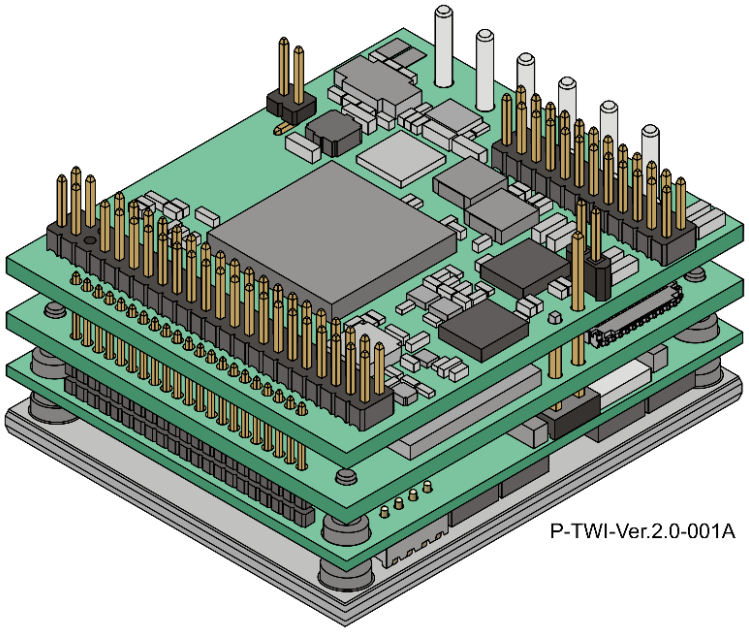
Platinum by Elmo

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

Platinum Twitter Digital Servo Drive Installation Guide

Functional Safety

Safety Capability: S, T



September 2020 (Ver. 2.005)

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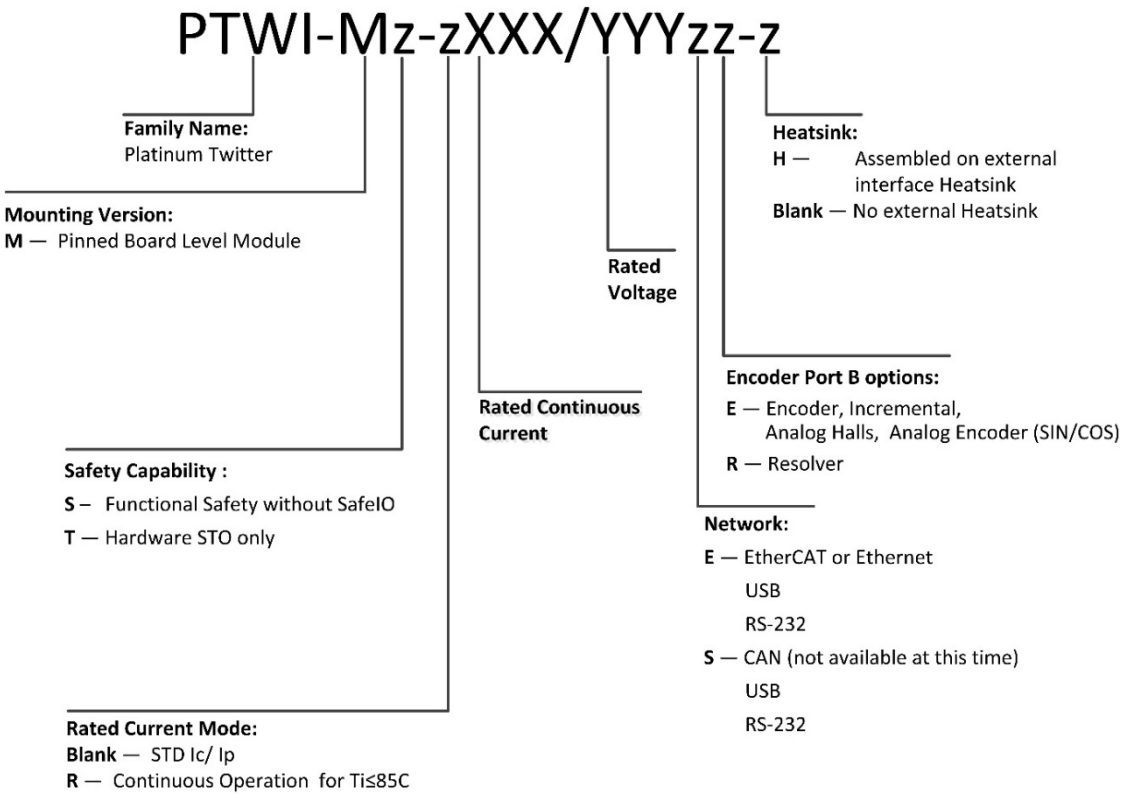

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Chapter 1: This Installation Guide

This installation Guide details the technical data, pinouts, and power connectivity of the Platinum Twitter.

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

Chapter 2: Functional Safety

The Platinum Twitter 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.

Chapter 3: Safety Information

In order to achieve the optimum, safe operation of the Platinum Twitter, 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 Twitter 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 Twitter 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 Twitter 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 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 2 seconds before touching or disconnecting parts of the equipment that are normally loaded with electrical charges (such as capacitors or contacts). Measuring the electrical contact points with a meter, before touching the equipment, is recommended.

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 Twitter 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 Twitter, 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 Twitter 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 Twitter 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 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.

Chapter 4: Product Description

The Platinum Twitter is an advanced high power density servo drive, delivering up to **5.6 kW power** in a 16.4 cm^3 (1.0 in^3) compact package (35 x 30 x 15.6 mm or 1.38" x 1.18" x 0.6"). The Platinum Twitter is designed to be mounted on a PCB by soldering its pins directly to the PCB.

This advanced, high power density servo drive provides top performance, advanced networking and built-in safety, as well as a fully featured motion controller and local intelligence.

The Platinum Twitter is provided in two configurations:

- **PTWI-MS-zXXX/YYYzz-z** - Servo drive with Function Safety excluding Safe IO
  This configuration permits operation of safety functions only via FSOE (Fail Safe Over EtherCAT).

Important:
The integration board of the EtherCAT interface must be also designed and approved according to the safety standards IEC61800-5-2.

- **PTWI-MT-zXXX/YYYzz-z** - Servo drive with STO
  The servo drive configuration supports only STO

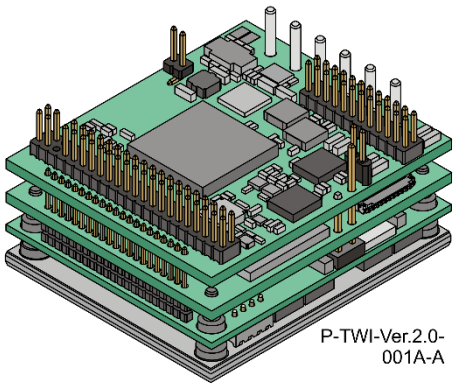


Figure 1: Platinum Twitter

Power to the Platinum Twitter is provided by a DC power source which is isolated from the Mains. The Platinum Twitter operates with dual isoloated power supplies from the main, a main DC power source and a control supply.

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 Twitter 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.

The Platinum Twitter is available in a variety of models. There are a number of possible options; multiple power rating, various communications, and feedback.

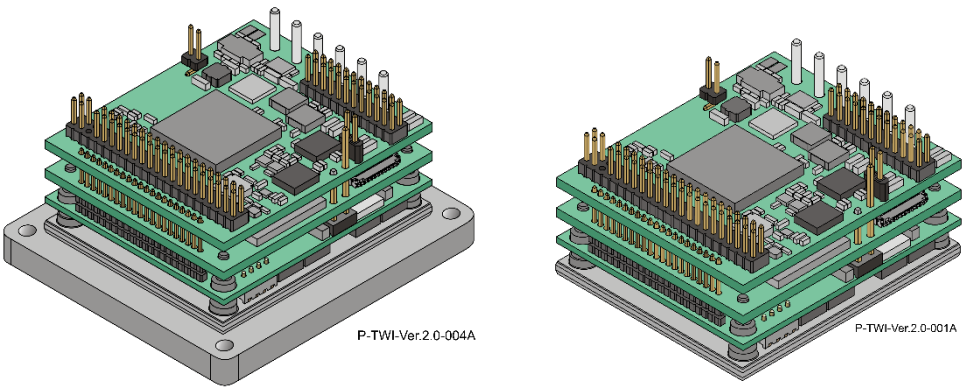


Figure 2: Platinum Twitter modules with/without Heatsink

Chapter 5: Technical Information

5.1 Physical Specifications

Feature	Units	All Types
Weight without Heatsink	g (oz)	26.0 g (0.91 oz)
Weight with Heatsink	g (oz)	47.0 g (1.66 oz)
Dimension without Heatsink	mm (in)	35 x 30 x 15.3 mm (1.38" x 1.18" x 0.6")
Dimension with Heatsink		47 x 41.3 x 19.3 mm (1.85" x 1.63" x 0.76")
Mounting method		PCB mount
Degrees of Protection		IP00

5.2 Current/Voltage Technical Data

Note:
For all models, the Max Output current is guaranteed for $T_{Heat\text{-}Sink}$ <85°C.

5.2.1 100V Models

Feature	Units	1/100	3/100	6/100	10/100	15/100	25/100
Minimum supply voltage	VDC	10					
Nominal supply voltage	VDC	85					
Maximum supply voltage	VDC	95					
Maximum continuous power output	W	80	235	470	800	1125	2000
Efficiency at rated power (at nominal conditions)	%	> 99					
Maximum output voltage		Up to 96% of DC bus voltage					
Ic, Amplitude sinusoidal/DC continuous current	A	1	3	6	10	15	25
Sinusoidal continuous RMS current limit (Ic)	A	0.7	2.1	4.2	7.1	10	17.7
Peak current limit	A	2 x Ic					

Table 1: 100V Models Technical Data

5.2.2 200V Models

Feature	Units	3/200	6/200	10/200
Minimum supply voltage	VDC	20		
Nominal supply voltage	VDC	170		
Maximum supply voltage	VDC	195		
Maximum continuous power output	W	485	975	1650
Efficiency at rated power (at nominal conditions)	%	> 99		
Maximum output voltage		Up to 96% of DC bus voltage		
Ic, Amplitude sinusoidal/DC continuous current	A	3	6	10
Sinusoidal continuous RMS current limit (Ic)	A	2.1	4.2	7.1
Peak current limit	A	2 x Ic		

Table 2: 200V Models Technical Data

5.2.3 R Type Models

Feature	Units	R80/80	R50/100	R70/100	R45/150	R15/200
Minimum supply voltage	VDC	10	10	10	10	20
Nominal supply voltage	VDC	65	85	85	115	170
Maximum supply voltage	VDC	75	95	95	135	195
Maximum continuous Electrical power output	kW	5	4	5.6	5	2.5
Efficiency at rated power (at nominal conditions)	%	> 99				
Maximum output voltage		Up to 96% of DC bus voltage				
Amplitude sinusoidal/DC continuous current	A	80	50	70	45	15
Sinusoidal continuous RMS current limit (Ic)	A	56.5	35.3	49.5	32	10.6

Table 3: R Type Models Technical Data

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 Encoder Supply

Feature	Details
5V supply	400 mA

5.5 Product Features

5.5.1 General Product Features

Main Feature	Details	Presence / No.
Analog Input	Differential ±10V	**1**
	Single ended	**1**
Feedback	Standard Port A, B, & C	**√**
Communication Option	USB	**√**
	EtherCAT *or*	**√**
	CAN (Available in the future)	**√**
	RS232 TTL level	**√**

5.5.2 IO Features Module

Main Feature	Details	Presence / No.
STO	+5V Logic, Opto isolated	**√**
Digital Input	TTL 3.3 V	**6**
Digital Output	TTL 3.3 V	**4**

5.6 Environmental Conditions

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

Warning:
During operation the Platinum Twitter becomes hot to the touch (the heatsink and wires may heat up to 92 °C). Care should be taken when handling it.

Feature	Details
Operating ambient temperature according to IEC60068-2-2	0 °C to 55 °C (32 °F to 131 °F)  **Remark:** Functional Safety is applicable to the above operating temperature. In some products, power derating is required to operate above 50°C.
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 1

5.7 Standards

The following table describes the Main Standards of the Platinum Twitter 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 section 5.6 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

Chapter 6: Installation

The Platinum Twitter 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 Twitter, verify that you have all of its components, as follows:

- The Platinum Twitter servo drive
- The Elmo Application Studio (EASII) software and software manual

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

To unpack the Platinum Twitter:

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

4. Verify that the Platinum Twitter type is the one that you ordered, and ensure that the voltage meets your specific requirements.
   The part number at the top provides the type designation. Refer to the appropriate part number in the section Catalog Number at the beginning of the installation guide.

