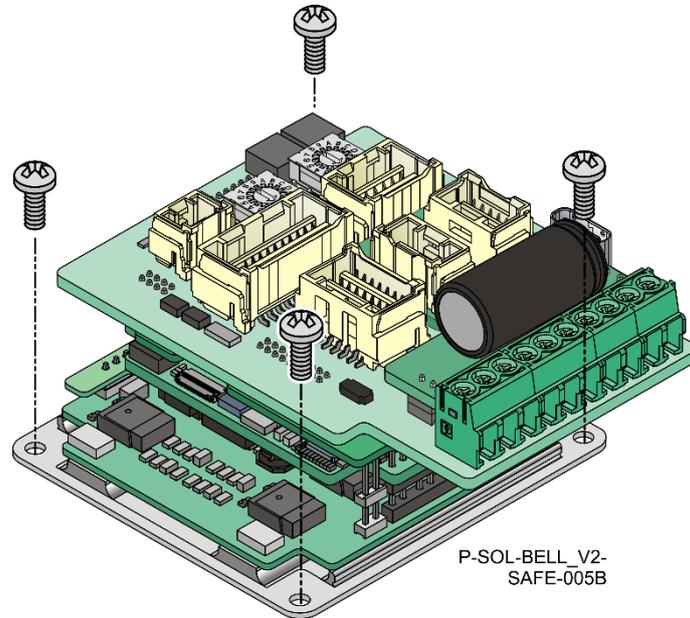


Figure 1: Mounting the Platinum Solo Bell

When the Platinum Solo 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: WHI-HEATSINK-2) that can be ordered for this purpose – see below.

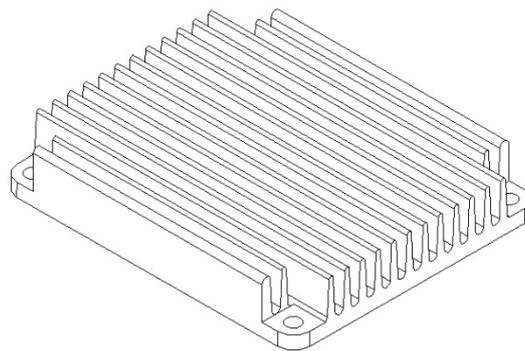


Figure 2: Platinum Solo Bell External Heat-sink

Chapter 7: Connector Types, Pinouts, and LEDs

The Platinum Solo 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
X4	5	Molex Pico-Clasp™ 5 pins, 1.00mm pitch	RS-422/RS-232 communication (available for Safety Cap.: T)
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
CAN Version			
X1	1x5	Molex, CLIK-Mate, 5 pins, 1.5 mm pitch	CAN
X2	1x5	Molex, CLIK-Mate, 5 pins, 1.5 mm pitch	CAN

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 IN/OUT CAN/EtherCAT Communication	CON CLIK-MATE HOUSING FE 5PIN(1X5) P=1.5 mm pitch	
X4 RS-422/RS-232 communication	CON Pico-Clasp™ HOUSING FE 5PIN(1X5) P=1.5 mm pitch	MOLEX CRIMP TERMINAL FE 28-32AWG FOR Pico-Clasp 1.0 mm
X3	Standard USB type C cable	

7.2 Connector Locations

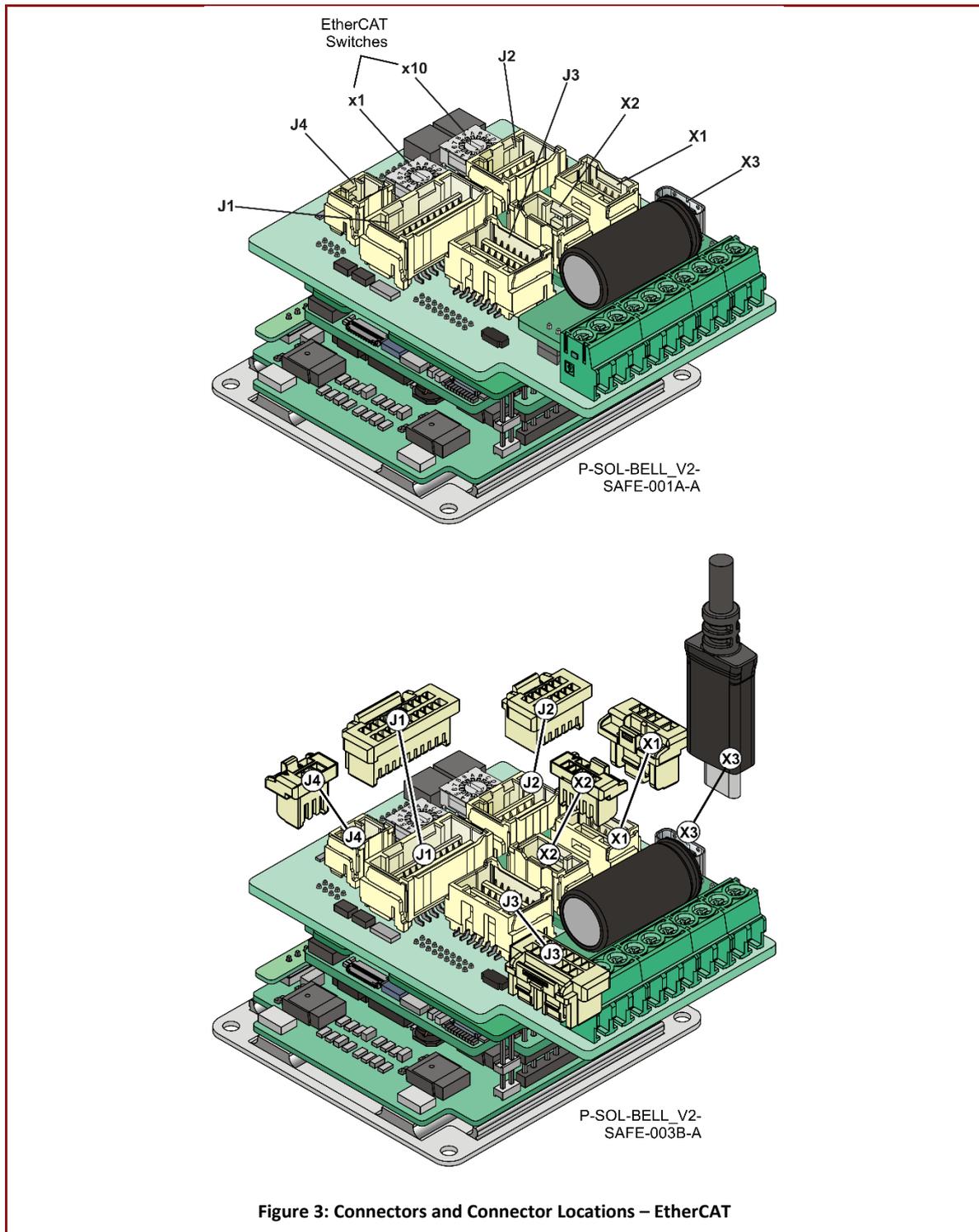


Figure 3: Connectors and Connector Locations – EtherCAT

Table 2: Connector Types

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

7.3 Solo Board Indicator Labelling

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

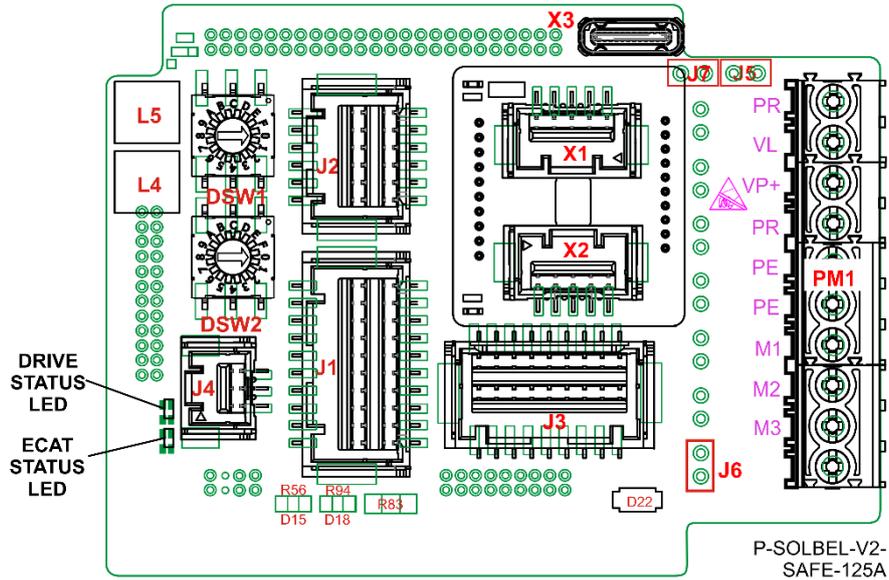


Figure 4: Platinum Solo Bell Board Indicator Labelling

7.4 Motor Power Connector Pinouts (M1)

For further details, refer to [Chapter 8 Input Power Supply](#) in the [Platinum Safety Drive Manual](#).

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

Pin Positions

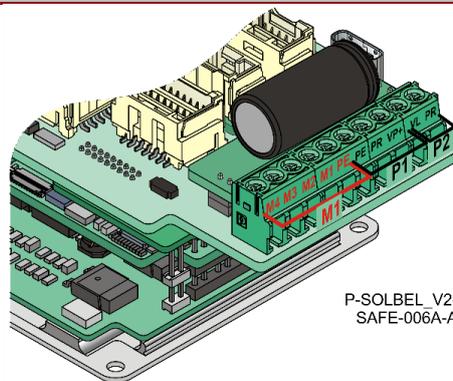


Table 3: Main Power and Motor Connections

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

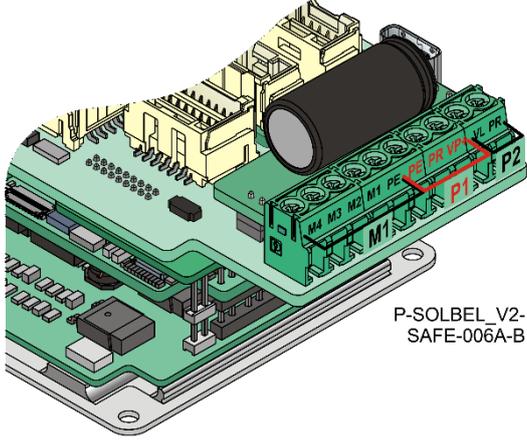


Table 4: Main Power Connections

7.6 Control Power Supply Connector Pinouts (P2)

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

Pin Positions

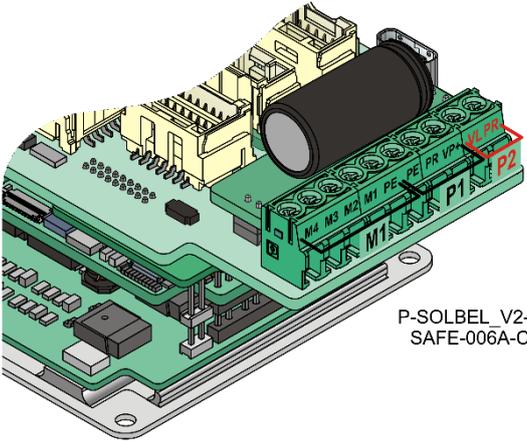


Table 5: Control Supply Pins

7.7 Drive Status Indicator

Figure 5 shows the position of the red/green dual LED, which is used for immediate indication of the Initiation and Working states.

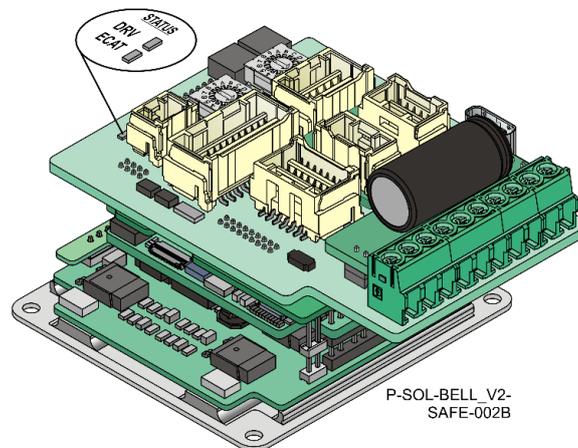


Figure 5: Drive Status Indicator

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)

For further details, refer to the Chapter 10 STO in the [MAN-P Safety Drive Manual](#).

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

Table 6: STO Input Pin Assignments

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

For full details, refer to [Chapter 11 Feedback](#) in the [MAN-P Safety Drive Manual](#).

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 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 8: J1 Port B Pin Assignments

7.9.3 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 9: J1 Hall Sensors 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

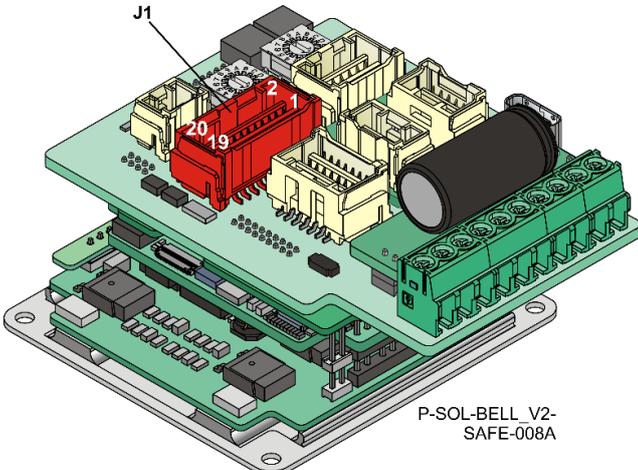
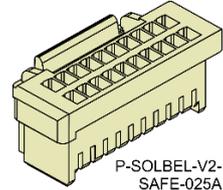
Pin Positions	Cable Connector
 <p>P-SOL-BELL_V2-SAFE-008A</p>	 <p>P-SOLBEL-V2-SAFE-025A</p> <p>CLIK-MATE HOUSING FE 20PIN(2x10) P=1.5MM</p>

Table 10: Power Pin Assignments

7.10 Port C Connector Pinouts (J2)

For full details, refer to [section 11.1.5 Port C Encoder](#) in the [Platinum Safety Drive Manual](#).

The Port C connector includes the following functions:

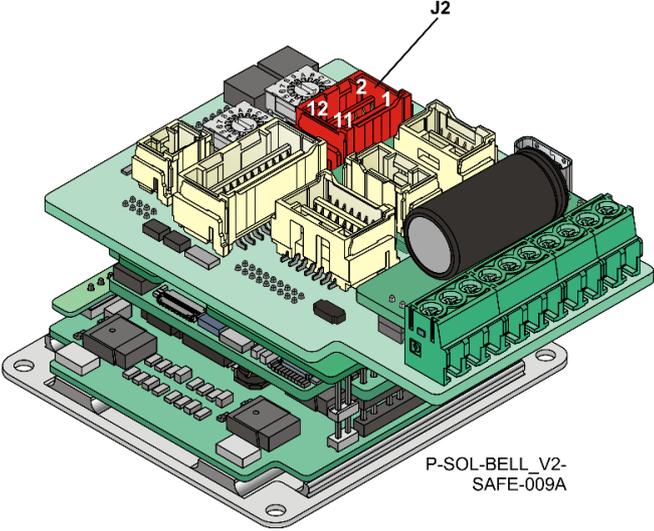
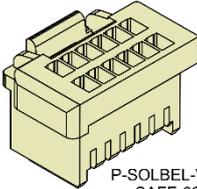
Pin (J2)		Incremental Encoder	Absolute Serial Encoder	General Outputs
Signal		Function	Function	Function
1	COMRET	Common return		
2	PortC_A+	Channel A +	Absolute encoder clock+	General Output A+
3	+5VE	Encoder +5V supply		
4	PortC_A-	Channel A -	Absolute encoder clock-	General Output A-
5	+11V	Encoder 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
 <p>P-SOL-BELL_V2-SAFE-009A</p>				 <p>P-SOLBEL-V2-SAFE-023A</p> <p>CLIK-MATE HOUSING FE 12PIN(2x6) P=1.5MM</p>

Table 11 Port C Pin Assignments

7.11 Digital I/Os Connector Pinouts (J3)

The Safe IO Digital I/Os connector includes the following functions:

I/O: Refer to [Chapters 12 Safe Digital IO](#) and [13 Regular Digital IO](#) in the [Platinum Safety Drive Manual](#) for full details.

7.11.1 Safe IO: IO TYPE = K, L, N

The Digital I/Os connector includes the following functions:

Pin (J3)	Signal	IO TYPE K	IO TYPE L	IO TYPE N
1	VDD_RET	VDD Return		
2	IN1	Input		
3	VDD_24V	VDD 19.6V up to 30V	VDD 19.6V up to 30V	Not Used
4	IN2	Input		
5	OUT4	Output		
6	IN3	Input		
7	VDD_48V	Not Used	VDD 19.6V up to 60V	VDD 19.6V up to 60V
8	IN4	Input		
9	OUT7	Output		
10	OUT1	Output		
11	OUT8	Output		
12	OUT2	Output		
13	VDD_RET	VDD Return		
14	OUT3	Output		

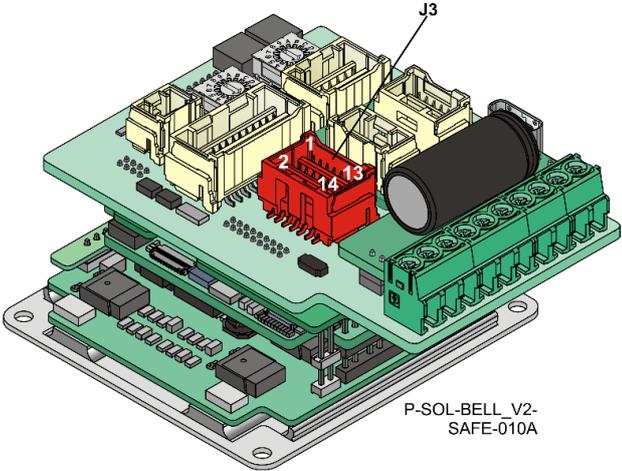
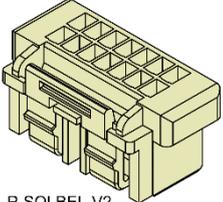
Pin Positions	Cable Connector
 <p>P-SOL-BELL_V2-SAFE-010A</p>	 <p>P-SOLBEL-V2-SAFE-024A</p> <p>CLIK-MATE HOUSING FE 14PIN(2x7) P=1.5MM</p>

Table 12: Safe Digital I/O Pin Assignments for IO TYPE = K, L, N

7.11.2 Regular IO: IO TYPE = U, V

The Regular Digital I/Os connector includes the following functions:

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	
7	SRC or SINK CONTROL	Not Used	For Source: 0 - Source Control For Sink: VDD
8	IN4	Input	
9	OUT7	Output	
10	OUT1	Output	
11	OUT8	Output	
12	OUT2	Output	
13	IN_COM	Digital Input Return	For Source: Digital Input Return For Sink: Digital Input Power
14	IN5	Input	

Pin Positions	Cable Connector
	<p>P-SOLWHI-V2-SAFE-024A</p> <p>CLIK-MATE HOUSING FE 14PIN(2x7) P=1.5MM</p>

Table 13: Regular Digital I/O Pin Assignments for IO TYPE = U, V

7.12 USB 2.0 Connector Pinouts (X3)

Refer to section 15.1 USB in the [Platinum Safety Drive Manual](#) for full details.

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
		<p>USB TYPE C CABLE</p>

Table 14: USB Device Type C - Pin Assignments

7.13 RS-232 and Differential RS-232 (RS-422) Serial Communication

Refer to [section 15.3](#) and [15.4 RS-232/RS-422](#) in the [Platinum Safety Drive Manual](#) for full details.



Note: It should be noted that all signals are isolated and the Grounding denoted ISO_GND throughout RS-232/RS-422 connections.

Pin (X4)	RS-232		RS-422	
	Signal	Function	Signal	Function
1	RS232_TX	RS232 Level	RS422_TX+	Differential RS-232 Transmit Level
2	Not Connected		RS422_TX-	Differential RS-232 Transmit Level
3	RS232_RX	RS232 Level	RS422_RX+	Differential RS-232 Receive Level
4	Not Connected		RS422_RX-	Differential RS-232 Receive Level
5	ISO_GND	Isolated Ground	ISO_GND	Isolated Ground
Pin Positions			Cable Connector	
<p>P-SOL-BELL_V2-NON-SAFE-016A-A_CAN</p>			<p>P-SOLBEL-V2-NON-SAFE-215A</p> <p>Molex 501330-0500</p>	

7.14 EtherCAT IN Connector Pinouts (X1)

Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Platinum Solo Bell supports the following EtherCAT fieldbus type industrial network protocol:

Fieldbus Type	Product Number
EtherCAT	PBEL-Sz-XXX/YYYYFzz

Refer to section 15.2 EtherCAT/Ethernet in the [Platinum Safety Drive Manual](#) for full details.

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

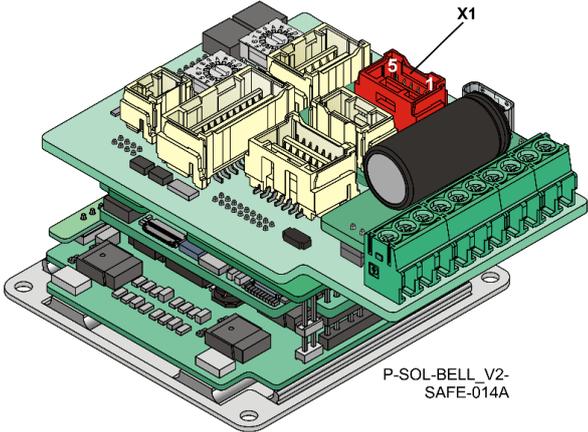
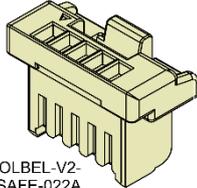
Pin Positions	Cable Connector
 <p>P-SOL-BELL V2-SAFE-014A</p>	 <p>P-SOLBEL-V2-SAFE-022A</p> <p>CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM</p>

Table 15: EtherCAT IN Pin Assignments

7.15 EtherCAT OUT/Ethernet Connector Pinouts (X2)

Refer to section 15.2 EtherCAT/Ethernet in the [Platinum Safety Drive Manual](#) for full details.

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

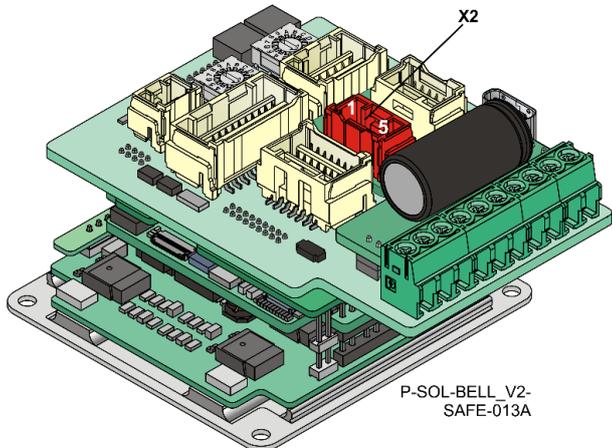
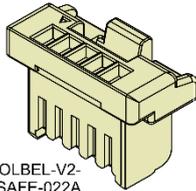
Pin Positions	Cable Connector
 <p>P-SOL-BELL_V2-SAFE-013A</p>	 <p>P-SOLBEL-V2-SAFE-022A</p> <p>CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM</p>

Table 16: EtherCAT OUT/Ethernet Pin Assignments

7.16 CAN Safety Capability: T only

Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Platinum Solo Bell supports the following CAN fieldbus type industrial network protocol:

Fieldbus Type	Product Number
CAN	PBEL-ST-zXXX/YYYSzz



Note: It should be noted that all signals are isolated and the Grounding denoted ISO_GND throughout CAN connections.

7.16.1 CAN Connector Pinouts (X1, X2)

Pin (X1, X2)	Signal	Function
1	Not Connected	
2	ISO_GND	Isolated Ground
3	CAN_H	CAN_H bus line (dominant high)
4	CAN_L	CAN_L bus line (dominant low)
5	PE	Shield drain wire

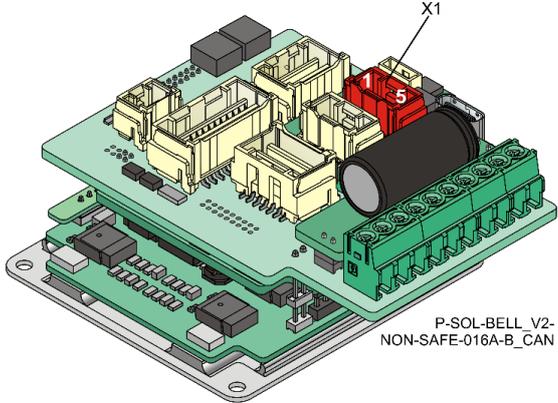
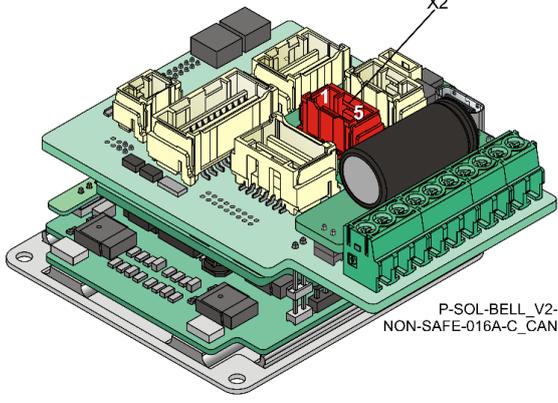
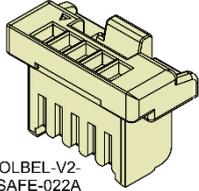
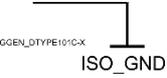
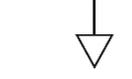
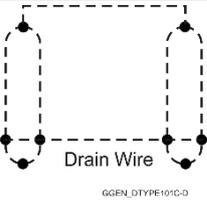
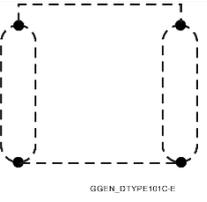
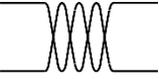
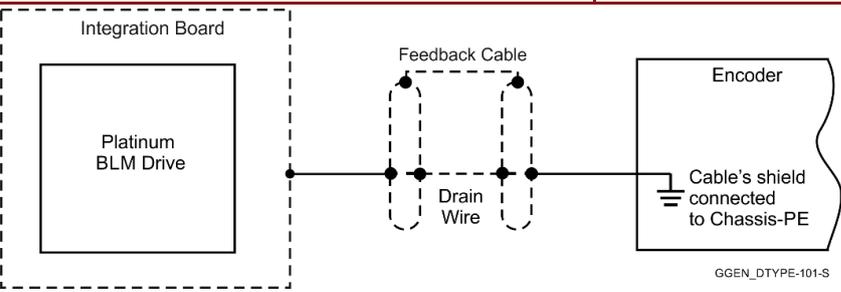
Pin Positions	Cable Connector
 <p>P-SOL-BELL_V2-NON-SAFE-016A-B_CAN</p>  <p>P-SOL-BELL_V2-NON-SAFE-016A-C_CAN</p>	 <p>P-SOLBEL-V2-SAFE-022A</p> <p>CLIK-MATE HOUSING FE 5PIN(1x5) P=1.5MM</p>