6.2 Over-Current and Short-Circuit Protection

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

PTWI –Mz-zXXX/YYYzz-z XXX = rated continues current [A]	Fuse	Circuit Breaker
1, 3, 6, 10, 15, 25	Slow blow	Type D
45, 50, 70, 80	Fast Acting Class J	Type B
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 Twitter

The Platinum Twitter was designed for mounting on a printed circuit board (PCB) via 1.27 mm pitch 0.40 mm square pins, 0.508 mm square pin and 3.65 mm pitch 1.02 mm round pins. When integrating the Platinum Twitter 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. We recommend that the Platinum Twitter be soldered directly to the board. If the PCB is enclosed in a metal chassis, we recommend that the Platinum Twitter be screw-mounted to it as well to help with heat dissipation. The Platinum Twitter has screw-mount holes on each corner of the heat-sink for this purpose – see below:

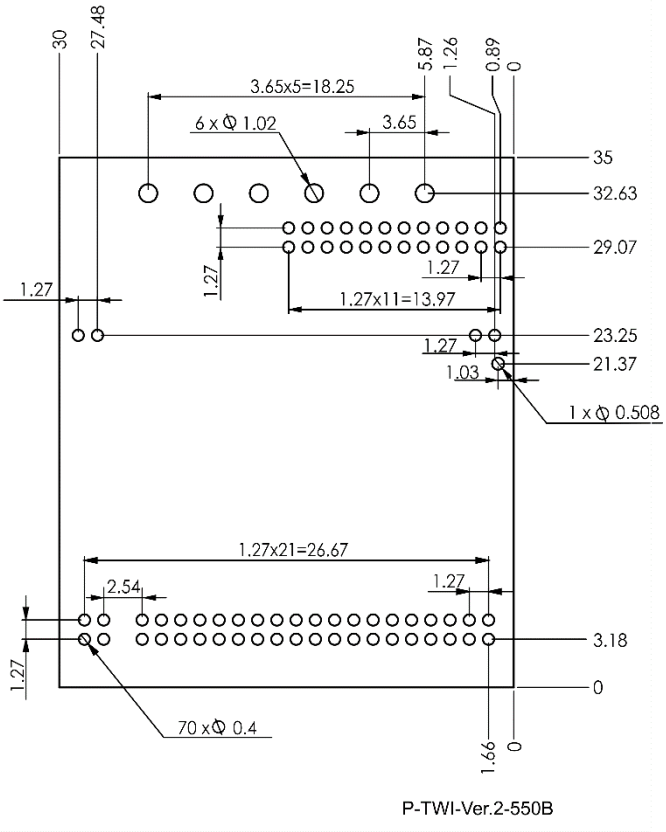


Figure 3: Platinum Twitter Pins, Dimensions

6.3.1 Mounting Platinum Twitter to an External Heatsink

Note: This feature is available only in model PTWI-Mz-zXXX/YYYzz-**H**.

The selected heat sink must be screwed to the lower surface of the Platinum Twitter.

To mount the Platinum Twitter to an external heat sink:

1. Mount the heat sink under the base of the Platinum Twitter.
2. Place the Thermal foil (PN IMT-GTWIALHFLAT purchased from Elmo) between the lower surface of the servo drive, and the upper surface of the heat sink.
3. Use four M2.5 head cup Allen screws to secure the heat sink under the servo drive.
4. Tighten the screws to the relevant torque force applicable to an M2.5 stainless steel A2 screw.

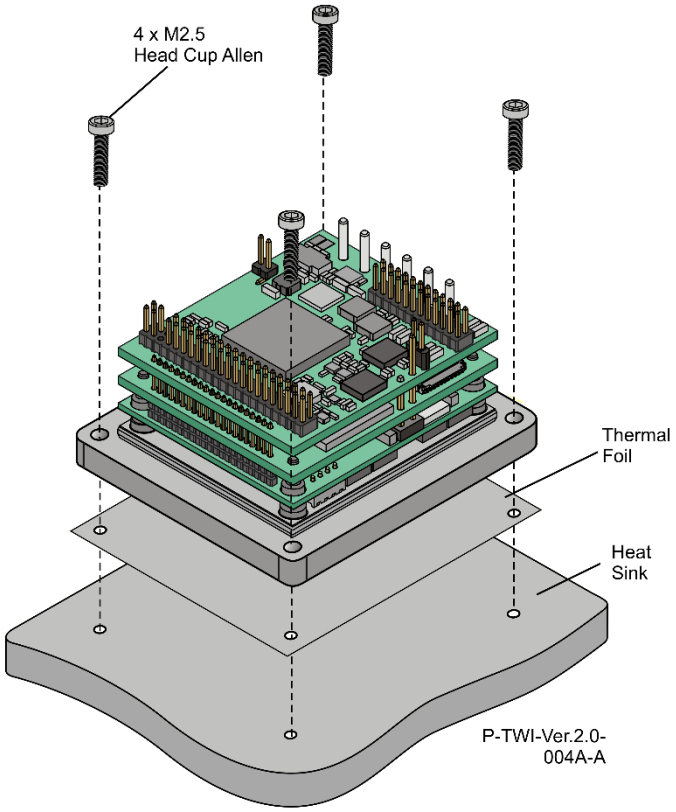


Figure 4: Mounting the Heat Sink and Thermal Foil to the Platinum Twitter

Chapter 7: Connections

The Platinum Twitter has 11 connectors (ports), as follows:

Port	Pins	Type	Function
FDB	2x12	1.27 mm pitch 0.40 mm sq.	Feedbacks
M3	1x1	3.65 mm pitch 1.02 mm round pins	Motor power output 3
M2	1x1		Motor power output 2
M1	1x1		Motor power output 1
PE	1x1		Protective earth
PR	1x1		Power output return
VP+	1x1		DC Positive power input
VL+	1x1	0.508 mm sq.	VL+
MAIN	2x21	1.27 mm pitch 0.40mm sq.	I/O, LEDs, STO, Communication
Extended IO	1x2	1.27 mm pitch 0.40mm sq.	Extended IO pins
3.3 V	1x2	1.27 mm pitch 0.40mm sq.	Available only for EtherCAT Version Only for LEDS end Transformer
Connector Locations			

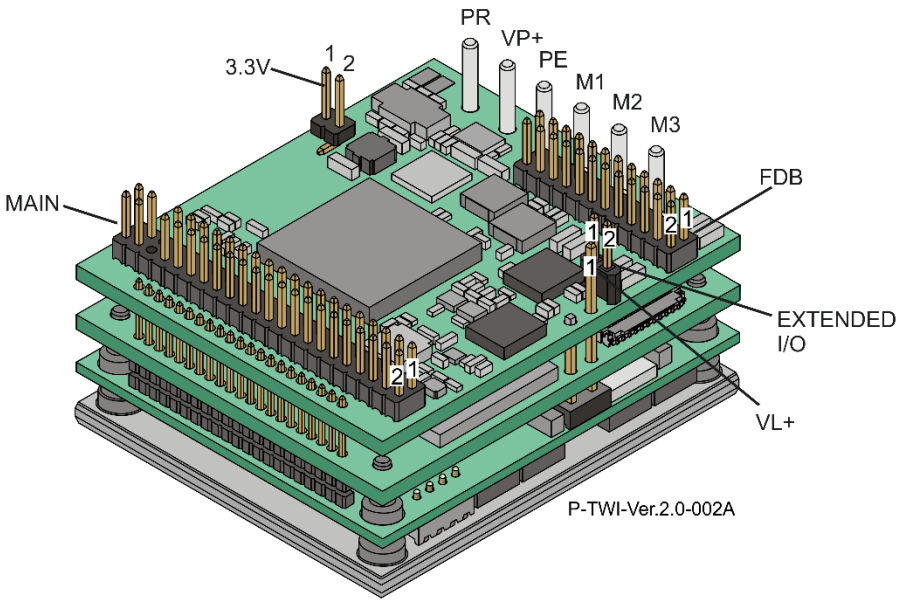


Table 4: EtherCAT Version Connector Types

7.1 Motor Power Pins

This section describes the Motor Power.

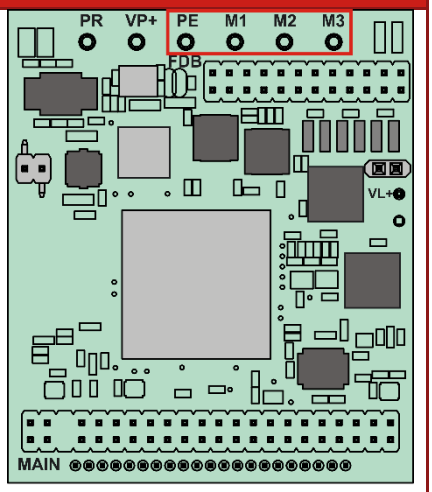
Pin	Function	Cable		Pin Positions
		Brushed DC Motor	Brushed DC Motor	 P-TWI-Ver.2-511A-F
PE	Connection earth	Motor	Motor	
M1	Motor phase	Motor	N/C	
M2	Motor phase	Motor	Motor	
M3	Motor phase	Motor	Motor	

Table 5: Motor Power Pins

7.2 Main Power Pins

This section describes the Main Power supply connector.

The VDC isolated from the Mains DC power source is not included with the Platinum Twitter.

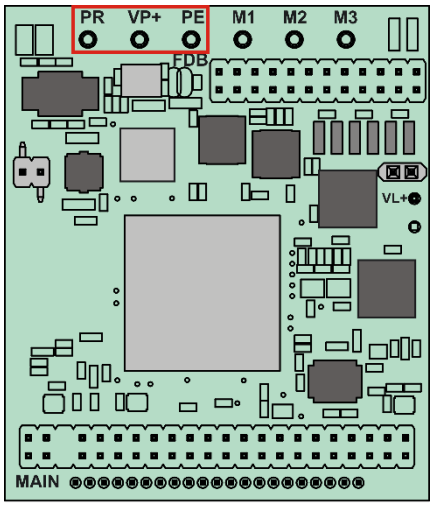
Pin	Function	Cable	Pin Positions
VP+	DC Pos. Power input	Power	 P-TWI-Ver.2-511A-G
PR	Power input return	Power	
PE	Protective earth	Power	

Table 6: Main Power Pins

7.3 Control Supply Pins

Connect the VL+ pin on the Platinum Twitter in the manner described in the table below.

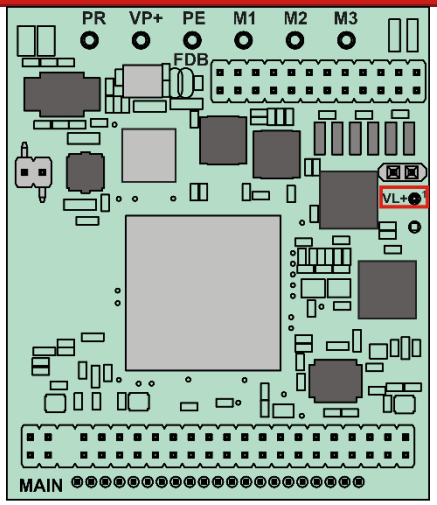
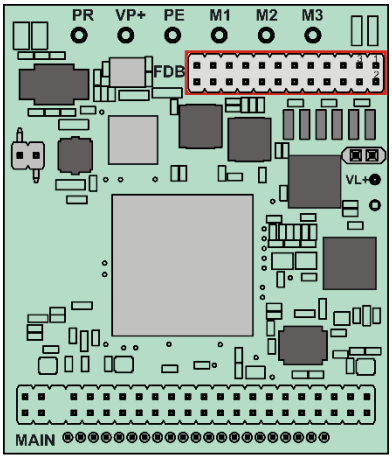
Pin	Signal	Function	Pin Positions
1	VL+	Control Supply Input	 P-TWI-Ver.2-511A
Input range: 12VDC – 60VDC Power consumption: ≤4 VA without external loading ≤6 VA with full external loading			

Table 7: Control Supply Pins

7.4 Feedback Pins (FDB)



P-TWI-Ver.2-511A-A

Feedback A/B/C, Digital Halls – see Chapter 11 in the Platinum Safety Drive Manual.