Table 17: CAN Connector Pin Assignments

Chapter 8: Wiring

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_DTYP101C-W	User Side: This symbol signifies that any type of grounding may be used on the user side
 GGEN_DTYP101C-W VDD_RET	VDD Return
 GGEN_DTYP101C-X ISO_GND	Isolated Ground
 GGEN_DTYP101C-C PR	Power Return
 GGEN_DTYP101C-S	COMRET Common at the Drive
 GGEN_DTYP101C-D	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_DTYP101C-E	Shielded cable braid only, without drain wire.
 GGEN_DTYP101C-F	Twisted-pair wires
 GGEN_DTYP101-S	
<p>Encoder Earthing. The cable's shield is connected to the chassis (PE) in the connector. The servo drive shield is connected to Earth.</p>	

8.1 Wiring Connectors

8.1.1 Wiring Female CON CLIK-MATE Connectors

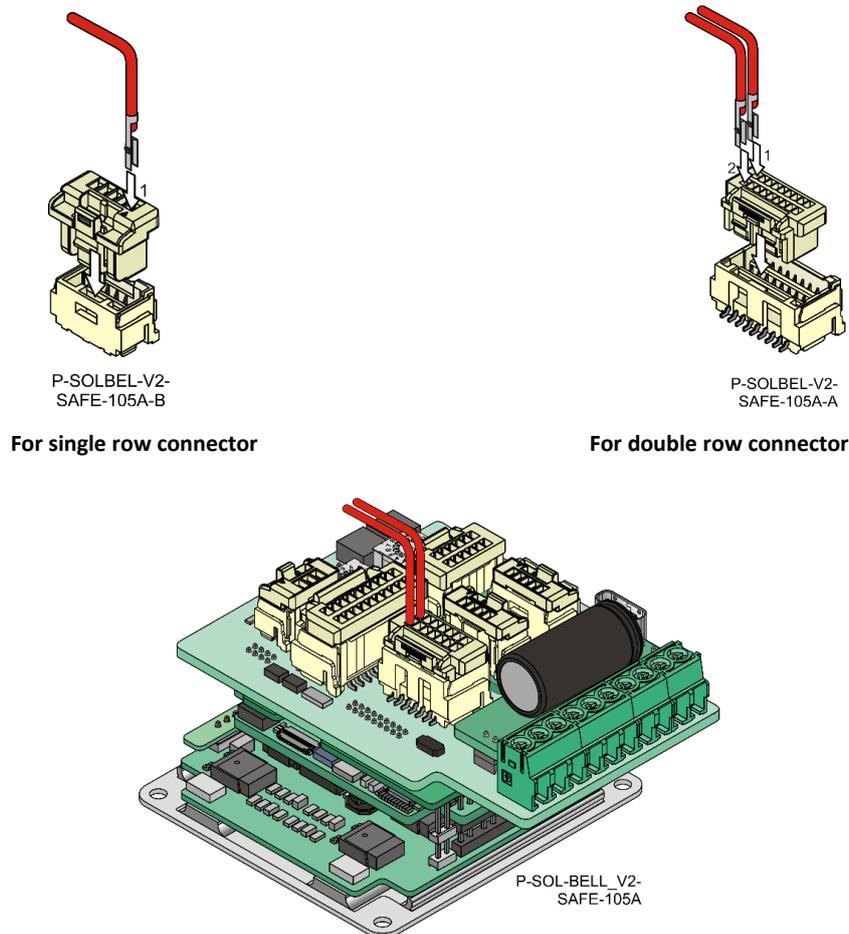


Figure 6: Inserting a wire/pin to the Female CON CLIK-MATE Connector

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 6. 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 6. 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 6.
5. Repeat the same procedure for all other wire connections.

8.2 The Platinum Solo Bell Connection Diagrams

8.2.1 EtherCAT with Safe IO (For Safety Capability: F)

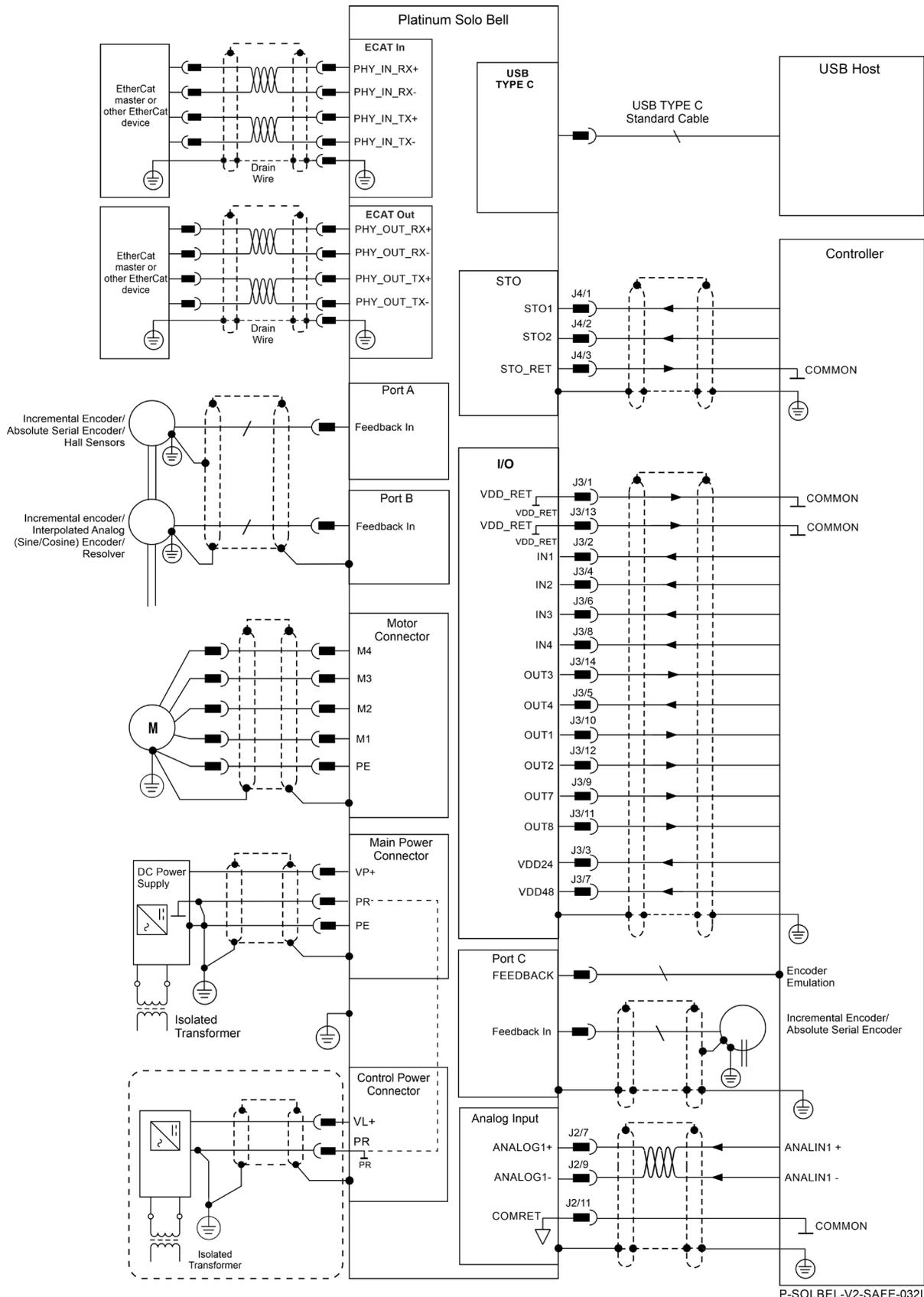


Figure 7: The Platinum Solo Bell with Safe IO, Connection Diagram – EtherCAT

8.2.2 EtherCAT Regular IO (For Safety Capability: S, T)

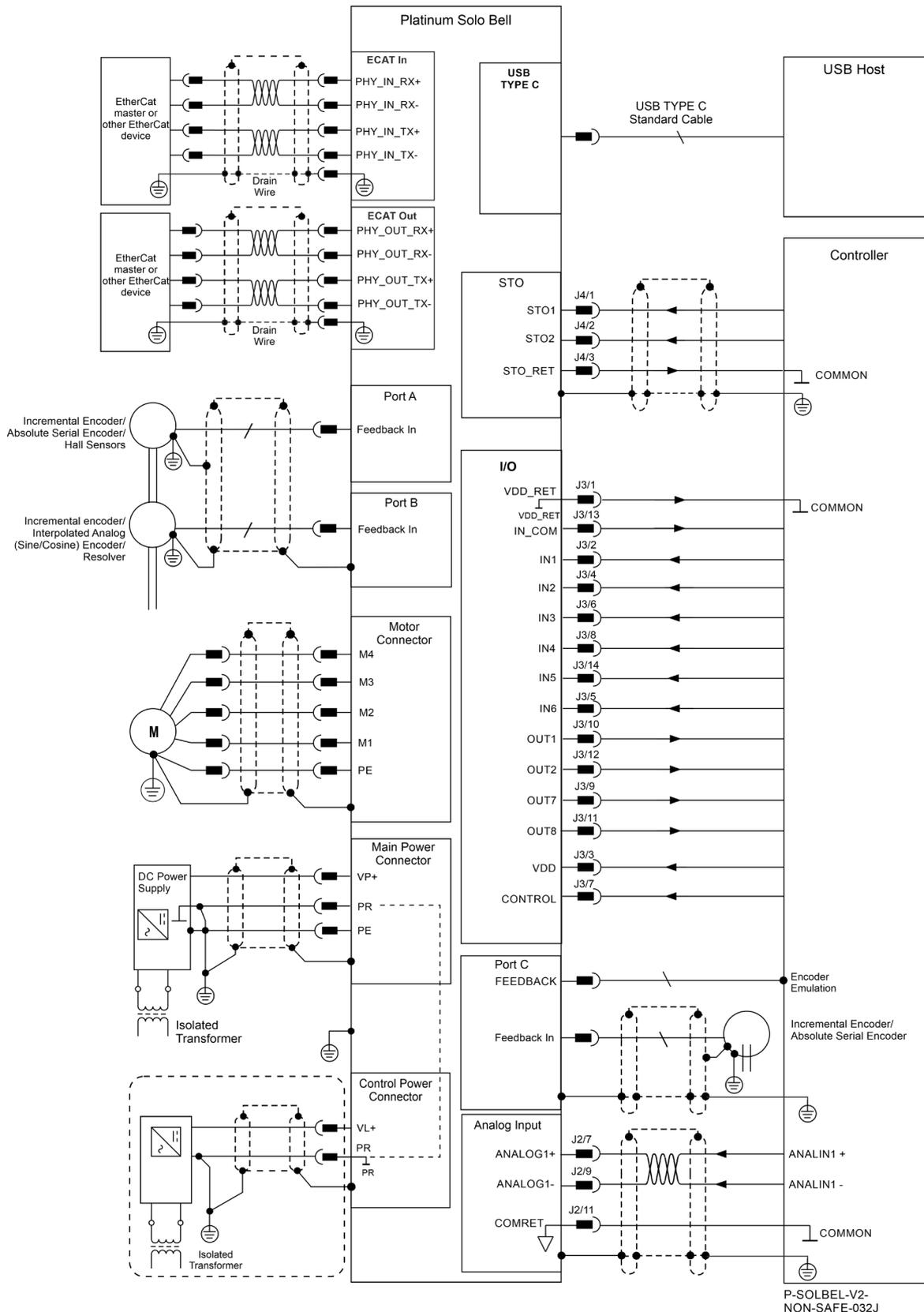


Figure 8: The Platinum Solo Bell without Safe IO, Connection Diagram – EtherCAT

8.2.3 CAN, RS-232, RS-422 (Safety Capability: T)

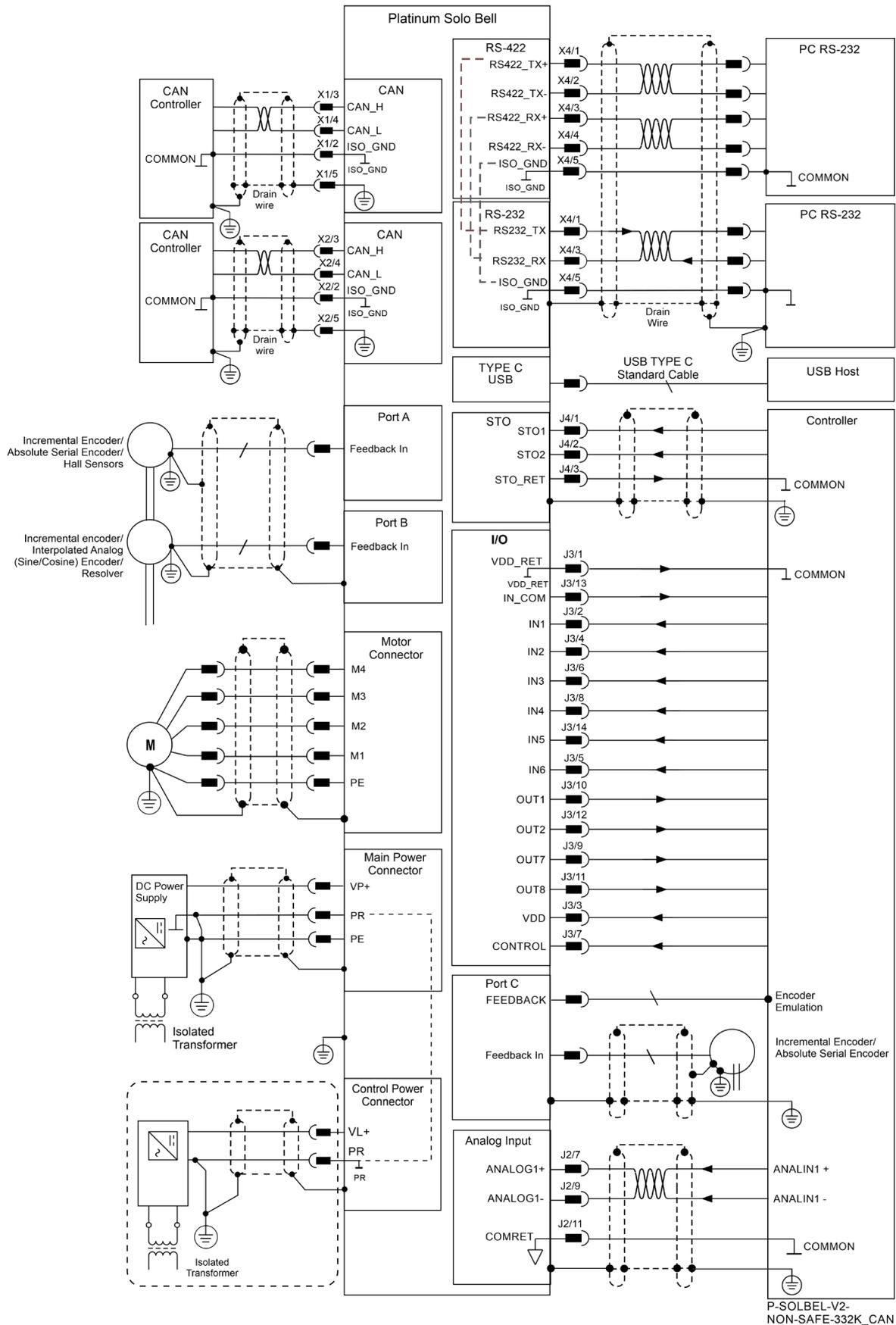


Figure 9: The Platinum Solo Bell Connection Diagram - CAN

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.

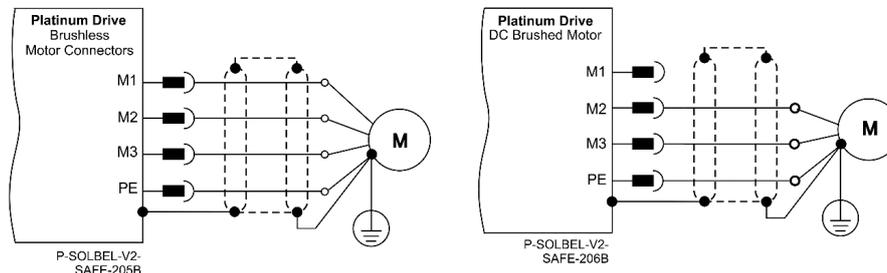


Figure 10: Brushless Motor Power and Brushed Single Motor Power Connection Diagrams

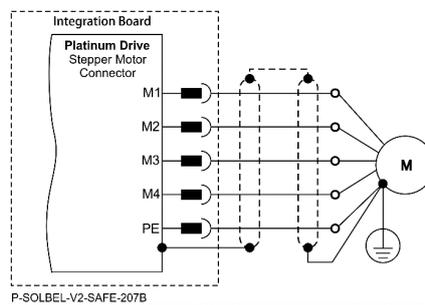


Figure 11: Stepper Single Motor Power Connection Diagram

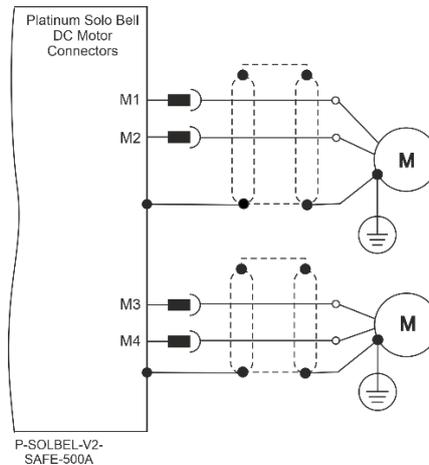


Figure 12: Two Motor Power Connection Diagram

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 Solo Bell.

Make sure not to bundle the wires.

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.

3. 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.
4. 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 (P1) and Control Power (P2)

The Platinum Solo Bell receives power from Main and Control supplies and delivers power to the motor.

Refer to the Chapter 8 Input Power Supply, in the Platinum Safety Drive Manual for details, specification, and connections of the Main and Control Power for safety.

8.4.1 Main Supply

There are two power ratings for the Platinum Solo Bell:

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

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 60V isolated from the Mains for the logic.

For power rating of 100V

Only a single DC Power source of 10 to 95 VDC isolated from the Mains, and a control supply 14 - 60V isolated from the Mains for the logic.



Note:

Both the 10V to 95V and 20V to 195V DC power sources 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 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 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.

8.4.2 Control Supply

The Control Power (VL) for Safety configuration must be 14V 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.

8.4.3 Dual Power Supply for Safety Configuration

Two DC power sources are required for functional Safety. Refer to the Chapter 8 Input Power Supply, in the Platinum Safety Drive Manual for details, specification, and connections.

- 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.



Important:

CAPACITANCE IN: For Platinum Solo Bell modules 20/100 and 25/100A a DC Bus Capacitance of 900uF must be connected between the VP+ and the PR as shown in the following figure. Alternative, the Elmo Tabla-200 (a DC Bus connection and capacitance bank) can be used. Please refer to the TABLA-200 Installation Guide.

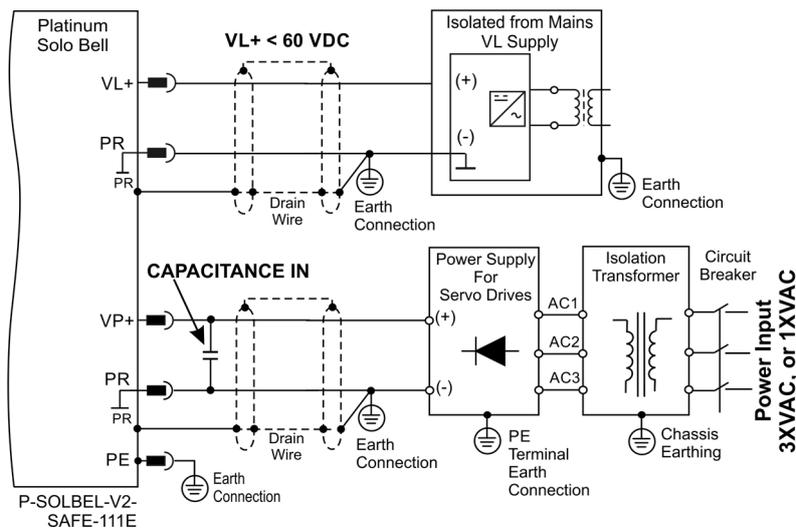


Figure 13: Power Supply Connection Diagram for Safety Configuration



Note:

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

8.5 STO (Safe Torque Off) (J4)

Refer to the Chapter 10 Safe Torque Off (STO) section, in the Platinum Safety Drive Manual for details, specification and connection of the STO.

8.5.1 Source Mode – PLC Voltage Level

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

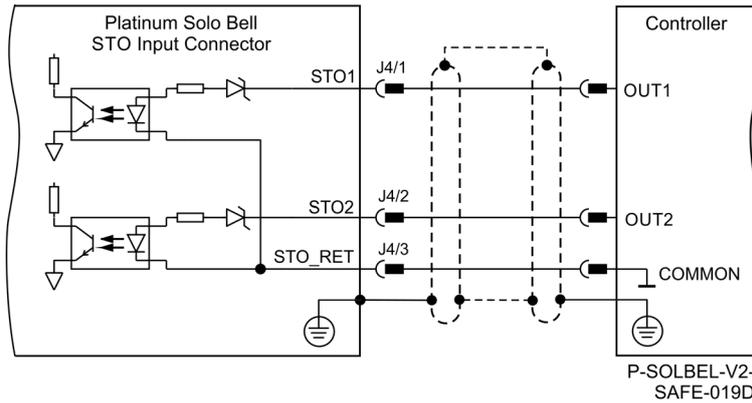


Figure 14: STO Type Connection – PLC Source Option

8.5.2 TTL Mode – TTL Voltage Level

TTL option is available only for non-Safe IO. Refer to the diagrams below for TTL option connection.

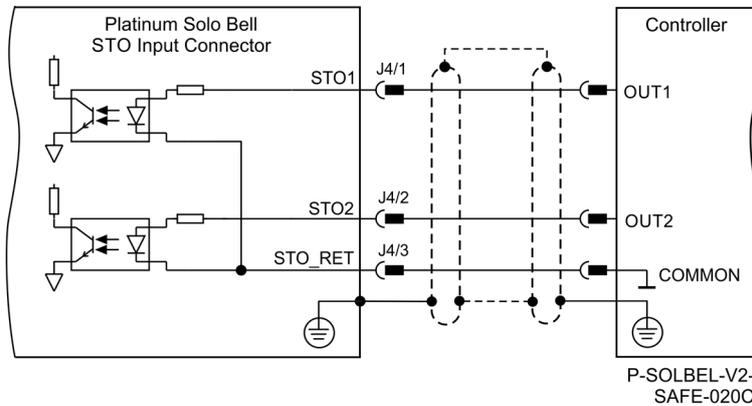


Figure 15: STO Input Connection – TTL Option

8.6 Feedbacks (J1 and J2)

Refer to the Chapter 11 Feedback, in the Platinum Safety Drive Manual for details, specification, and connections of the Feedback for safety.

8.6.1 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

8.6.1.1 Incremental Encoder

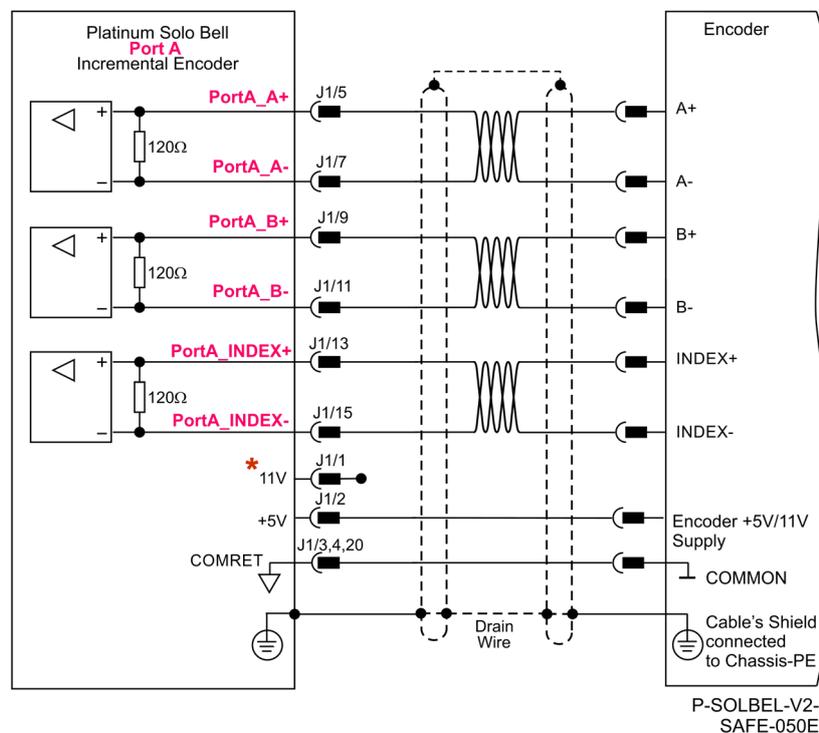


Figure 16: Port A Incremental Encoder Input – Recommended Connection Diagram



* **Note:** If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.1.2 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:

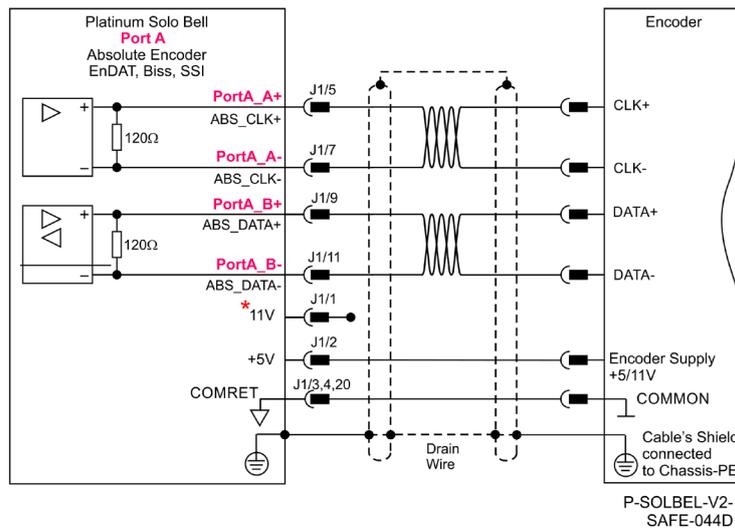


Figure 17: Absolute Serial Encoder – Recommended Connection Diagram for EnDat, Biss, SSI



* Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.1.3 Hiperface

The following figure describes the connection diagram.

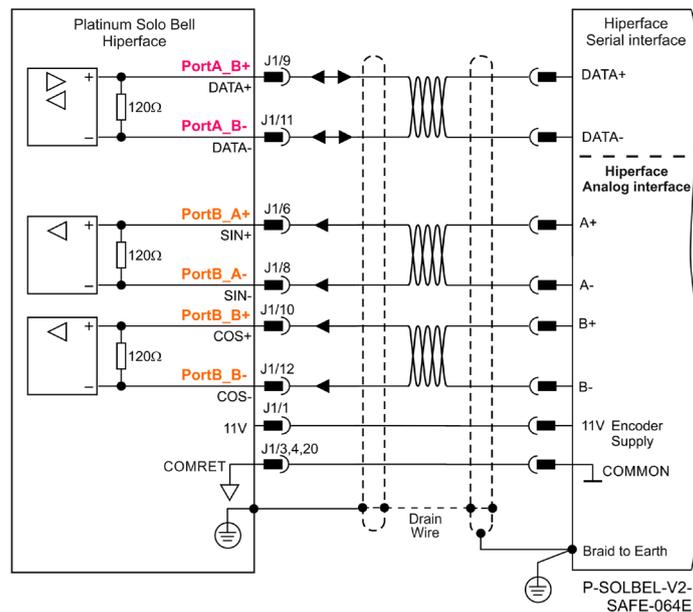


Figure 18: Absolute Serial Encoder – Recommended Connection Diagram for Stegmann Hiperface



Note: For non-Safe IO, external 11V power supply should be provided.