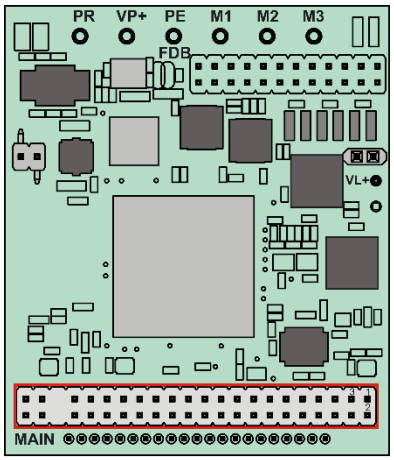
FDB Pins

Pin (FDB)	Signal	Function
1	PortA_A+	Port A Channel A+
2	PortB_A-/Sine-	Port B Channel A-/Sine-
3	PortA_A-	Port A Channel A-
4	PortB_A+/Sine+	Port B Channel A+/Sine+
5	PortA_B+	Port A Channel B+
6	PortB_B-/Cosine-	Port B Channel B-/Cosine-
7	PortA_B-	Port A Channel B-
8	PortB_B+/Cosine+	Port B Channel B+/Cosine+
9	PortA_INDEX+	Port A Channel Index+
10	PortB_INDEX-/Analog_Index-	Port B Channel Index-/Analog Index-
	RESOLVER_OUT-	Vref complement
11	PortA_INDEX-	Port A Channel Index-
12	PortB_INDEX+/Analog_Index+	Port B Channel Index+/Analog Index+
	RESOLVER_OUT+	Vref
13	HALL A	Hall sensor A input
14	PortC_A-	Port C Buffered Channel A-
15	HALL B	Hall sensor B Input
16	PortC_A+	Port C Buffered Channel A+
17	HALL C	Hall sensor C Input
18	PortC_B-	Port C Buffered Channel B- output / Dir-

Pin (FDB)	Signal	Function
19	+5V	Encoder +5V supply with a total allowable maximum consumption of 400mA
20	PortC_B+	Port C Buffered Channel B+ output / Dir+
21	COMRET	Common return
22	PortC_INDEX-	Port C Buffered Channel INDEX- output
23	COMRET	Common return
24	PortC_INDEX+	Port C Buffered Channel INDEX+ output

Table 8: FDB Connector – Feedback

7.5 Main Pins (MAIN)



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USB– see section 16.10.1 in the Platinum Safety Drive Manual

RS-232– see section 16.10.3 in the Platinum Safety Drive Manual

EtherCAT– see section 16.10.2 in the Platinum Safety Drive Manual

CAN– see section 9.11.4 in this manual

Analog– see section 16.8 in the Platinum Safety Drive Manual

Regular Digital IO– see section 13.4 in the Platinum Safety Drive Manual

STO– see section 16.5 in the Platinum Safety Drive Manual

MAIN Pins

Pin (MAIN)	Signal	Function
1	USB_VBUS	USB VBUS 5V Detector
2	USBD+	USB_P line
3	RS232_RX /SB_OUT	There are two options for this pin: **Option 1**: TTL RS232 receive (default) **Option 2**: Serial Bus output for extended I/O (refer to MAN-P-Safety Drive Manual) This option is only available for EtherCAT
4	USBD-	USB_N line
5	PHY_IN_LINK_ACT	Indicates EtherCAT IN
	CANL	CAN_L BUS Line(dominant low) (available in the future)
6	PHY_OUT_LINK_ACT	Indicates EtherCAT OUT LINK/Ethernet LINK input
7	PHY_IN_SPEED	Indicates EtherCAT IN
	CANH	CAN_H BUS Line(dominant high) (available in the future)
8	PHY_OUT_SPEED	Indicates EtherCAT OUT Speed/Ethernet Speed input
9	LED_ET_ERR	EtherCAT status LED Error
10	LED_ET_RUN	EtherCAT status LED Run
11	RS232_TX /SB_IN	There are two options for this pin: **Option 1**: TTL RS232 transmit (Default)

Pin (MAIN)	Signal	Function	
		Option 2: Serial Bus IN for extended I/O (refer to MAN-P-Safety Drive Manual) This option is only available for EtherCAT	
12	ANALOG2+	Analog input 2	There is no ANARET (analog return) pin. Instead the COMRET pin used.
13	COMRET	Common return	
14	COMRET	Common return	
15	ANALOG1+	Analog input 1	There is no ANARET (analog return) pin. Instead the COMRET pin used.
16	ANALOG1-	Analog input 1 complement	
17	IN6	Programmable digital input 6 (connected to COMRET) (**3.3V logic level**)	
18	IN5	Programmable digital input 5 (connected to COMRET) (**3.3V logic level**)	
19	IN4	Programmable digital input 4 (connected to COMRET) (**3.3V logic level**)	
20	IN3	Programmable digital input 3 (connected to COMRET) (**3.3V logic level**)	
21	IN2	Programmable digital input 2 (connected to COMRET) (**3.3V logic level**)	
22	IN1	Programmable digital input 1 (connected to COMRET) (**3.3V logic level**)	
23	LED1	Bi-color indication output 1 (Cathode) Internal Resistor 1K Ω	
24	LED2	Bi-color indication output 2 (Cathode) Internal Resistor 1K Ω	
25	OUT4	Programmable output 4 (connected to COMRET) (**3.3V logic level**)	
26	OUT2	Programmable output 2 (connected to COMRET) (**3.3V logic level**)	

Pin (MAIN)	Signal	Function
27	OUT3	Programmable output 3 (connected to COMRET) (**3.3V logic level**)
28	OUT1	Programmable output 1 (connected to COMRET) (**3.3V logic level**)
29	COMRET	Common return
30	COMRET	Common return
31	EtherCAT_IN_RX+	EtherCAT IN RX+ Line
32	EtherCAT_IN_TX+	EtherCAT IN TX+ Line
33	EtherCAT_IN_RX-	EtherCAT IN RX- Line
34	EtherCAT_IN_TX-	EtherCAT IN TX- Line
35	EtherCAT_OUT_RX+/Ethernet_RX+	EtherCAT OUT/Ethernet RX+ Line
36	EtherCAT_OUT_TX+/Ethernet_TX+	EtherCAT OUT/Ethernet TX+ Line
37	EtherCAT_OUT_RX-/Ethernet_RX-	EtherCAT OUT/ Ethernet RX- Line
38	EtherCAT_OUT_TX-/Ethernet_TX-	EtherCAT OUT/ Ethernet TX- Line
39	Not Connected	
40	Not Connected	
41	STO1	STO 1 input, opto isolated from control (COMRET)
42	STO_RET	STO signal return. The two digital STO inputs are optically isolated from the other parts of the drive.
43	STO2	STO 2 input, opto isolated from control (COMRET)
44	STO_RET	STO signal return. The two digital STO inputs are optically isolated from the other parts of the drive.

Table 9: MAIN Pins – I/O, STO, Analog, LEDs, Communication

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

7.6 Drive Status Indicator

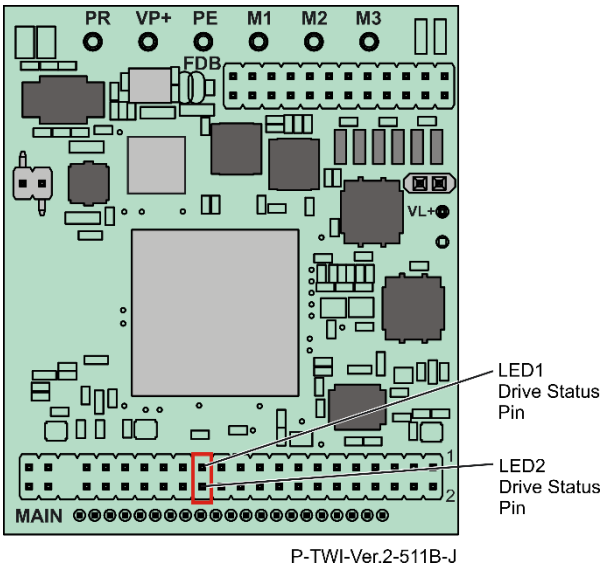
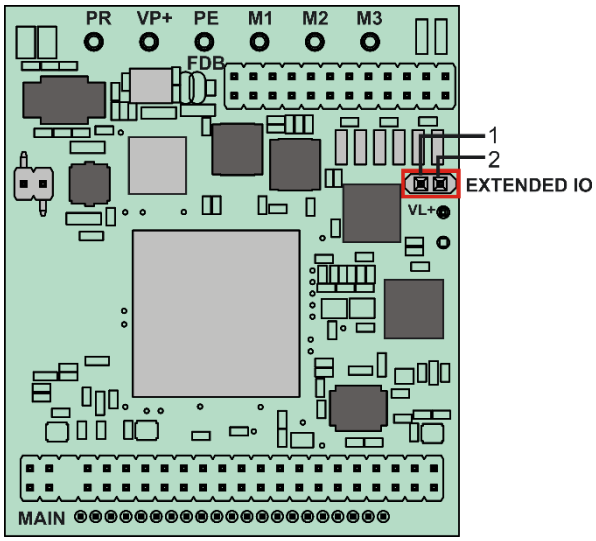


Figure 5: Platinum Twitter Drive Status Indicator pins

Figure 5 shows the position of the Drive Status Indicator pin which is used for immediate indication of the Initiation and Working states.

7.7 Extended IO Pins



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Extended Digital IO– see section 16.9 in the Platinum Safety Drive Manual

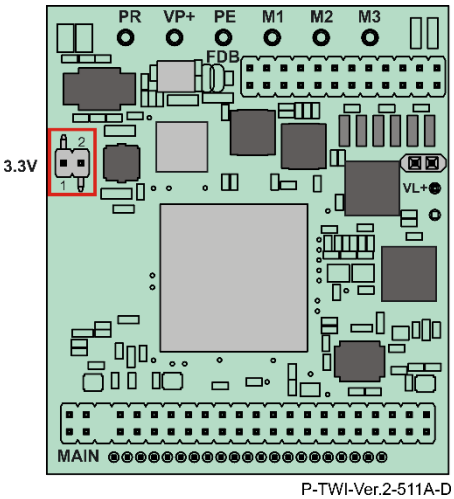
For application of extended features refer to the **Application Note IO Extended Features**

Extended IO Pins

Pin (Extended IO)	Signal	Function
1	SB_Clock	Serial Bus_Clock (9.375Mhz) for extended IO
2	SB_Load	Serial Bus Load for extended IO

Table 10: Extended IO Pins

7.8 3.3V Pins



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3.3V Pins

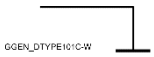
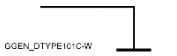
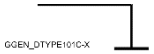
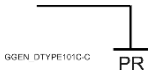
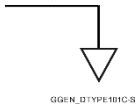
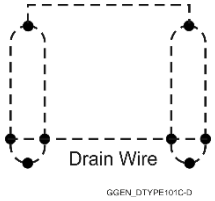
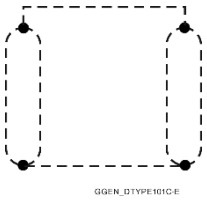
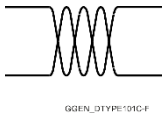
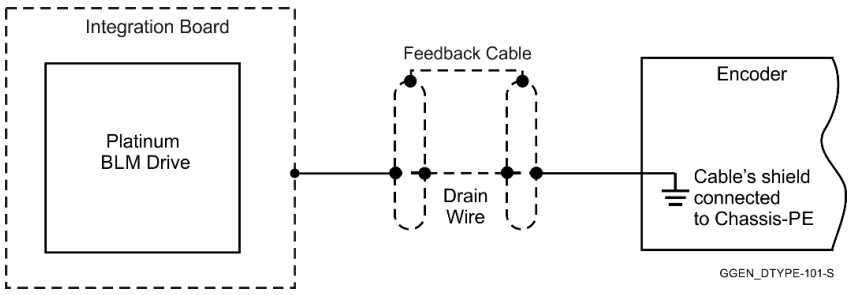
Pin (3.3V)	Signal	Function
1	3.3V	3.3 V supply voltage for EtherCAT LEDs
2	3.3V	3.3 V supply voltage for EtherCAT LEDs

Table 11: 3.3V Pins

Chapter 8: Installation

8.1 Wiring Legend

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

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.

8.2 The Platinum Twitter Connection Diagrams

8.2.1 EtherCAT Connection Diagram

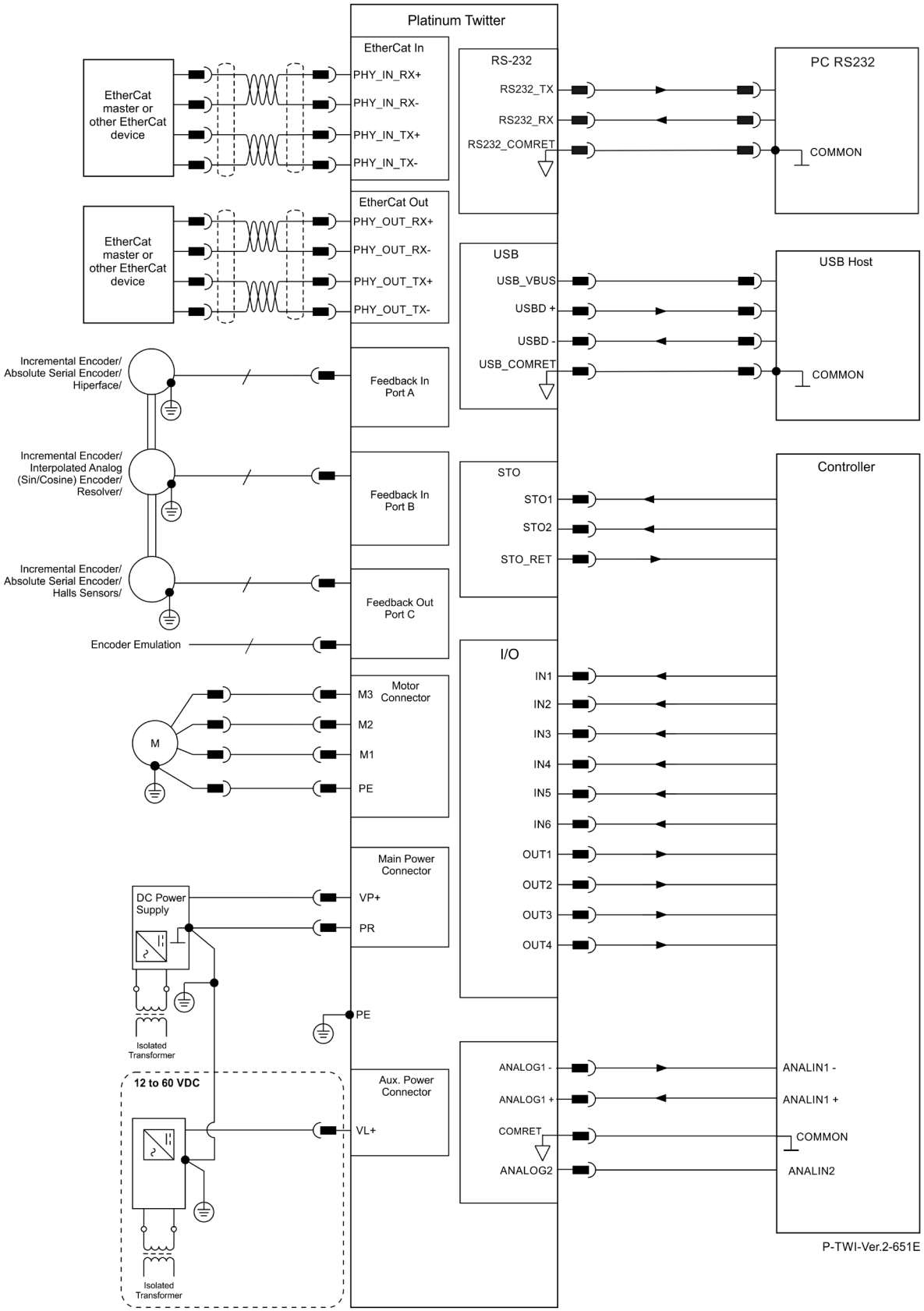


Figure 6: The Platinum Twitter EtherCAT Connection Diagram

8.3 Integrating the Platinum Twitter on a PCB

The Platinum Twitter is designed to be mounted on a PCB by soldering its pins directly to the PCB. Refer to Chapter 16 in the **Platinum Safety Drive Manual** for further information.