8.6.2 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

8.6.2.1 Incremental Encoder

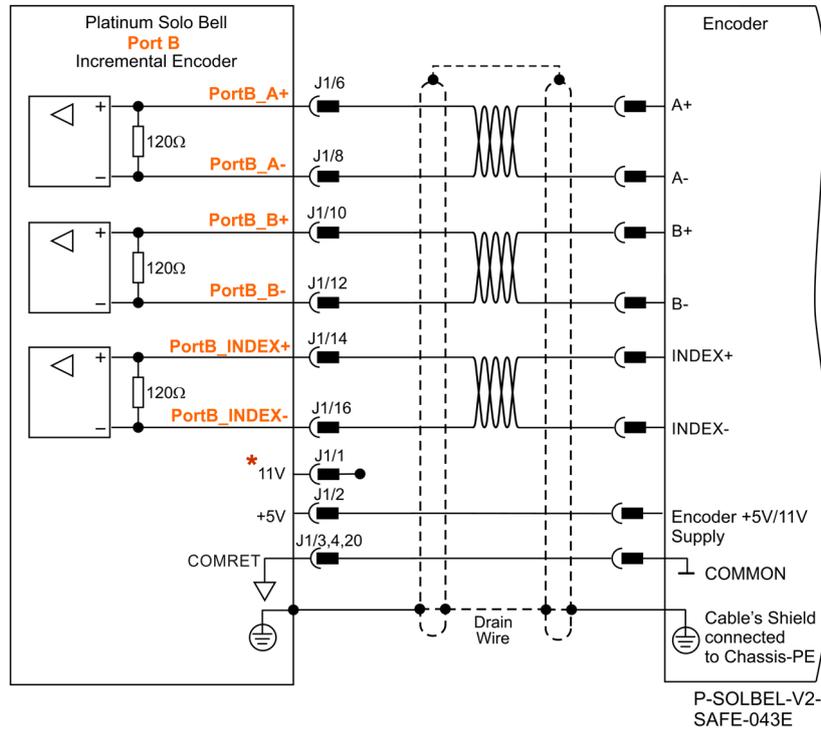


Figure 19: Port B Incremental Encoder Input – Recommended Connection Diagram



* Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.2.2 Interpolated Analog (Sine/Cosine) Encoder

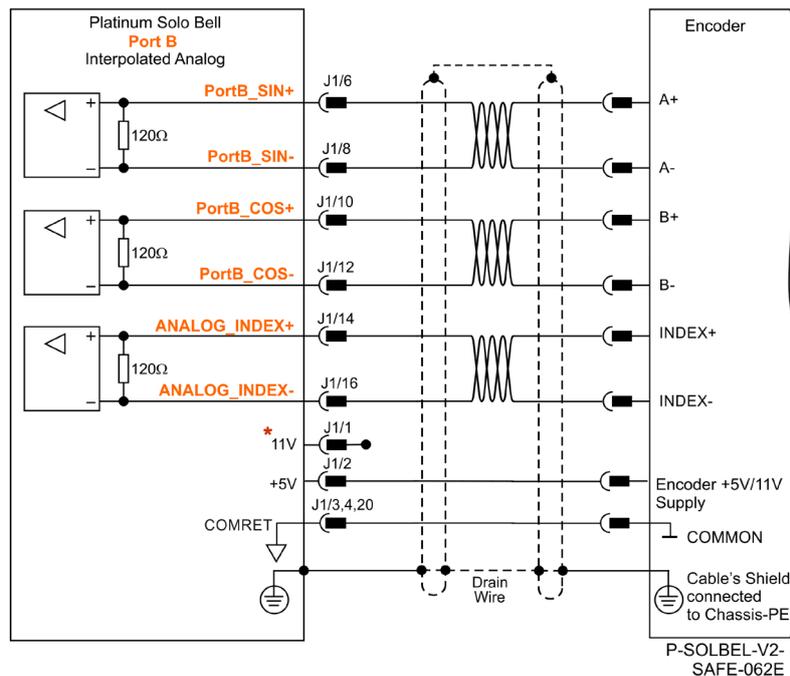


Figure 20: Port B - Interpolated Analog Encoder Connection Diagram



* Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.2.3 Resolver

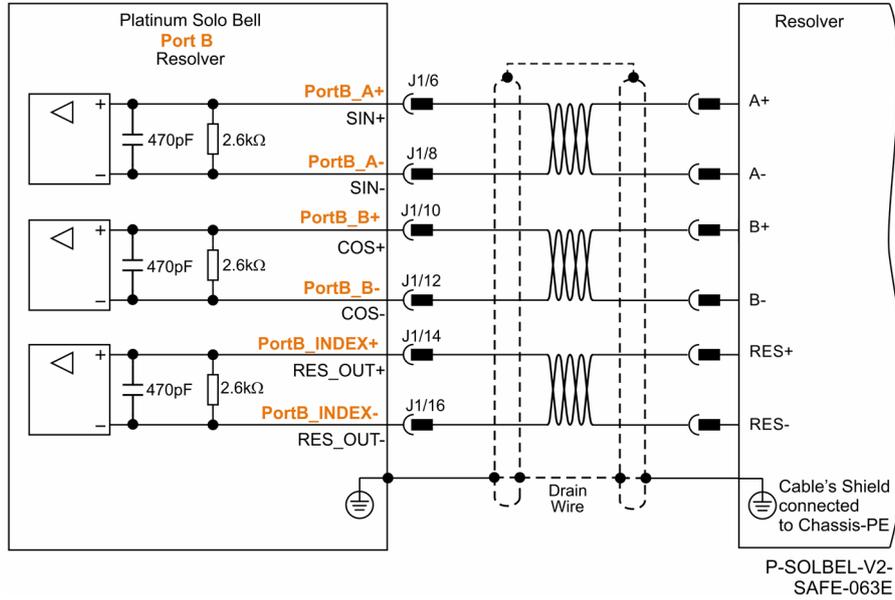


Figure 21: Port B – Resolver Connection Diagram

8.6.3 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

8.6.3.1 Incremental Encoder

The following Incremental Encoder types are supported:

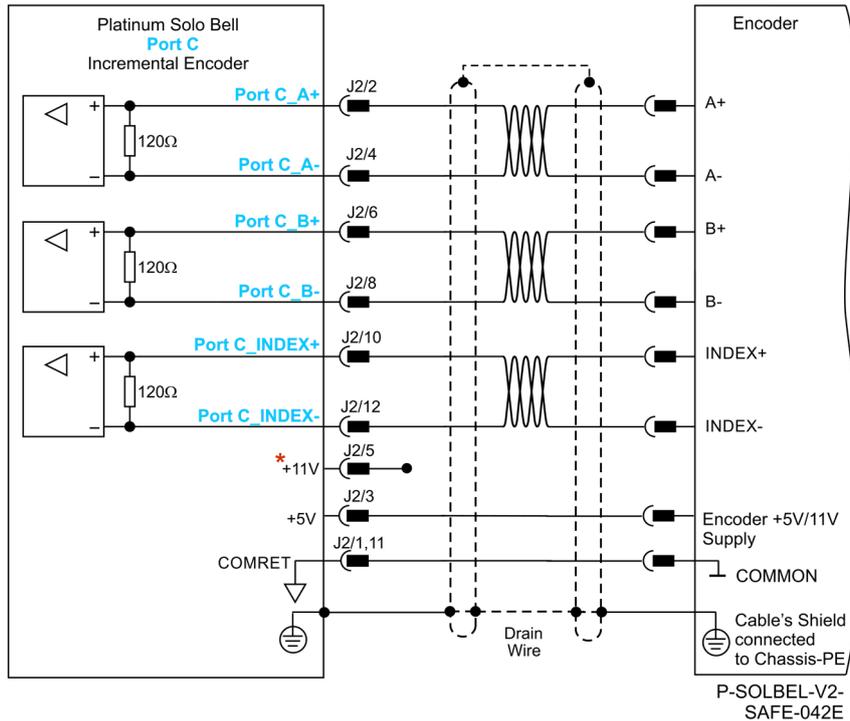


Figure 22: Port C Incremental Encoder Input – Recommended Connection Diagram



*Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.3.2 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:

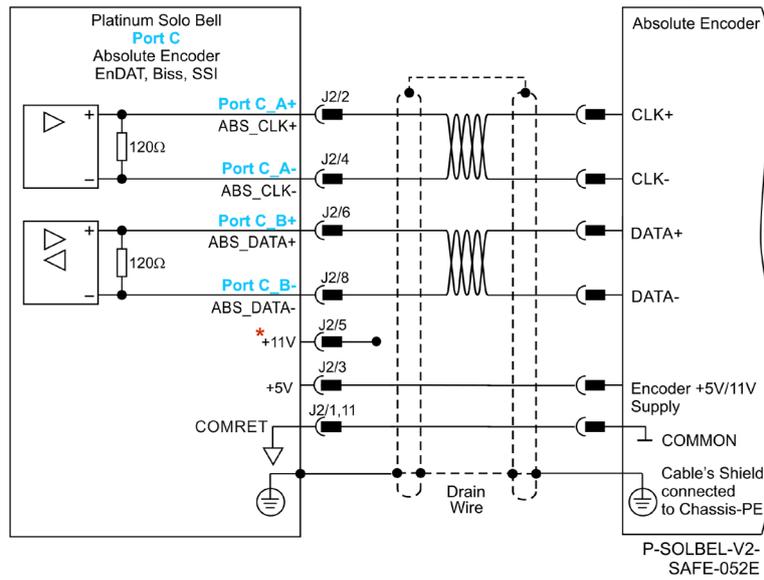


Figure 23: Absolute Serial Encoder – Recommended Connection Diagram for EnDat, Biss, SSI



***Note:** If the Encoder supports 11V, then for Safety Capability F, 11V is available.

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

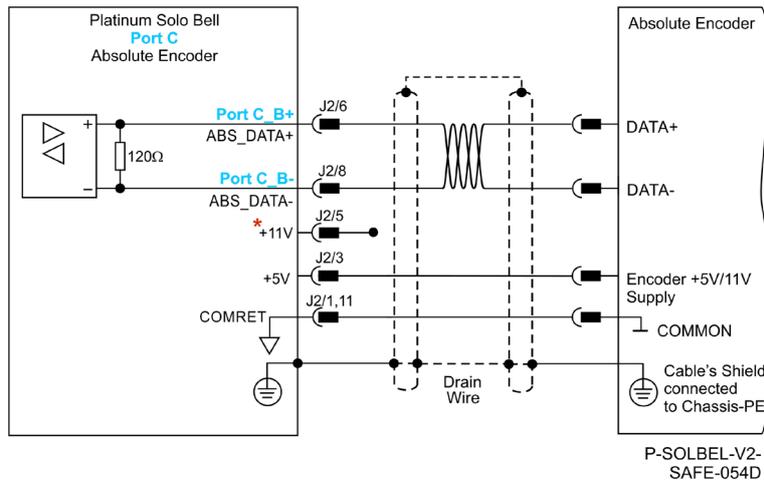


Figure 24: Absolute Serial Encoder – Recommended Connection Diagram for Panasonic, Tamagawai, Sanyo-Danki



***Note:** If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.3.3 Emulated Encoder Output

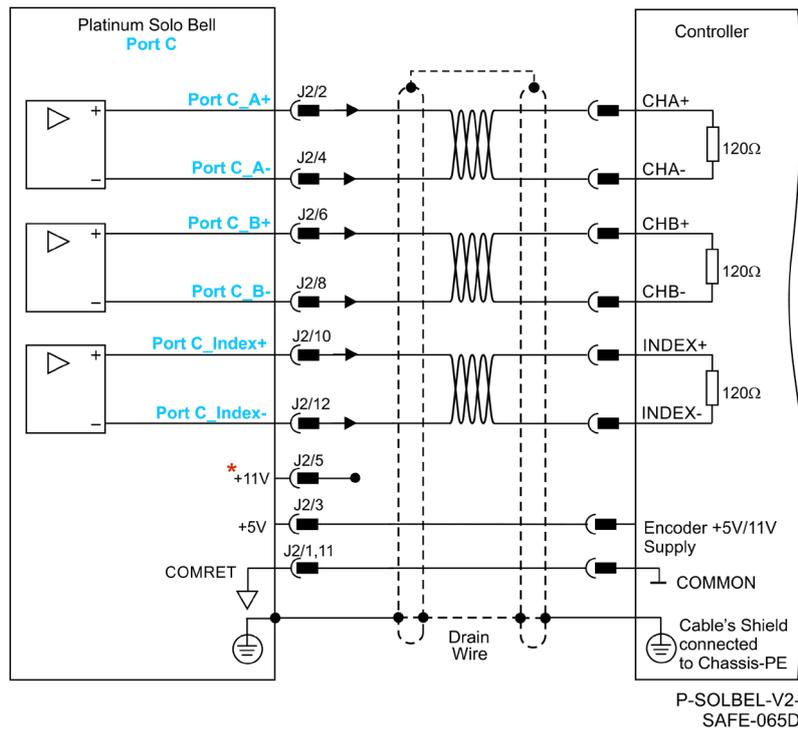


Figure 25: Emulated Encoder Differential Output – Recommended Connection Diagram



*Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.6.4 Feedback - Hall Sensors

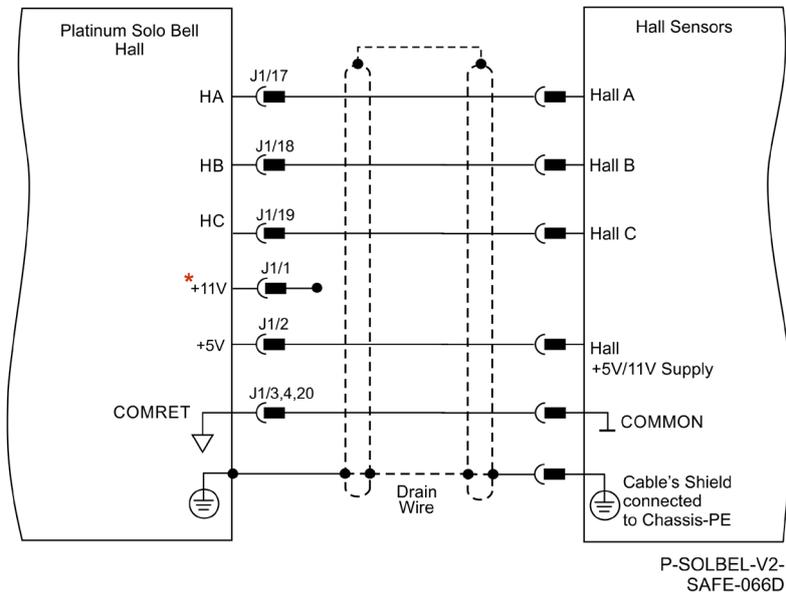


Figure 26: Hall Sensors Connection Diagram



*Note: If the Encoder supports 11V, then for Safety Capability F, 11V is available.

8.7 Safe Digital I/Os (Safe IO Style: K, L, M) (J3)

Refer to the Chapter 12 Safe Digital IO section, in the Platinum Safety Drive Manual for details, specification and connection of IO for Safety.

8.7.1 Digital Input with Test Pulse

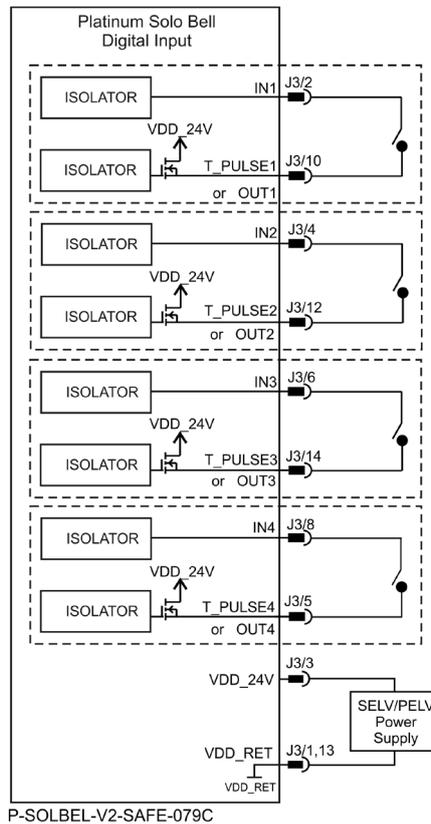


Figure 27: Digital input with Test Pulse

8.7.2 OSSD Digital Input

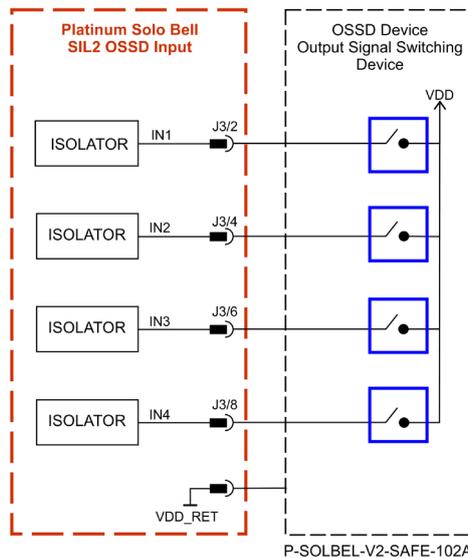


Figure 28: OSSD Digital input

8.7.3 Digital Output

The Platinum servo drive provides three configurations of the VDD connection as shown in the Catalog Number:

- **K** — VDD=24V, All Outputs
- **L** — VDD=24V, Outputs 1,2,3,4 and VDD=48V, Outputs 7,8
- **N** — VDD=48V, Outputs 7,8

8.7.3.1 Option K Configuration VDD_24

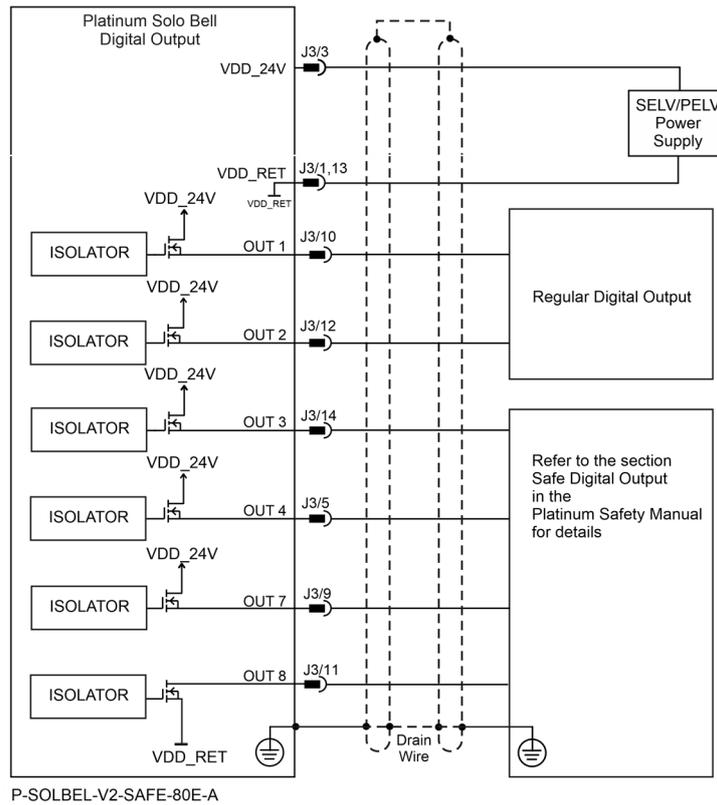


Figure 29: Safe Digital Outputs for Option K Configuration

8.7.3.2 Option L Configuration VDD_24 & VDD_48

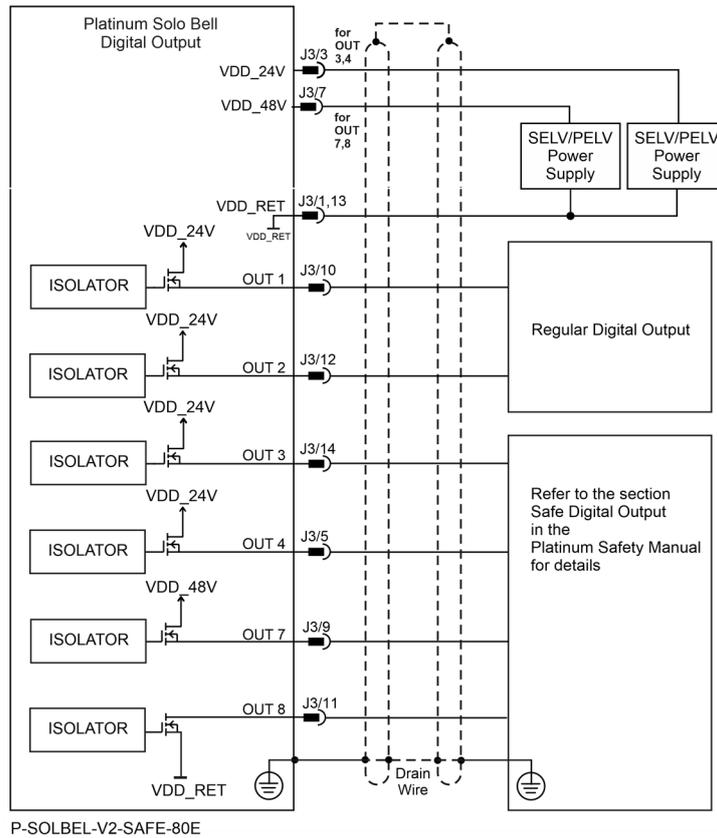


Figure 30: Safe Digital Outputs for Option L Configuration

8.7.3.3 Option N Configuration VDD_48

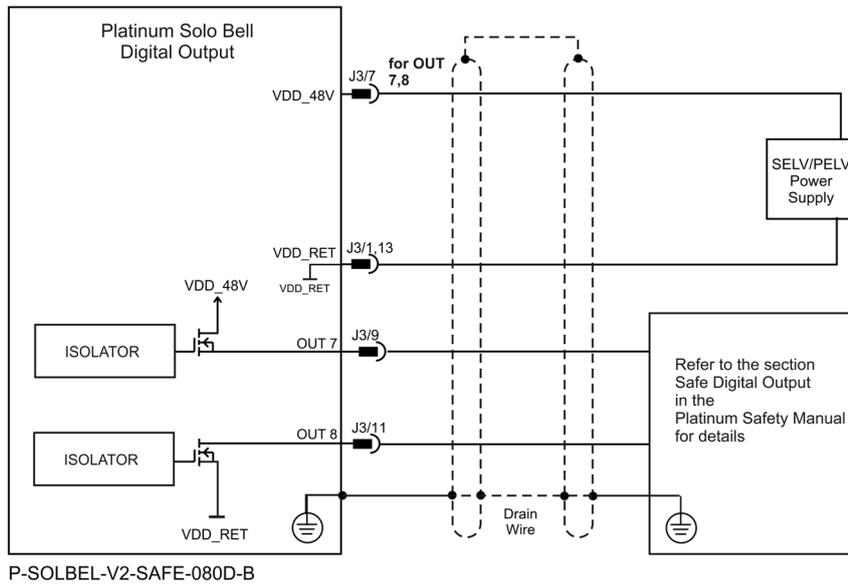


Figure 31: Safe Digital Outputs for Option N Configuration

8.8 Regular Digital I/Os (Safe IO: U, V) (J3)

Refer to the Chapter 13 Regular Digital IO section, in the Platinum Safety Drive Manual for specification details of the Regular IO connections.

8.8.1 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.

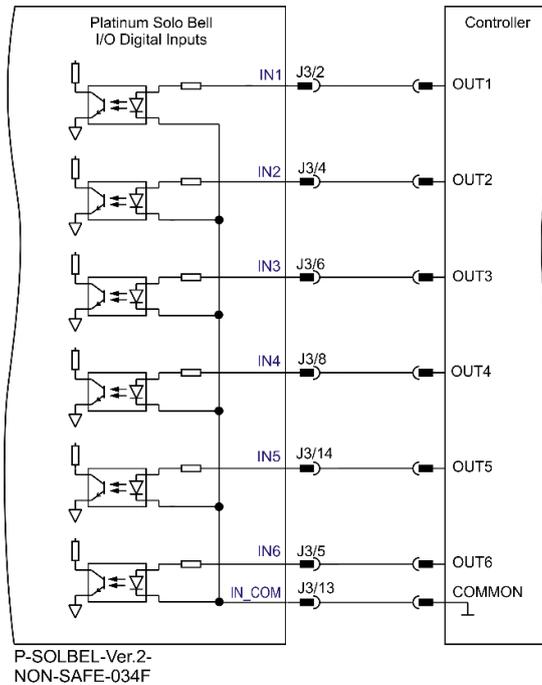


Figure 32: Regular Digital Input 5V Logic Connection Diagram

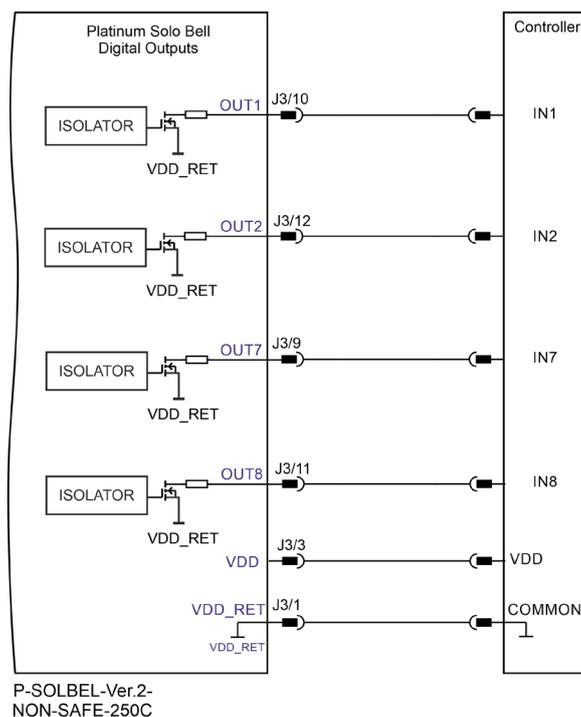


Figure 33: Regular Digital Output Connection Diagram – 5V Logic Option

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

8.8.2.1 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.

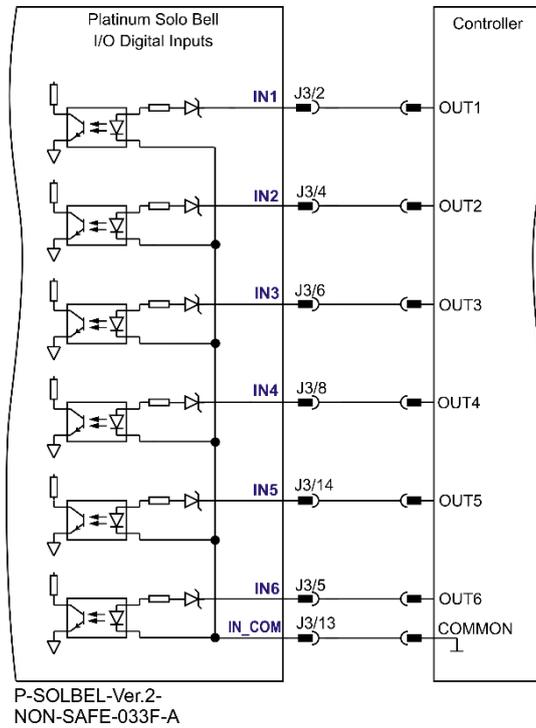


Figure 34: Regular Digital Input Connection Diagram – PLC Source Option

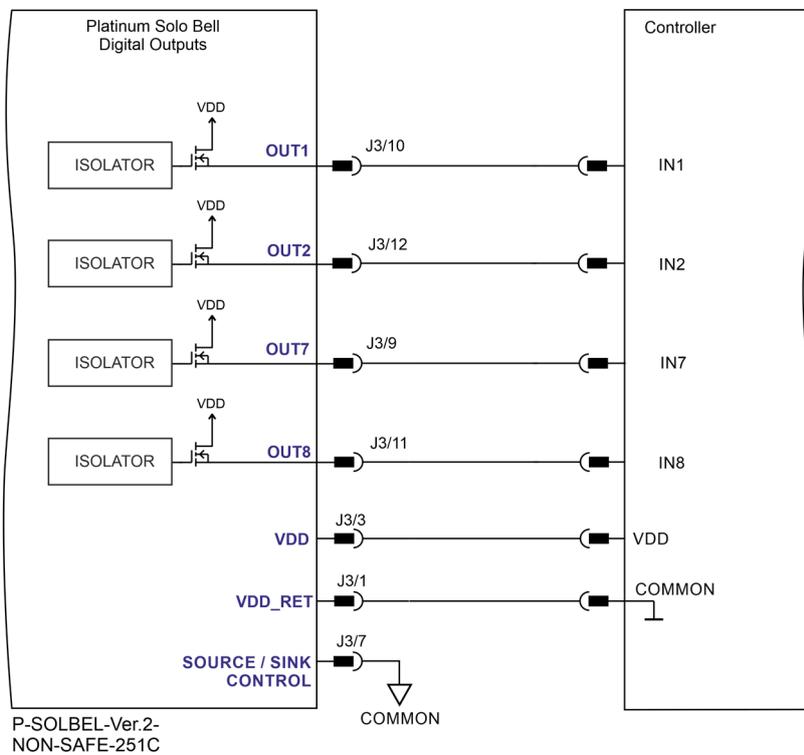


Figure 35: Regular Digital Output Connection Diagram – PLC Source Option

8.8.2.2 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.