8.3.1 Power Returns (PR)

In the Platinum Twitter, the power stage and control stage are internally connected, and the negative node of the DC power bus is designates as PR.

The maximum realistic Power Return is achieved using a plane, which connects between the Platinum Drive and the power source. The impedance on this plane must be as low as possible to reduce the impedance between the "Grounds". This effectively reduces the levels of common mode differences, interferences, EMI etc.

8.3.2 Common Return (COMRET)

For details of the COMRET, refer to section 16.1.4 in the **Platinum Safety Drive Manual**.

8.3.3 Earth Connection (PE)

The PE (Earth connection) terminal is connected internally in the drive to the Platinum Twitter's chassis (heat-sink) which serves as an EMI common plane. Any other assembly metallic parts (such as the chassis) should also be connected to the PE.

Under normal operating conditions, the PE trace carries no current. The only time these traces carry current is under unusual conditions (such as when the device has become a potential shock or fire hazard while conducting external EMI interferences directly to ground). When connected properly the PE trace prevents these hazards from affecting the drive.

8.3.4 Power Return (PR), Common Return (COMRET) and Earth Connections (PE) Regulation

Safety regulations (UL61800-5-1, IEC61800-5-1, and UL508C) require that the servo drive, as a "stand alone", must withstand breakdown voltages of 2KV for the 200V models, and 1.7KV for the 100V models, between PE to PR. However, the connections between PE to PR and the COMRET are essential for the safe operation of the servo drive. Therefore, the following topology must be used:

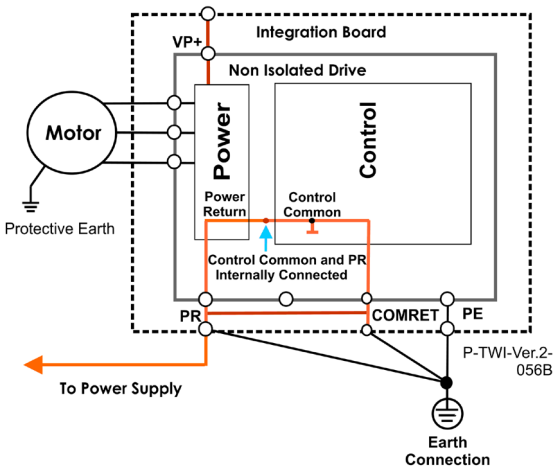


Figure 7: Platinum Twitter Earth Connections

The connections to PE are essential, but must be done externally to the integration board.

The COMRET should be connected to the PR in the Integration Board.

8.4 Logic and Control Cabling and Wiring

For functional safety applications, shielded and twisted wires should be used.

8.4.1 Feedback Ports, VL, RS232, RS422, Analog Input, USB

For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.

8.4.2 Digital Inputs/Outputs, STO

Wires can be always used, no need for twisting, no need for shielding.

8.4.3 EtherCAT Communication

Always use CAT5e cables.

8.5 Power Conductors PCB layout

The PCB virtually divided into two zones; Power Zone, and Control & Communication Zone.

- **Power Zone** - This area is dedicated to Power conductors only: VP+, PR, PE, VL+, and motor leads.
- **Control and Communication Zone** - This area of the PCB is dedicated to Control low level signals.

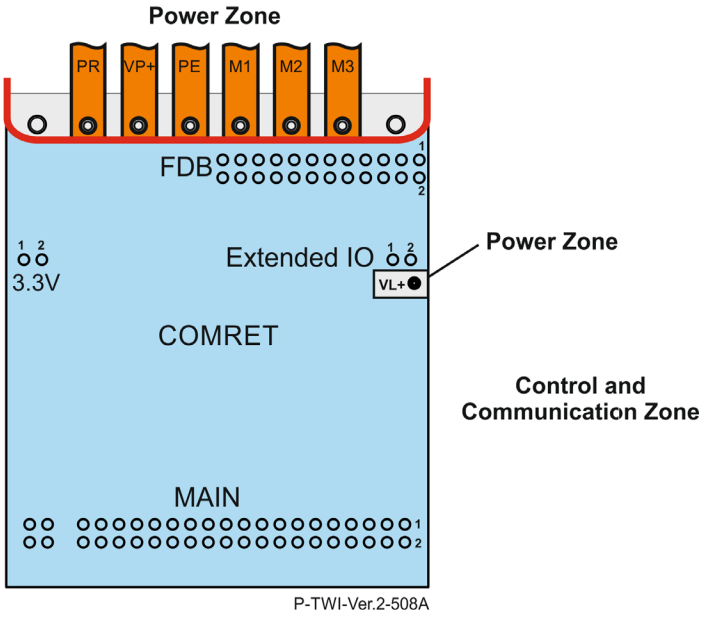


Figure 8: Platinum Twitter EtherCAT Power Conductors PCB layout

For more details, refer to section 16.2.2 in the Platinum Safety Drive Manual.

8.6 Motor Power

This section describes the Motor Power.

For full details refer to section 16.3 in the Platinum Safety Drive Manual.

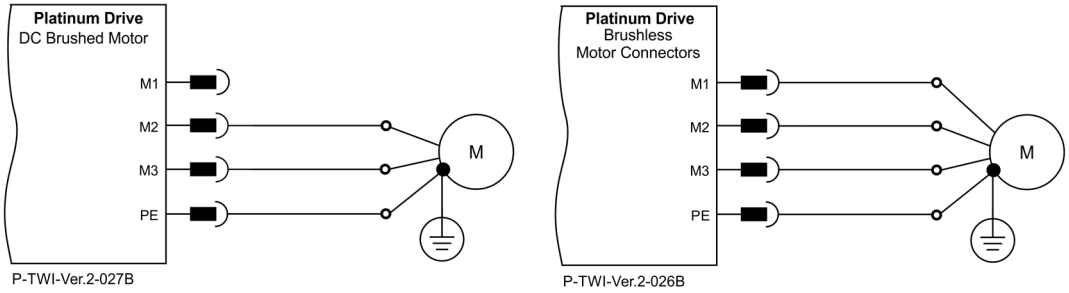


Figure 9: Brushed and Brushless Motor Power Connection Diagram

8.6.1 Connections

1. Ensure that the motor chassis is properly earthed.
2. Connect the appropriate wire from the Motor Power cables to the M1, M2, M3, and PE terminals on the Platinum Twitter.
   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 4-wire shielded (not twisted) cable for the motor connection. The gauge is determined by the actual RMS current consumption of the motor.
   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).

8.7 Main Power and Control Connector

This section describes the Main Power and the Control supply connector.

8.7.1 Main Power

The VDC isolated from the Mains DC power source is not included with the Platinum Twitter.

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

To connect the Platinum Twitter to the DC power source:

1. The source of the VDC power supply must be isolated from the Mains.
2. Verify that the rectified VDC is indeed within the range of the drive.
3. Connect the VP+ and PR wires to the terminals on the servo-drive.
   It is highly recommended to twist the two DC main power cables at intervals of 10 cm.
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.

8.7.2 Control Supply Connections

To connect the VL+ pin on the Platinum Twitter, to the control supply:

1. The source of the control supply must be isolated from the Mains.
2. Connect the return (common) of the control supply source to the closest earth connection near the control supply source.
3. Connect the VL+ wire to the terminals on the servo-drive.
   For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.
4. Before applying power, first verify the polarity of the connection.

8.7.2.1 Dual Power Supply Topology

Two DC power sources are required for functional safety:

- Main power isolated from the Mains
  - Main power 20 to 195VDC for 200V module
  - Main power 10 to 135VDC for 150V module
  - Main power 10 to 95VDC for 100V module
  - Main power 10 to 75VDC for 80V module
- Isolated Power supply maximum **60V for the logic**

Ordinary Option

This option describes an Ordinary power supply for Servo drives with sufficient internal capacitance and shunt regulator to handle power flow in both directions to-and-from the motor. The following figure describes this connection of main power and control power.

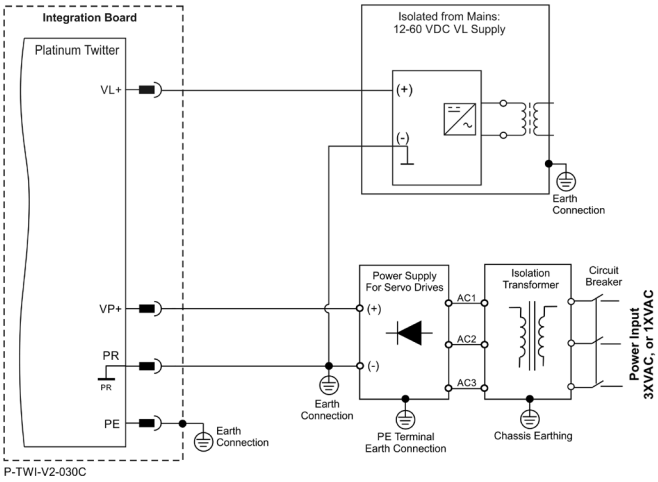


Figure 10: Ordinary Option: Separate VP and VL Power Supplies Connection Diagram

The (+) of the control power supply is connected to the VL+ terminal, while the (-) of the control power supply is connected directly to the (-) of the DC bus power supply. This connection avoids high current ground loops due to poor wiring (Figure 10).

SMPS Option

This option describes a topology with a main power without regeneration, but with limited Braking capabilities dependent on additional capacitance.

The $C_{external}$ can be mounted on the Integration Board if there are no space limitations.

Minimum capacitance of the Power supply: **$C_{external}$ > "Drive's Rated Current" *20uF**

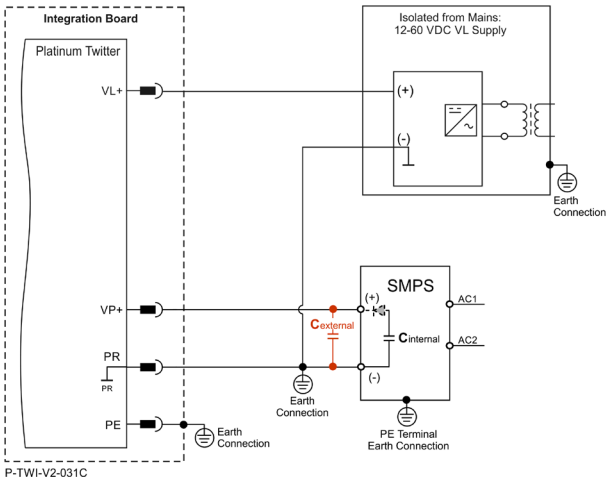


Figure 11: SMPS Option: Separate VP and VL Power Supplies Connection Diagram

The (+) of the control power supply is connected to the VL+ terminal, while the (-) of the control power supply is connected directly to the (-) of the DC bus power supply. This connection avoids high current ground loops due to poor wiring (Figure 11).

8.8 Feedback

Refer to Chapter 11 and section 16.6 Feedback, in the Platinum Safety Drive Manual for details, specification, and connections of the Feedback for safety.

Important:
It should be noted that throughout the Feedback section the following applies:
For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.