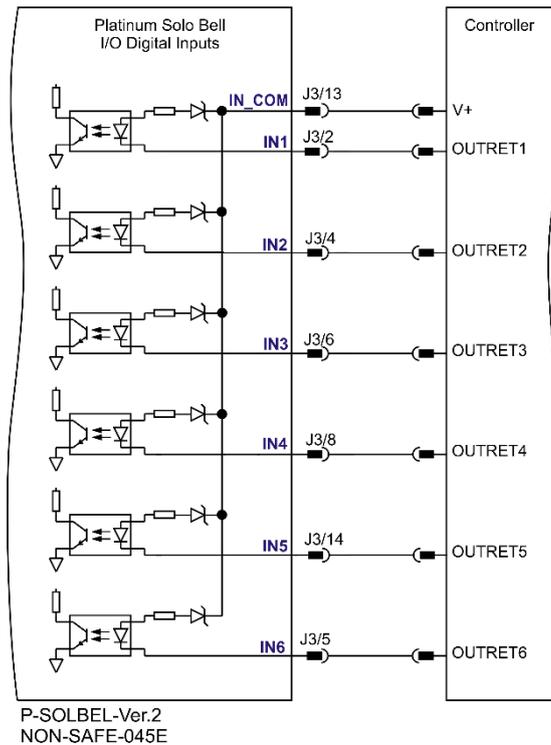


Figure 36: Regular Digital Input Connection Diagram – PLC Sink Option

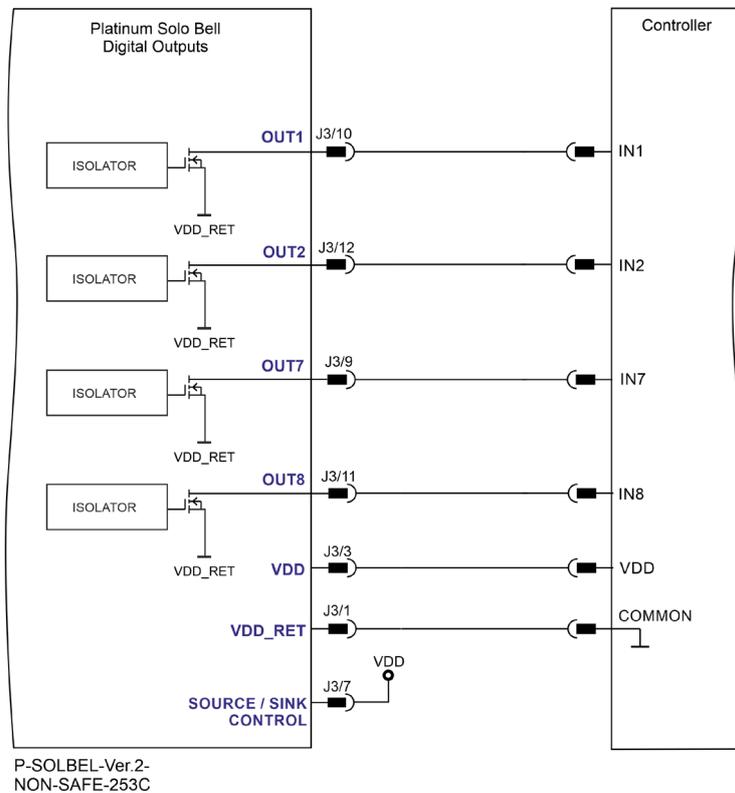


Figure 37: Regular Digital Output Connection Diagram – PLC Sink Option

8.9 Analog Input

There is a single type of Analog Input in the Platinum Solo Bell:

- Analog Input 1 – Differential ± 10 V

Refer to the Chapter 14 Analog Input section, in the Platinum Safety Drive Manual for specification details of the Analog Input.

8.9.1 Analog Input1 – Differential (J2)

The following circuit describes the internal interface of the Analog input.

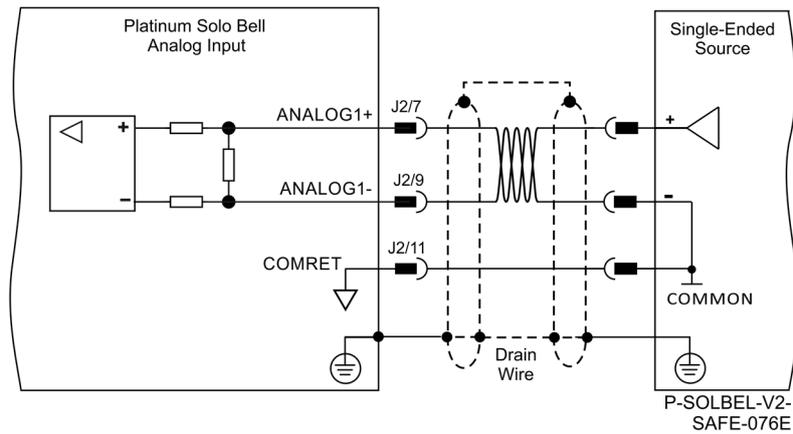


Figure 38: Differential Analog Input

8.10 Communication

8.10.1 USB 2.0 (X3)

Use a standard USB 2.0 Type C cable and connector to connect the USB. Refer to section 15.1 in the [Platinum Safety Drive Manual](#).

8.10.2 Serial Communication (X4)

The X4 connector is optionally for either RS-422 or RS-232 communication.

8.10.2.1 RS-422 (Differential RS-232) Serial Communication

The following describes the RS-422 specification.

Specification	Details
Physical layer	Differential RS-232 Full duplex, serial communication
Interface	RS-422
Termination	120 Ohm It is required to connect termination of 120 ohm in the end of the TX signals (refer to the figure below)
Speed	Baud Rate of 0.0048 to 3.60 Mbps
Protocols	For setup and control

The following are RS-422 signals:

Signal	Function
RS-422_TX+	Differential RS-232 Transmit
RS-422_TX-	Differential RS-232 Transmit Complement
RS-422_RX+	Differential RS-232 Receive
RS-422_RX-	Differential RS-232 Receive Complement
ISO_GND	Isolated Ground

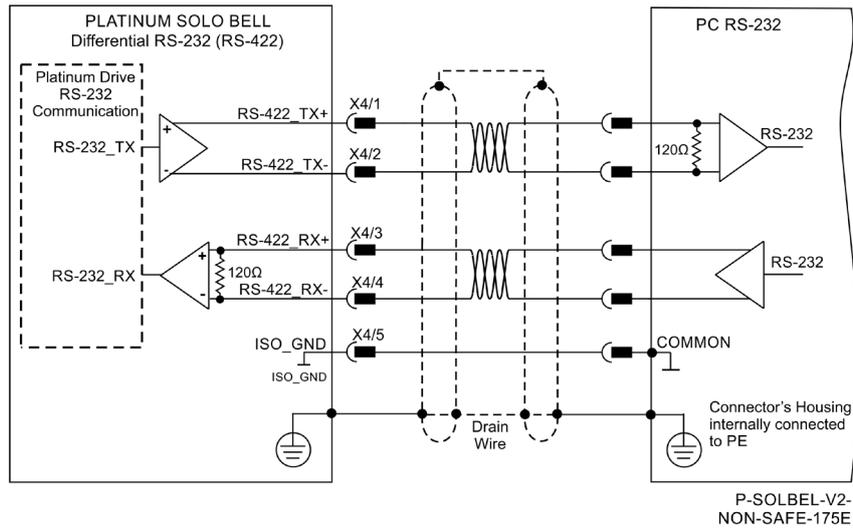


Figure 39: Differential RS-232 Communication Example

8.10.2.2 RS-232 Serial Communication

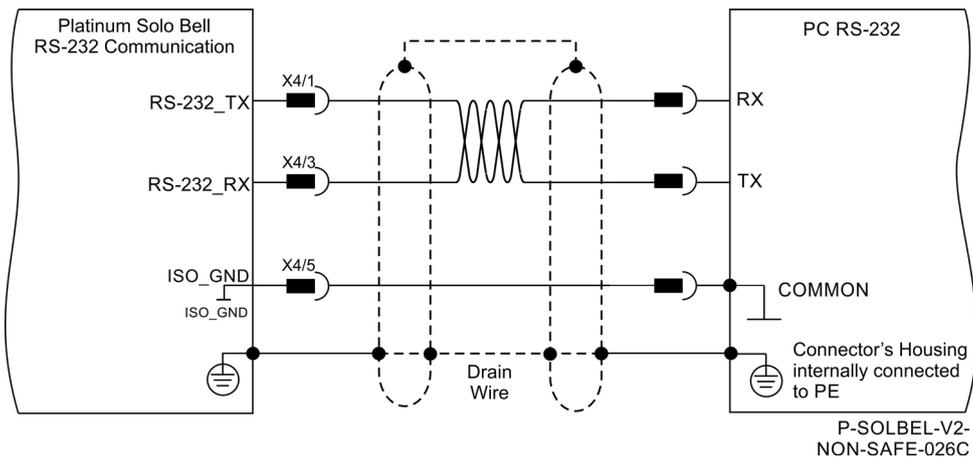


Figure 40: RS-232 Connection Diagram

8.10.3 EtherCAT (X1 and X2)

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

8.10.3.1 EtherCAT Connection

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

The Platinum Solo 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.

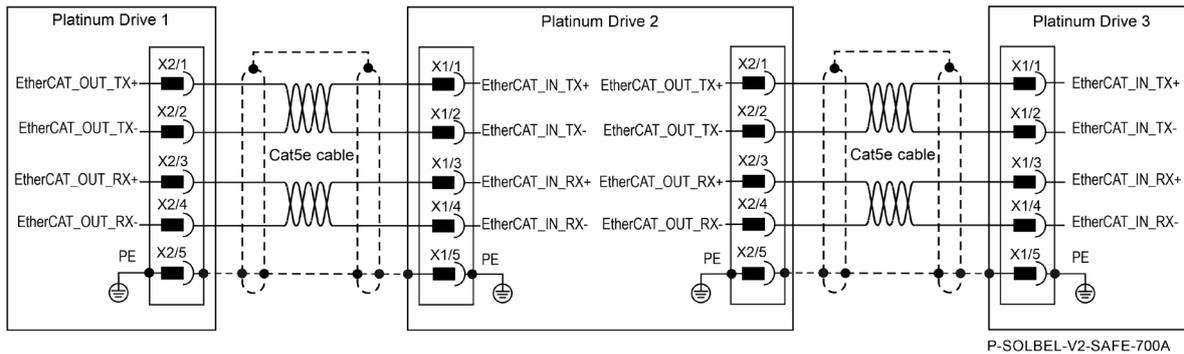


Figure 41: EtherCAT Connection Schematic Diagram

 **Note:**
Always use CAT5e cables.

8.10.3.2 EtherCAT Status Indicator

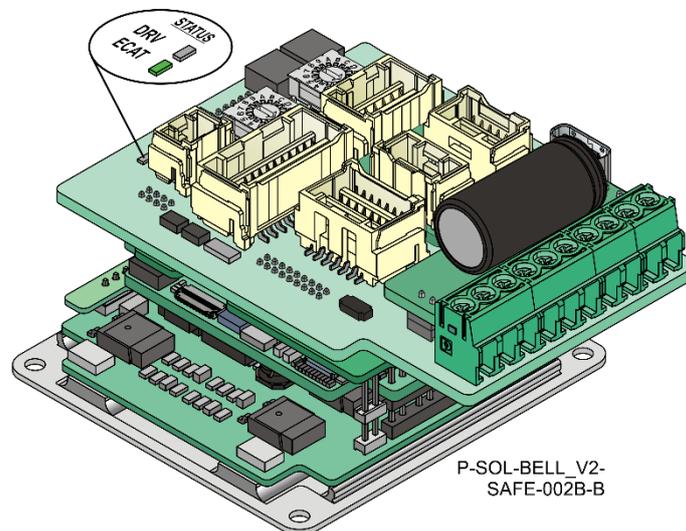


Figure 42: EtherCAT Status LED

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.

8.10.3.3 EtherCAT Link Indicators

Each of the EtherCAT Ports has a LED; EtherCAT In and EtherCAT Out, which are shown in Figure 43.