8.8.1 Feedback Port A

Port A supports the following sensor inputs as described in the table below:

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

Pin (FDB Connector) Port A		Incremental Encoder	Absolute Serial Encoder
	Signal	**Function**	**Function**
1	PortA_A+	Channel A +	Absolute encoder clock+
3	PortA_A-	Channel A -	Absolute encoder clock-
5	PortA_B+	Channel B+	Absolute encoder data+
7	PortA_B-	Channel B -	Absolute encoder data -
9	PortA_INDEX+	Index+	
11	PortA_INDEX-	Index-	
19	5VDC	Encoder +5V supply	
21, 23	COMRET	Common return	

8.8.1.1 Incremental Encoder

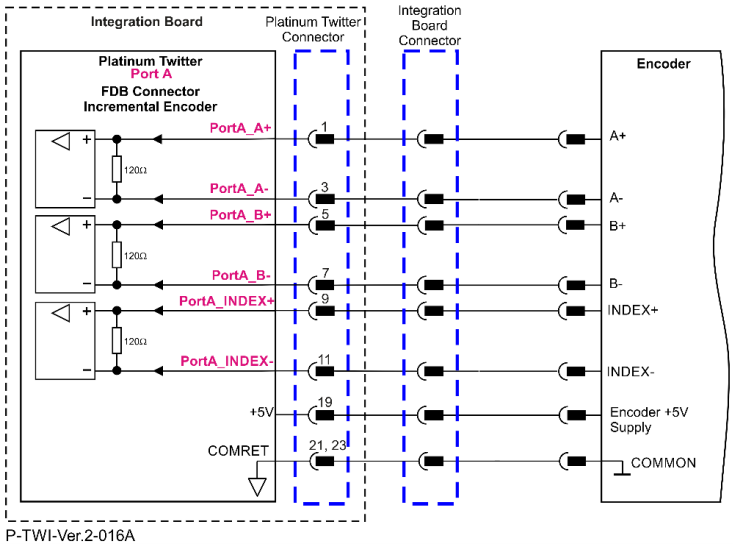


Figure 12: Port A Incremental Encoder Input – Recommended Connection Diagram

8.8.1.2 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:

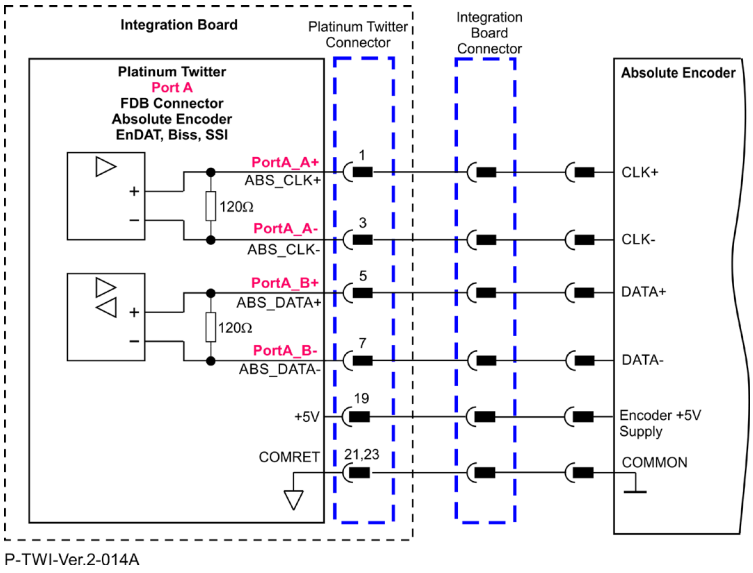


Figure 13: Absolute Serial Encoder – Recommended Connection Diagram for Endat, Biss, SSI

8.8.1.3 Hiperface

The following figure describes the connection diagram.

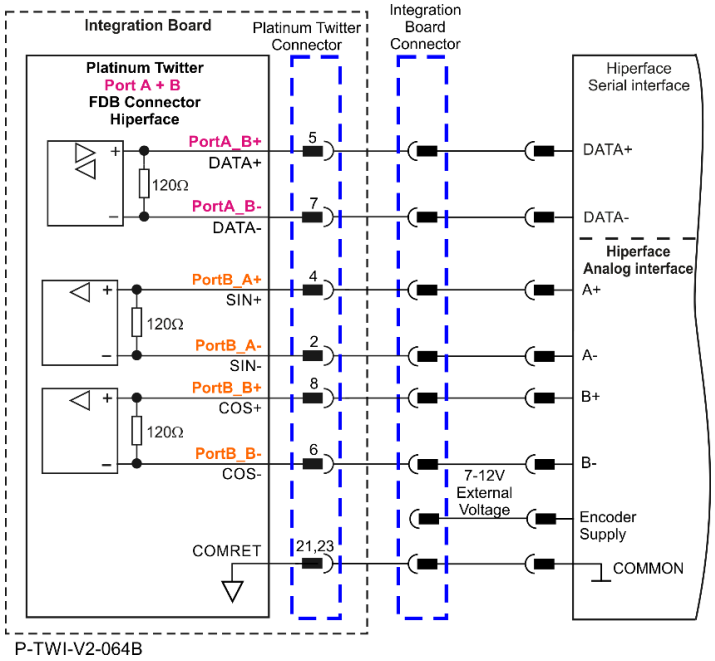


Figure 14: Absolute Serial Encoder – Recommended Connection Diagram for Stegmann Hiperface

Note: You cannot use the Hiperface encoder for functional safety; the Hiperface encoder requires an external voltage supply of 7V to 12V.

8.8.2 Feedback Port B

Port B supports any of the following sensors described in the table:

- Incremental Encoder, interpolated analog Encoder

Or

- Resolver (separate hardware option)

Differential PWM signal input can be connected to port B

Pin (FDB Connector) Port B		Incremental Encoder	Interpolated Analog Encoder	Resolver
	Signal	**Function**	**Function**	**Function**
		PTWI-Mz-XXX/YYYzE-z		PTWI-Mz-XXX/YYYzR-z
2	PortB_A-	Channel A -	Sine-	Sine-
4	PortB_A+	Channel A+	Sine+	Sine+
6	PortB_B-	Channel B-	Cosine-	Cosine-
8	PortB_B+	Channel B+	Cosine+	Cosine+
10	PortB_INDEX-	Channel_Index-	Analog_Index-	RESOLVER_OUT-Vref complement f= 1/TS, 50 mA Maximum
12	PortB_INDEX+	Channel_Index+	Analog_Index+	RESOLVER_OUT+ Vref f=1/TS, 50 mA Max.
19	+5V	Encoder +5V supply		
21, 23	COMRET	Common return		

8.8.2.1 Incremental Encoder

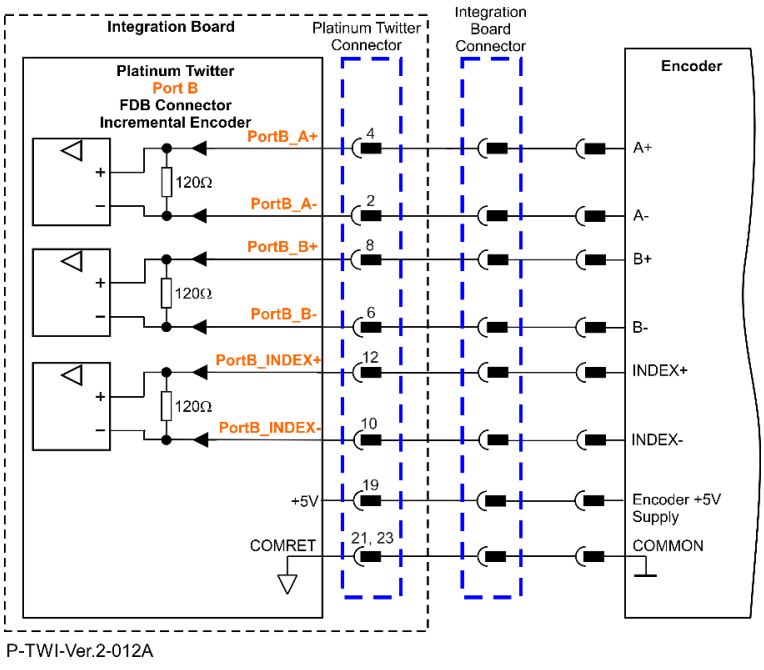


Figure 15: Port B Incremental Encoder Input – Recommended Connection Diagram

8.8.2.2 Interpolated Analog (Sine/Cosine) Encoder

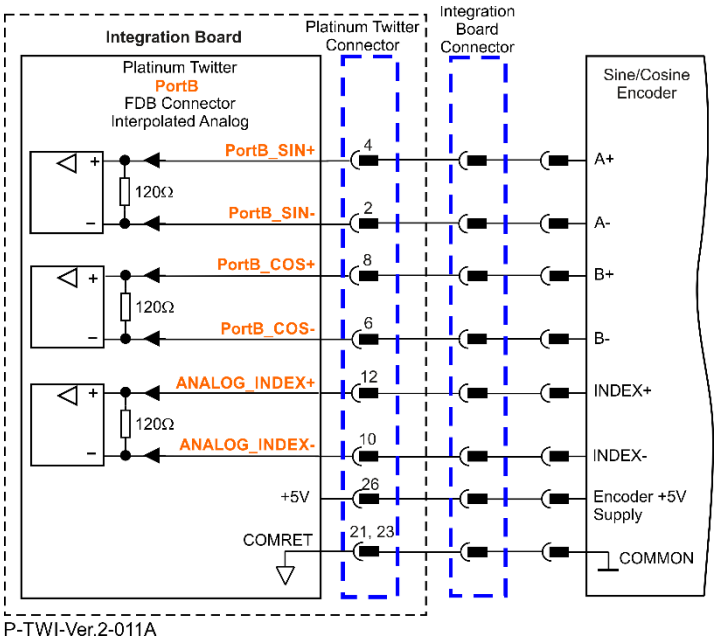


Figure 16: Port B - Interpolated Analog Encoder Connection Diagram

8.8.2.3 Resolver

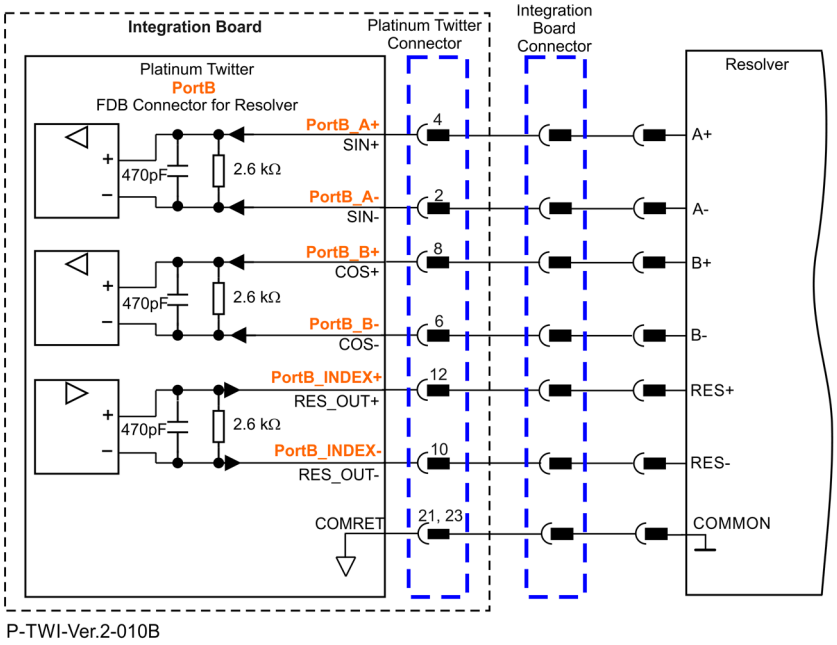


Figure 17: Port B – Resolver Connection Diagram

8.8.3 Feedback Port C

Port C provides the following as described in the table below:

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

Pin (FDB Connector) Port C		Incremental Encoder	Absolute Serial Encoder	Emulated Encoder
Signal		**Function**	**Function**	**Function**
13	HALL A	Hall A Input		
15	HALL B	Hall B Input		
17	HALL C	Hall C Input		
14	PORTC_A-	Channel A-	Absolute encoder clock-	Emulated Output A-
16	PORTC_A+	Channel A+	Absolute encoder clock+	Emulated Output A+
18	PORTC _B-	Channel B-	Absolute encoder data -	Emulated Output B-
20	PORTC_B+	Channel B+	Absolute encoder data+	Emulated Output B+
22	PORTC_INDEX-	Index -	Reserved	Emulated Output Index-
24	PORTC_INDEX+	Index+	Reserved	Emulated Output Index+
19	+5V	Encoder +5V supply		
21, 23	COMRET	Common return		

8.8.3.1 Incremental Encoder

The following Incremental Encoder types are supported:

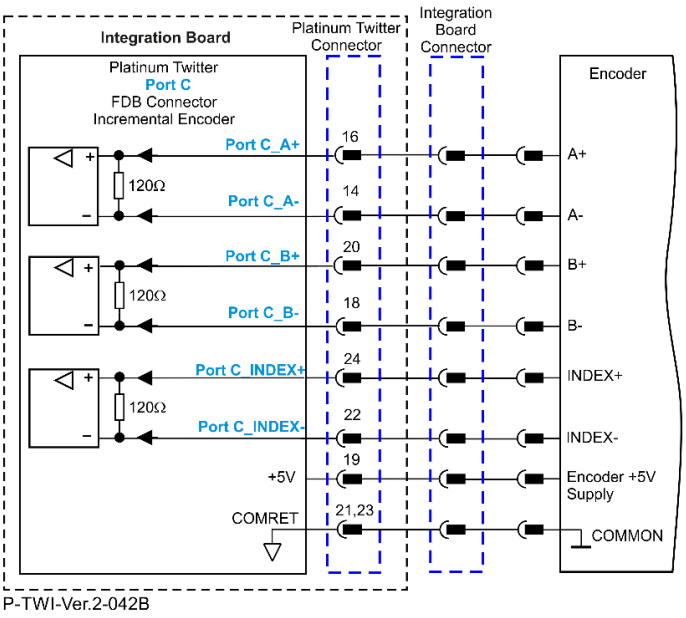


Figure 18: Port C Incremental Encoder Input – Recommended Connection Diagram

8.8.3.2 Absolute Serial Encoder

Port C supports the following ABS feedback:

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

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

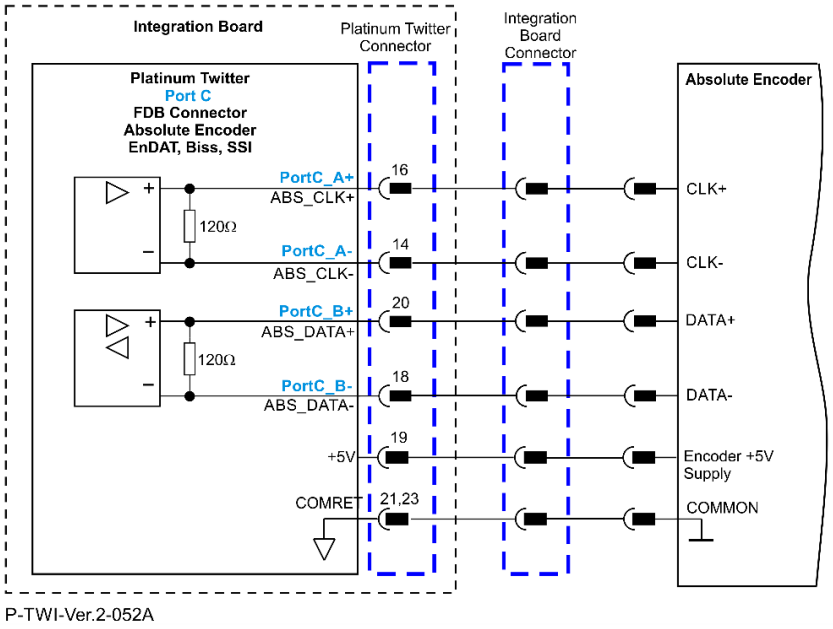


Figure 19**: Absolute Serial Encoder – Recommended Connection Diagram for Endat, Biss, SSI**

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

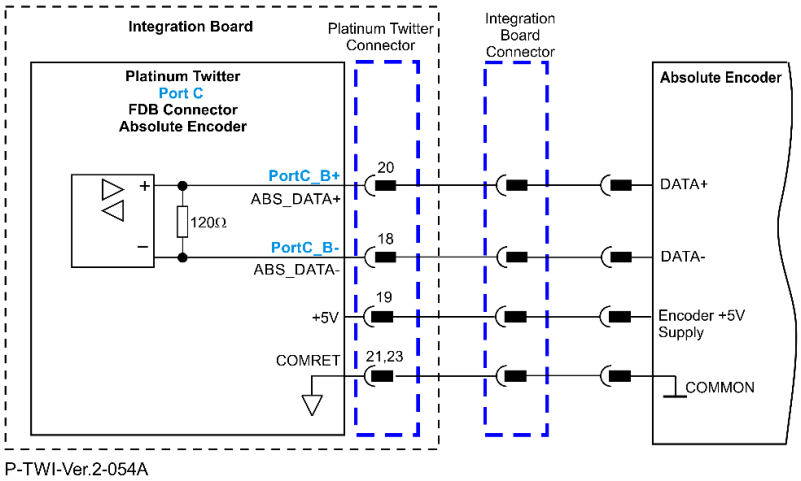


Figure 20**: Absolute Serial Encoder – Recommended Connection Diagram for Panasonic, Tamagawa, Sanyo-Danki**

8.8.3.3 Emulated Encoder Output

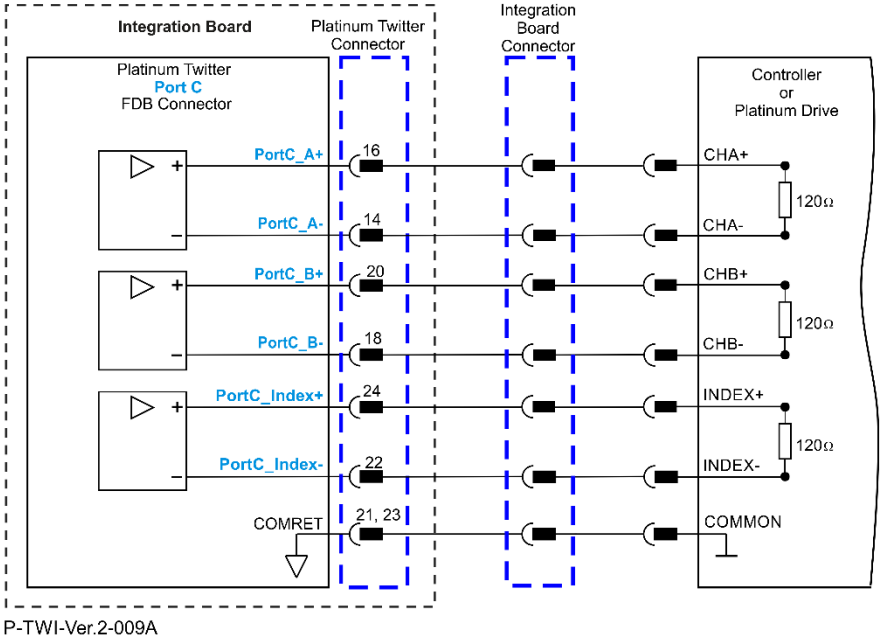


Figure 21: Emulated Encoder Differential Output – Recommended Connection Diagram

8.8.4 Feedback - Hall Sensors

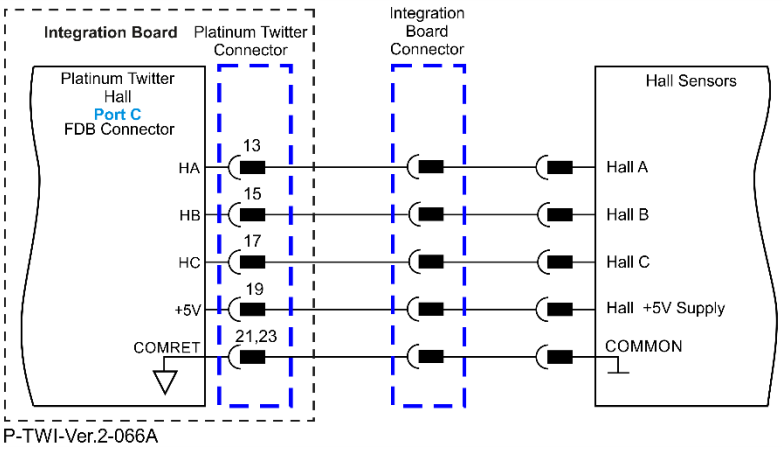


Figure 22: Hall Sensors Connection Diagram

8.9 Digital IO

Refer to the section 16.7 User I/Os in the Platinum Safety Drive Manual for details, specification and connection of the User IO connections.

8.9.1 Digital Inputs

The following table describes the electrical specification of the inputs IN1 to IN6:

Feature	Details
Input Voltage (VIN)	0 to 6V
V_{ih} min	2.2V
V_{il} max	0.6V
R_1 Pull-up Resistor	If VT = 3.3V, R1<3.3KΩ If VT = 5V, R1<10KΩ
Minimum pulse width	> 250 µsec
Execution time (all inputs): the time from application of voltage on input until execution is complete	0 < T < 250 µsec
High-speed inputs – 1–6 minimum pulse width, in high-speed mode	T = 5 µsec if the input functionality is set to latch/capture (index/strobe). **Note:** Home mode is high-speed mode and can be used for fast capture and precise homing.
Capture with differential input Port A, Port B Index	T > 0.1 µsec if the differential input functionality is set to touch probe/capture (index/strobe).

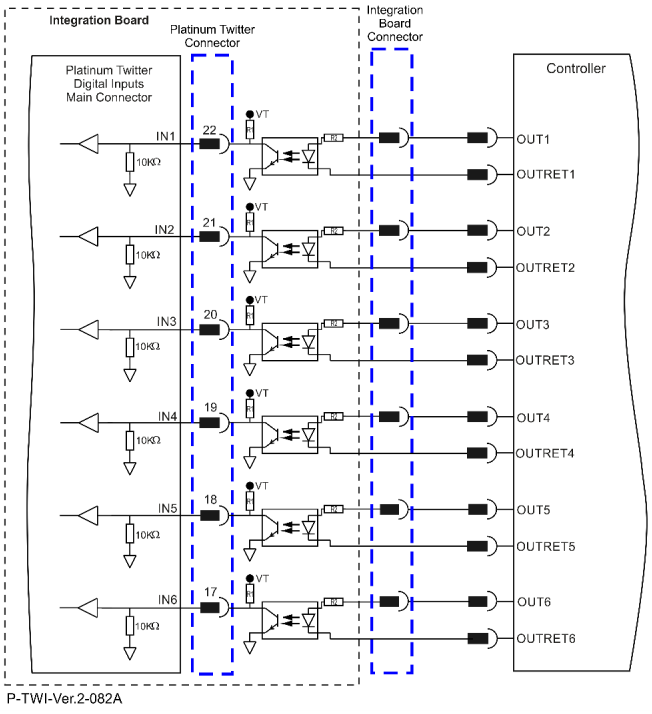
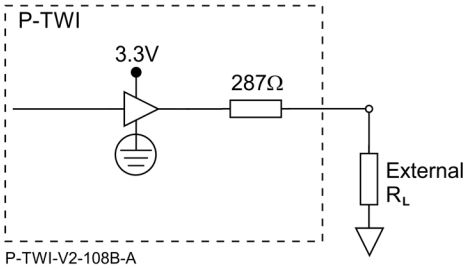
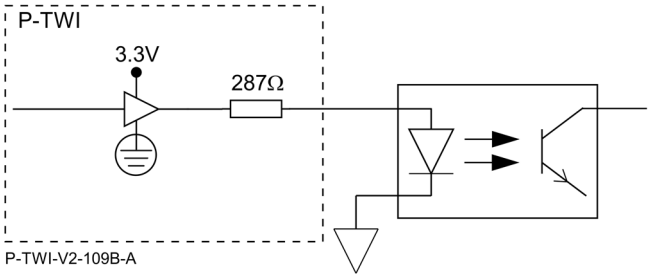


Figure 23: Digital Input 5V Logic level Mode Connection Diagram

8.9.2 Digital Outputs

Digital outputs 1 to 4 are 3.3V Logic.

The following table describes the electrical specification of outputs 1 to 4:

Feature	Details
Type of output	• 3.3V Logic
Output Configuration	
V_{OL} max of TTL Buffer (low level)	V_{out} (Low) ≤ 0.44V @ 8mA
V_{OH} min of TTL Buffer (High level)	V_{out} (High) > 4.4V @ 8mA
Output current	$I_{out(\max)} = \frac{3.3V}{287\Omega + R_{L\,(\text{external})}}$ Where: $V_{R_{L\,(High)}} = 3.3V - 287 * I_{out(\max)}$
Example of connection to the opto-couplers	 Where: $I_{out(\max)} = \frac{3.3V - 2.0V}{287\Omega} = 4.5mA$
T_{on} (time from low to high)	<1µsec
T_{off} (time from high to low)	<1µsec
Executable time	0 < T < 250 µsec

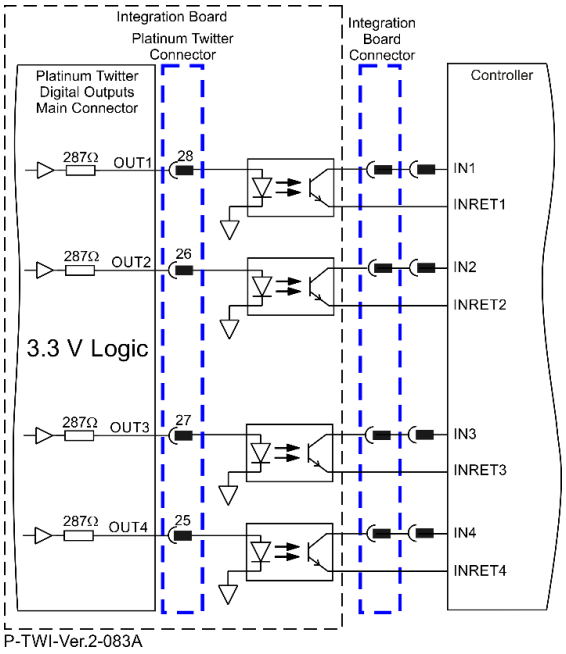


Figure 24: Digital Output 3.3V Logic Mode Connection Diagram

8.9.3 STO (Safe Torque Off)

Refer to the section 16.5 Safe Torque Off (STO) in the Platinum Safety Drive Manual for details, specification and connection of the STO.