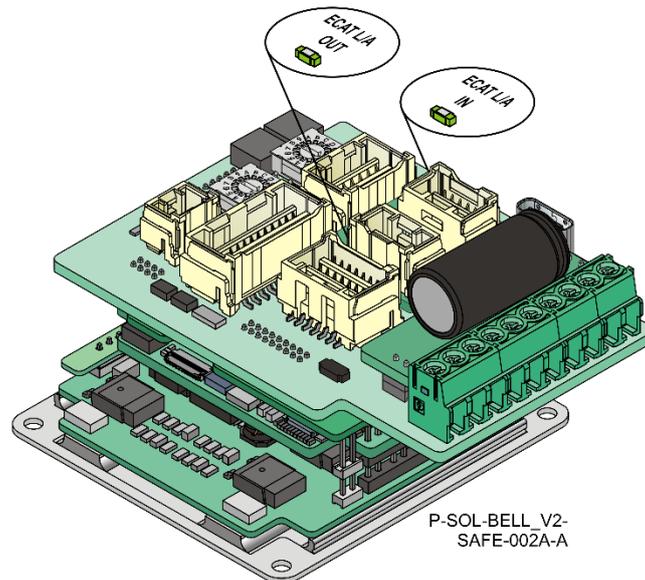


Figure 43: Ethernet Connector LEDs

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.

8.10.3.4 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 44 displays the switches available in the EtherCAT Version. Refer to section 15.2.5 EtherCAT Switches in the [Platinum Safety Drive Manual](#) for full details.

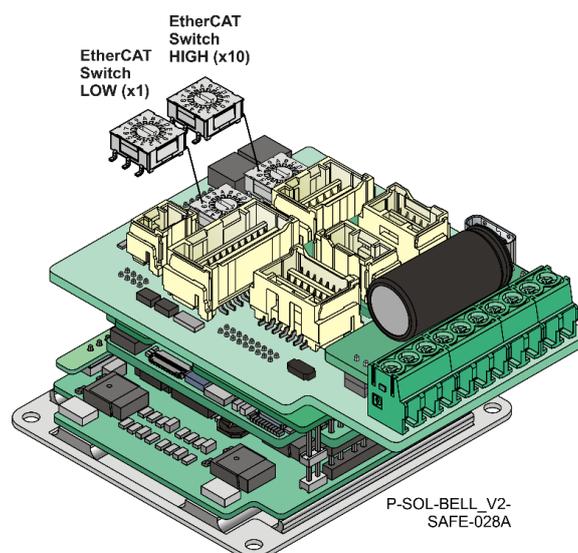


Figure 44: EtherCAT Address Switches

The positions of the switches on the drive are shown in Figure 44. Use a screwdriver to set the low and high bytes values of the drive EtherCAT address. This address is only retrieved after power-up.

Chapter 9: Powering Up

After the Platinum Solo 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 Solo 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

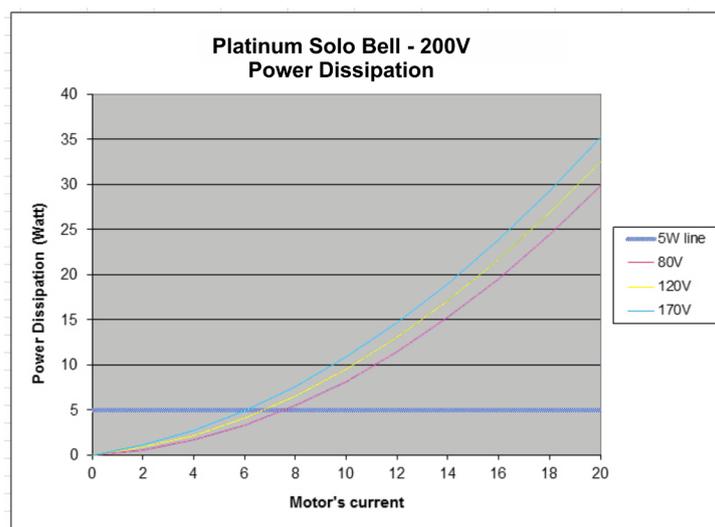
The best way to dissipate heat from the Platinum Solo Bell is to mount it so that its heat sink faces up. For best results leave approximately 10 mm of space between the Platinum Solo Bell's heat sink and any other assembly.

9.2.1 Thermal Data

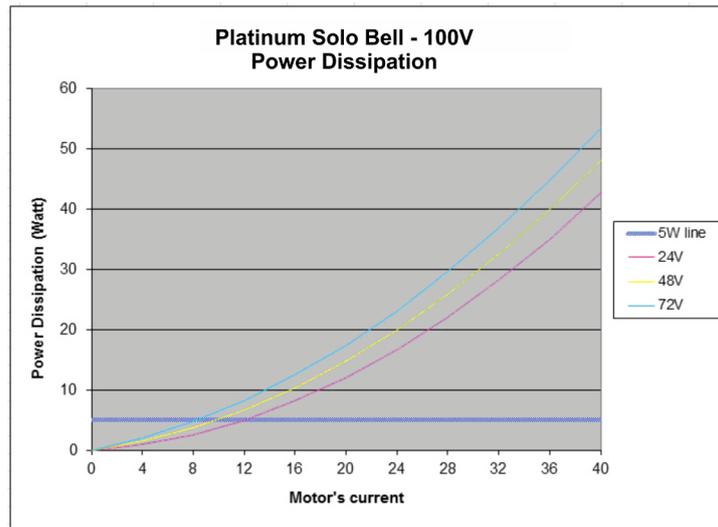
- Heat dissipation capability (θ): Approximately 10 °C/W
- Thermal time constant: Approximately 240 seconds (thermal time constant means that the Solo Bell will reach 2/3 of its final temperature after 4 minutes)
- Shut-off temperature: 86 °C to 88 °C (measured on the heat sink)

9.2.2 Heat Dissipation Data

Heat dissipation is shown in graphically below:



P-SOLBEL-V2-SAFE-039C
Graph 200V



P-SOLBEL-V2-SAFE-040C

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 Solo 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 **PBEL-Sz-zXXX/YYYzzz**
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:

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

Chapter 10: Dimensions

10.1 EtherCAT

10.1.1 PBEL-SF-XXX/YYFzz

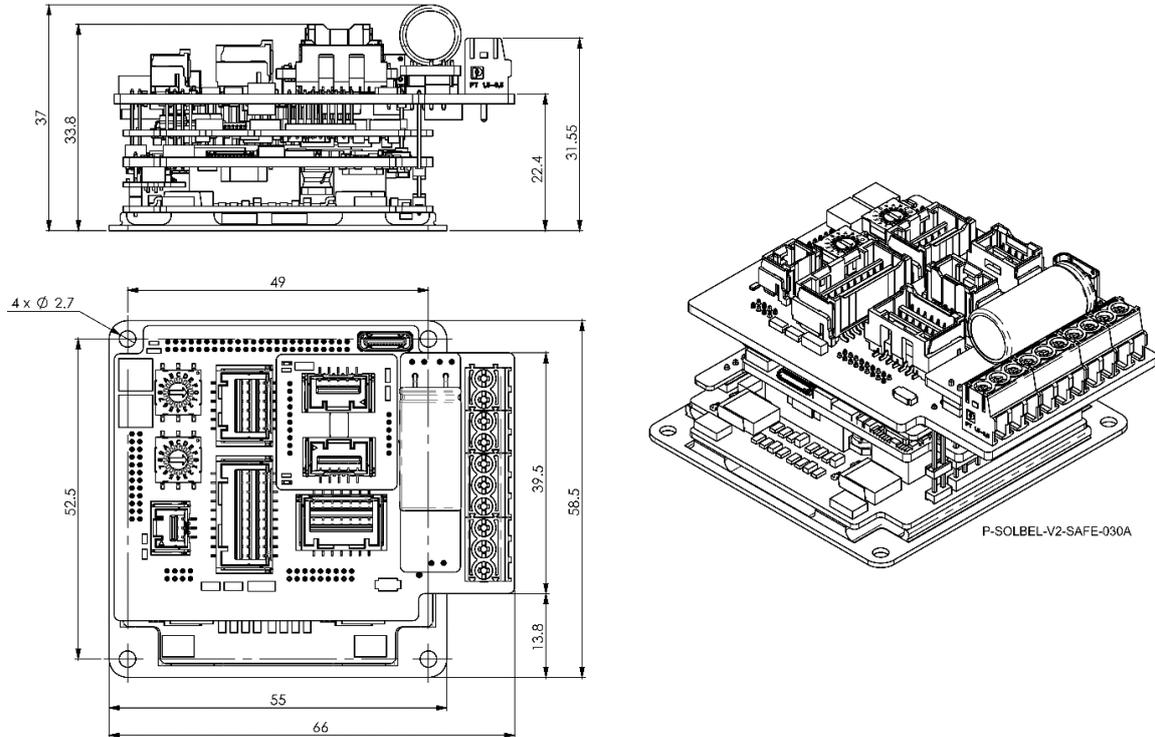


Figure 46: Platinum Solo Bell with Safe IO Board

10.1.2 PBEL-SS-XXX/YYFzz or PBEL-ST-XXX/YYFzz

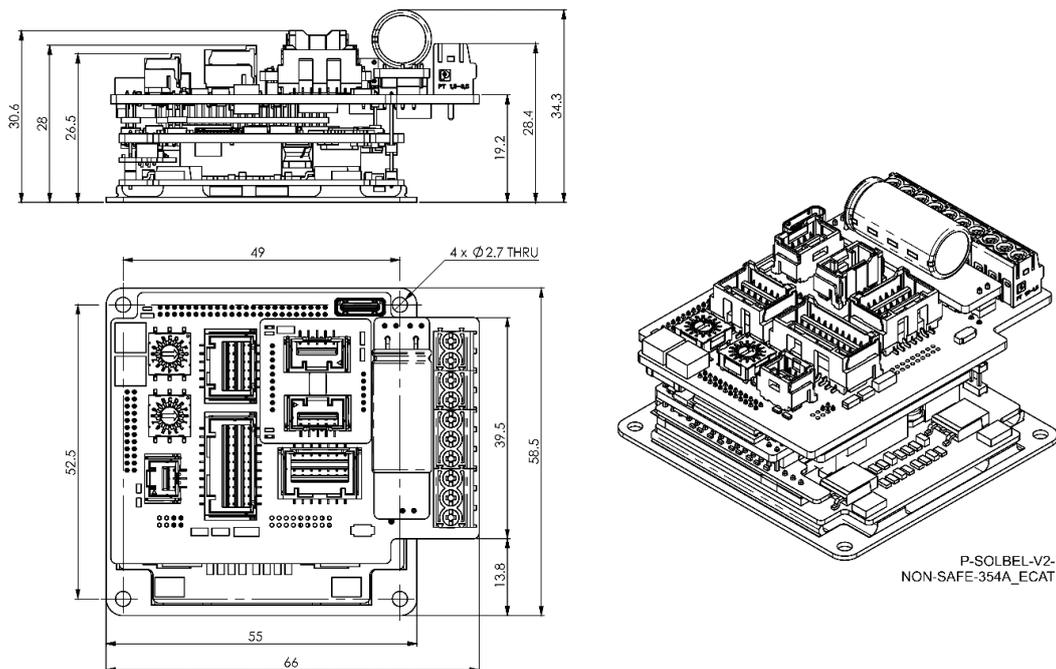


Figure 47: Platinum Solo Bell

10.2 CAN

10.2.1 PBEL-ST-XXX/YYYSzz or PBEL-ST-XXX/YYTzz

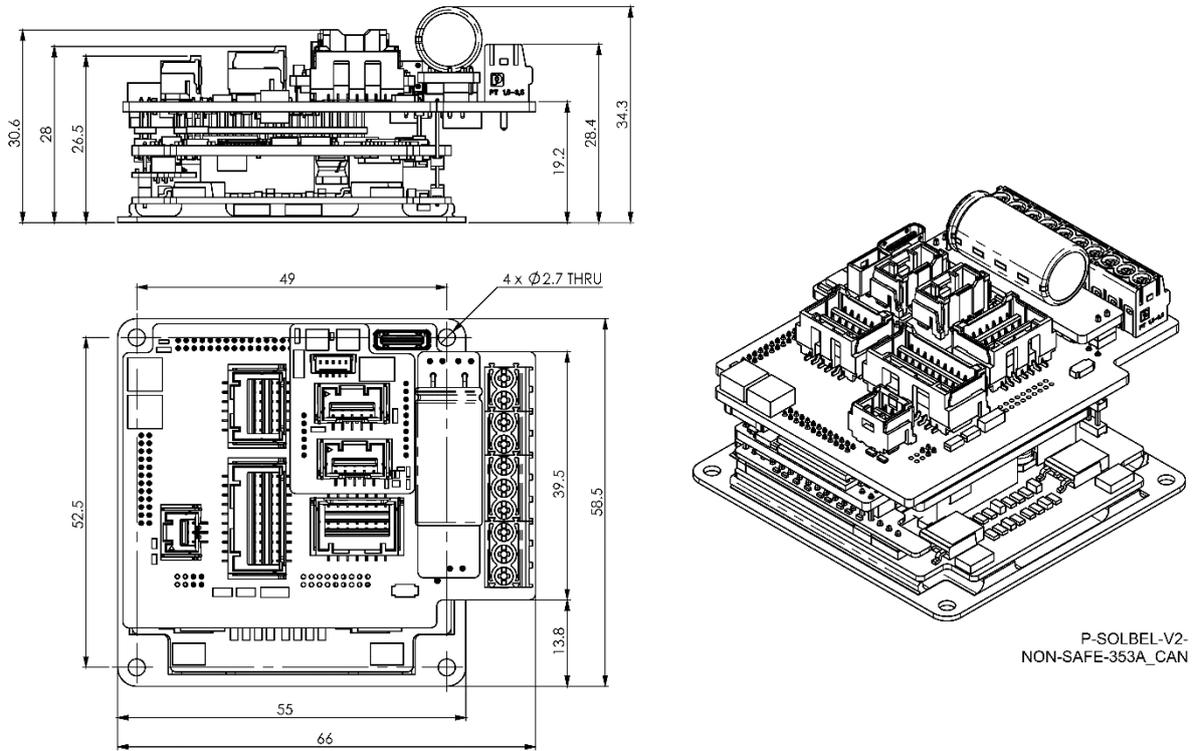


Figure 48: Platinum Solo Bell without Safe IO board - CAN

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Go Platinum.

Platinum 
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