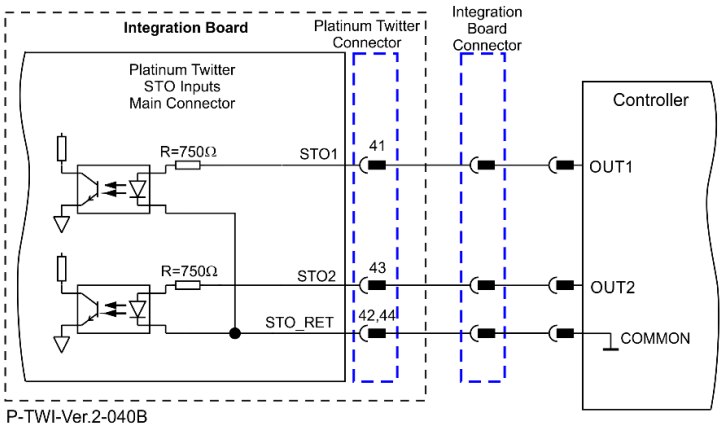


Figure 25: STO Input Connection – 5V Logic Level

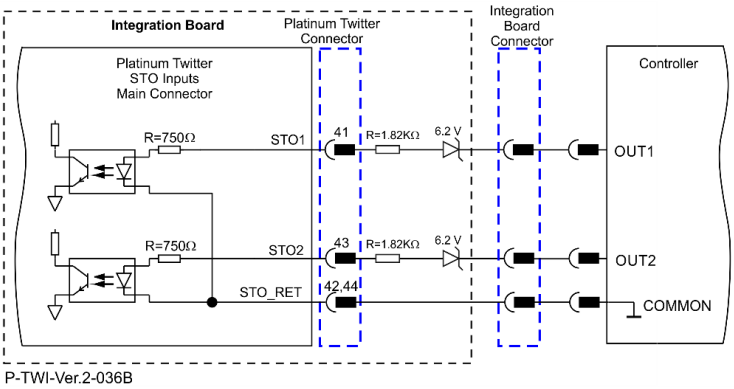


Figure 26: STO Input Connection – PLC (24V Logic)

8.10 Analog Inputs

There are two possible types of Analog Inputs in the Platinum Twitter:

- Analog Input 1 – Differential ±10 V
- Analog Input 2 – Single ended

Refer to the section 16.8 Analog Input in the Platinum Safety Drive Manual for details, specification and connection of the Analog Input.

Important:
It should be noted that throughout the Analog Inputs section the following applies:
For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.

8.10.1 Analog Input 1

Figure 27 describes the input interface of the Analog input 1 in the Platinum Twitter:

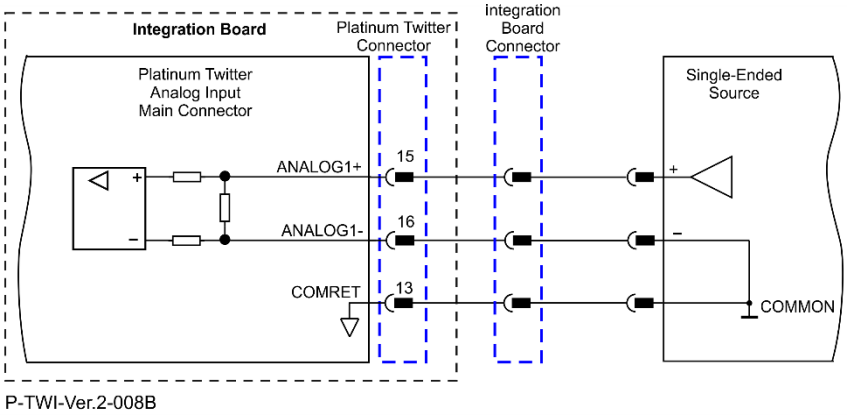


Figure 27: Analog Input 1

8.10.2 Analog Input 2

Figure 28 describes the input interface of the Analog input 2 in the Platinum Twitter.

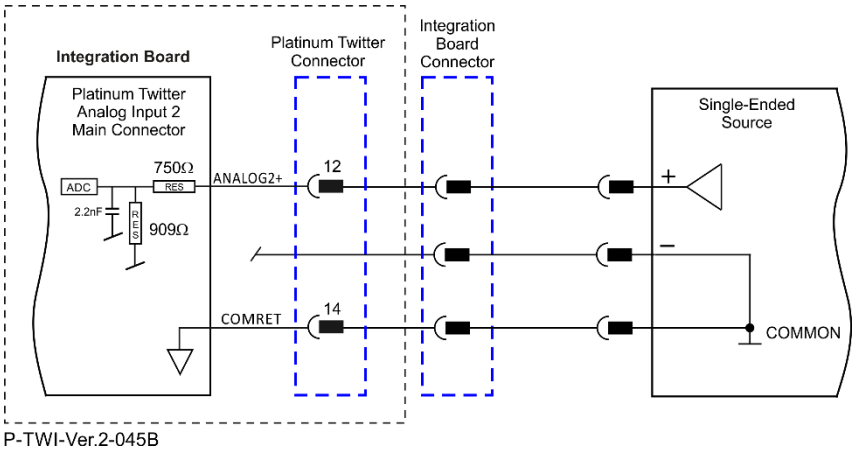


Figure 28: Analog Input 2

8.11 Communication

8.11.1 RS-232

There are two types of RS232: Standard RS232 and RS232 TTL Level.

Important:
It should be noted that throughout the RS-232/RS-422 sections the following applies:
For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.

8.11.1.1 Standard RS-232

Refer to section 16.10.3 RS232 in the Platinum Safety Drive Manual for details, specification and connection of the RS232 TTL Level.

Figure 29 describes the Standard RS232 connection diagram.

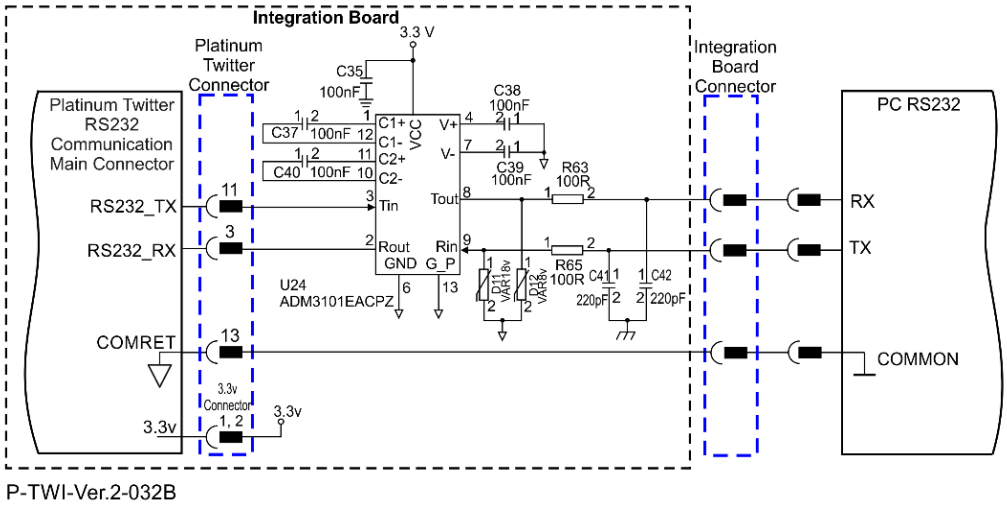


Figure 29: RS232 Connection Diagram

8.11.1.2 RS-422 (Differential RS-232)

The following is recommended when connecting the Differential RS-232 communication cable:

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

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
COMRET	Common Return

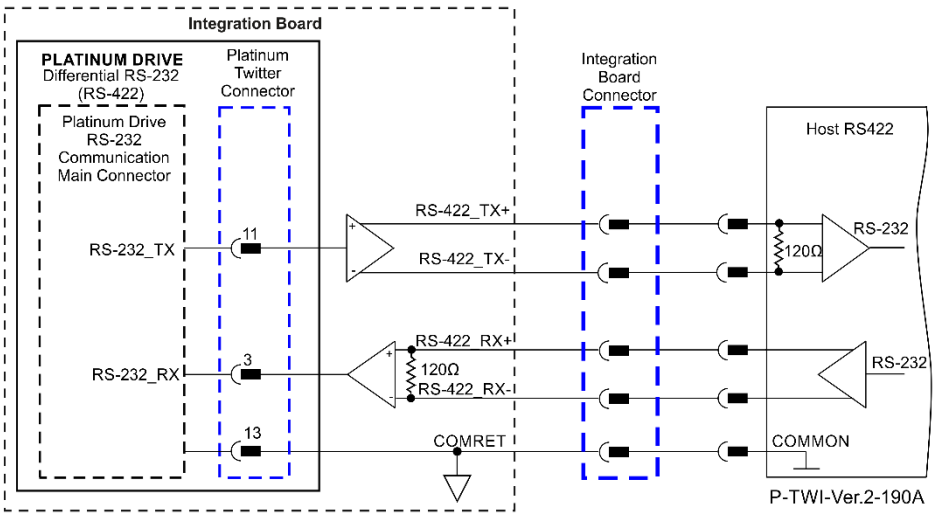


Figure 30: Differential RS-232 Communication Example

The RS232 TTL Level will be used in order to connect Differential RS232 (RS422).

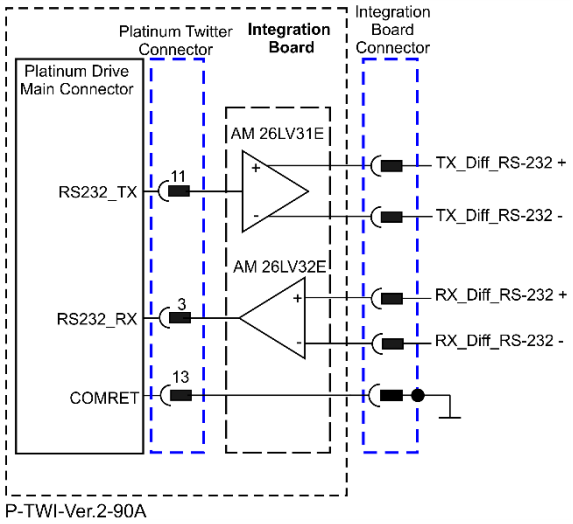


Figure 31: Differential RS232 (RS422) Connection Diagram

8.11.2 USB 2.0

Refer to section 16.10.1 USB in the Platinum Safety Drive Manual for details, specification and connection of the USB.

Important:
It should be noted that throughout the USB section the following applies:
For short distances between the drive and control, 0.5 to 1.0 m wires can be used and shielding is not required. For longer distances than 1.0 m and/or high EMI environment, shielded and twisted wires should be used. Drain wires should be connected to Elmo COMRET.

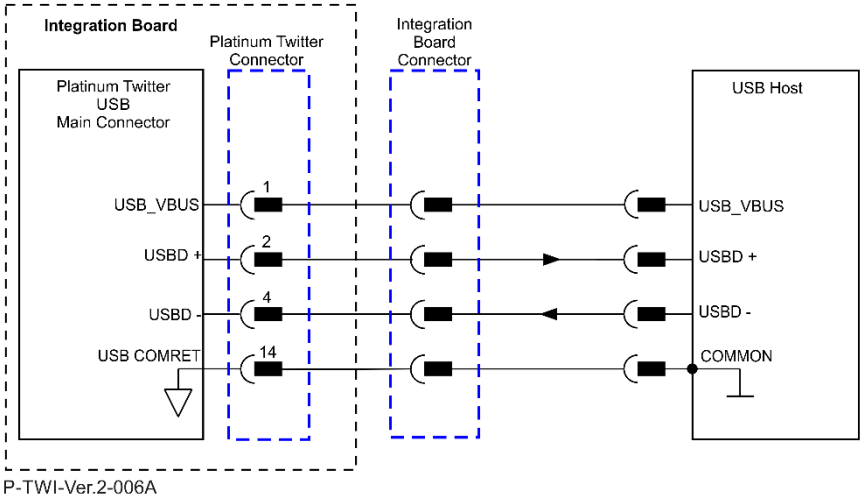


Figure 32: USB Network Diagram

8.11.3 EtherCAT/Ethernet Communication

This section only describes the EtherCAT communication, and the pinout drawing of the connector.

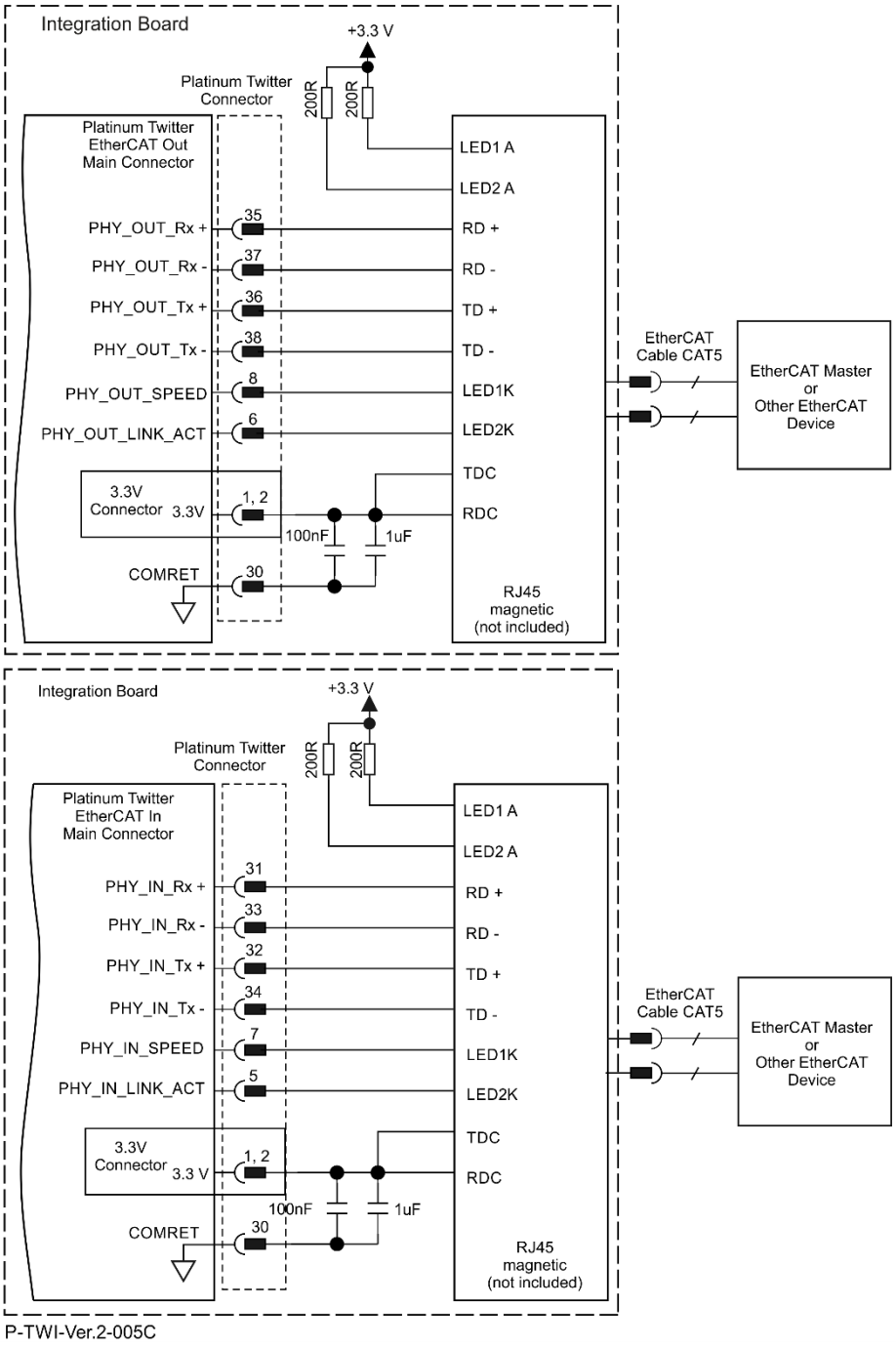


Figure 33: EtherCAT Connection Schematic Diagram

Note:

Always use CAT5e cables.

8.11.3.1 EtherCAT Status Indicator

Figure 34 describes the Pin associated with the EtherCAT status indicator.

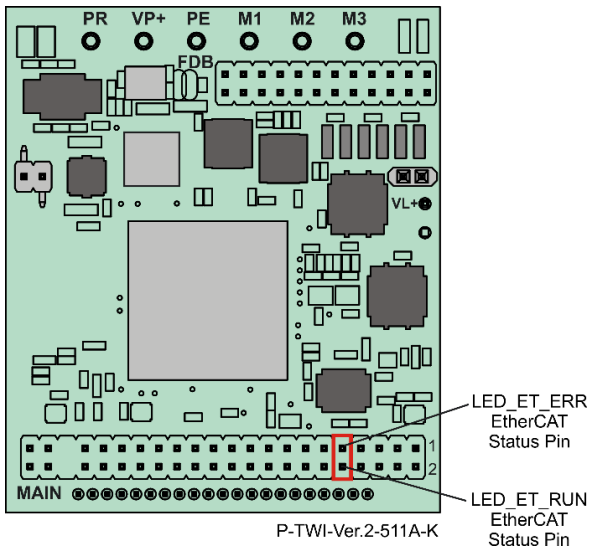


Figure 34: EtherCAT Status Indicator Pin

The EtherCAT status indicator is a single red/green dual bi-colored LED which is used for immediate indication of the Initiation and Working states.

8.11.3.2 EtherCAT Link Indicators

The Platinum Twitter can serve as an EtherCAT slave device. For this purpose it has two Pins, which are designated as EtherCAT Link In and EtherCAT Link Out. Each of these Ports has a status LED; EtherCAT In and EtherCAT Out.

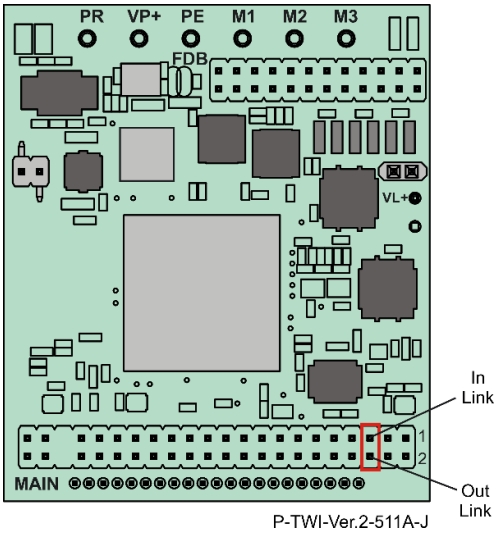


Figure 35: EtherCAT Link In and Out Pins

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

8.11.4 CAN (Available in the future)

To be detailed within the near future.

Chapter 9: Product Description

After the Platinum Twitter 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

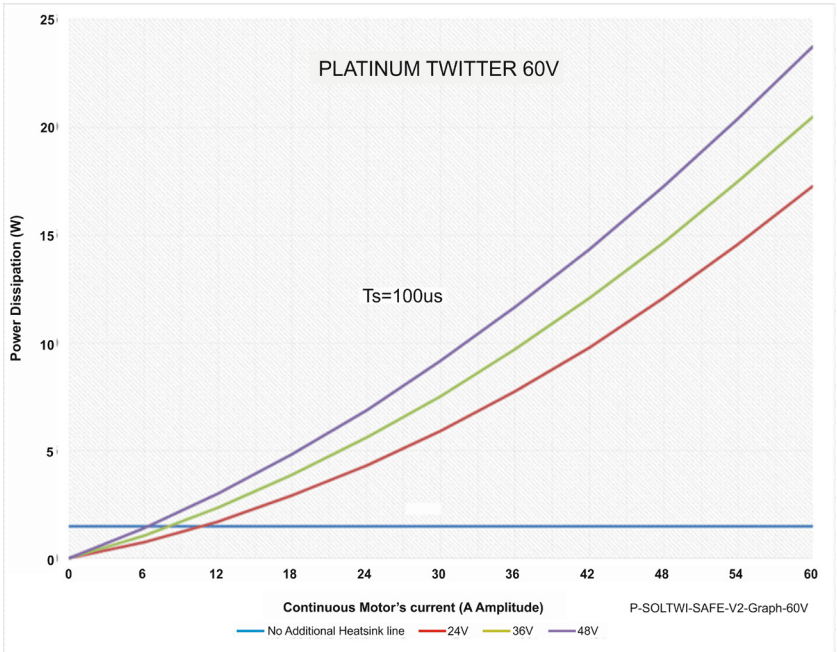
After the Platinum Twitter has been connected and mounted, the system must be set up and initialized. This is accomplished using the *EASII*, Elmo's Windows-based software application. Install the application and then perform setup and initialization according to the directions in the *EASII User Manual*.

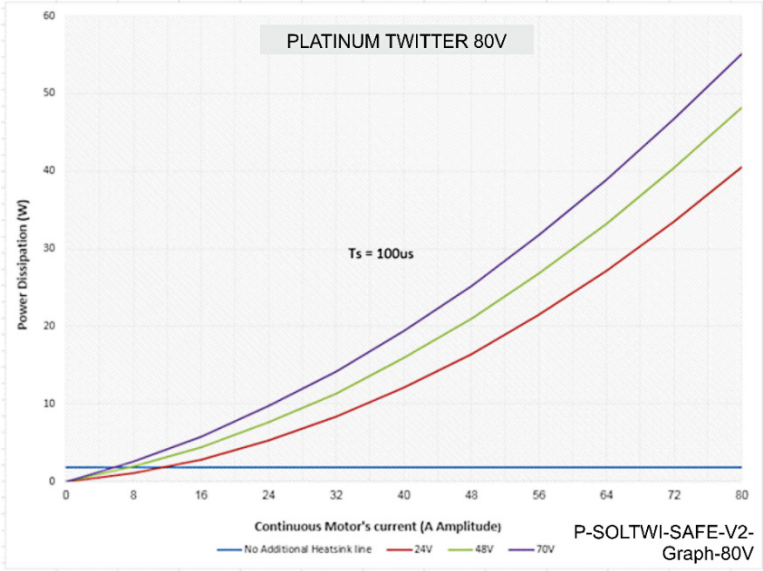
9.2 Heat Dissipation

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

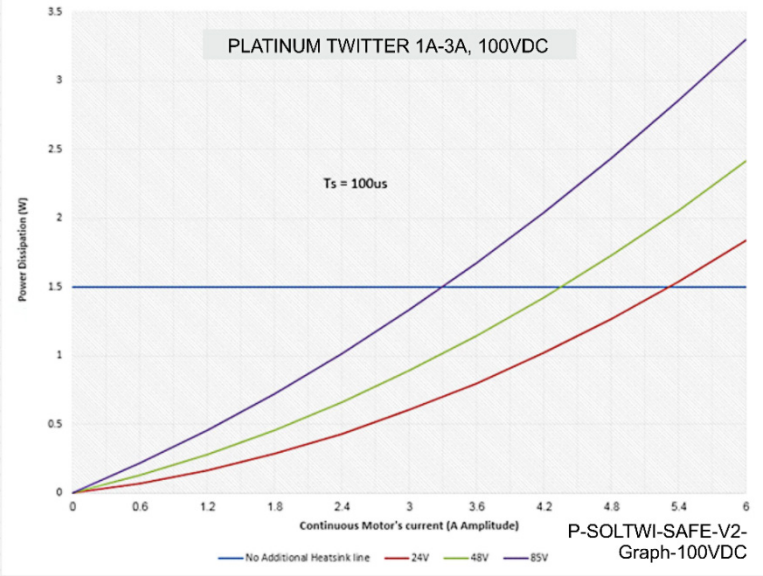
9.2.1 Thermal Dissipation Data

Heat Dissipation is shown graphically below.
The graphs below describe the basic Platinum Twitter PN PTWI-Mz-zXXX/YYY-zz-Blank.
It should also be noted that the Heat Sink of the model PN PTWI-Mz-zXXX/YYY-zz-H can dissipate up to 5.5W.

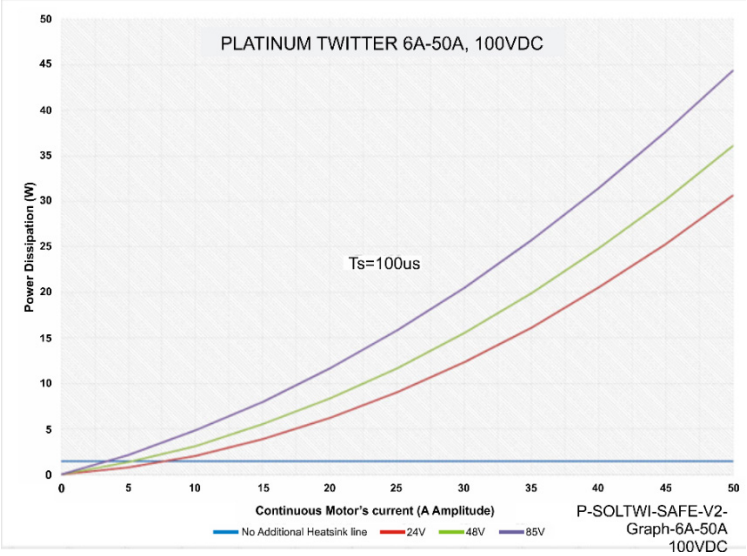




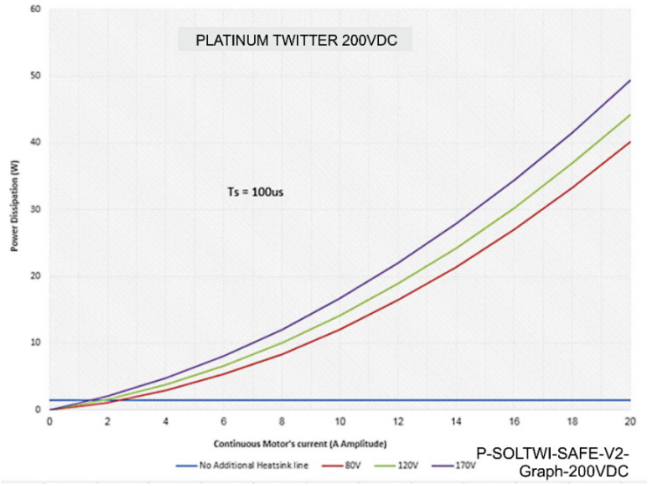
P-SOLTWI-SAFE-V2-Graph-80V



P-SOLTWI-SAFE-V2-Graph-100VDC



P-SOLTWI-SAFE-V2-Graph-6A-50A 100VDC



9.2.2 How to Use the Chart

The charts above are based upon the theoretical worst-case scenario. The actual test results display a 20% - 30% lower power dissipation.

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.
   If the DC bus is not one of the three curves above, estimate the dissipation by interpolation. The estimation error is not critical.
2. 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.
3. When the Heat-Sink temperature reaches ≈ 85 °C, the Platinum Twitter 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.
4. For model **PTWI-Mz-zXXX/YYYzz-Blank**
   If the average heat dissipation is less than ≈1.5W (Average operating power of 100W to 200W) there will be no requirement for an external heat sink.
   If the average Heat dissipation is higher than 1.5W then an additional heat dissipation means is required, usually by connecting to an external heat-sink.
   For model **PTWI-Mz-zXXX/YYYzz-H**
   If the average heat dissipation is less than ≈4W 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.
5. When an external Heat-Sink is required, calculate the thermal resistance of the heat sink according to:

   1. $$Ø_{°C/W} = \frac{80°C - T_{Ambient}}{Heat\ Dissipation}$$

Chapter 10: Dimensions

This chapter provides detailed technical dimensions regarding the Platinum Twitter.

10.1 EtherCAT without Heatsink

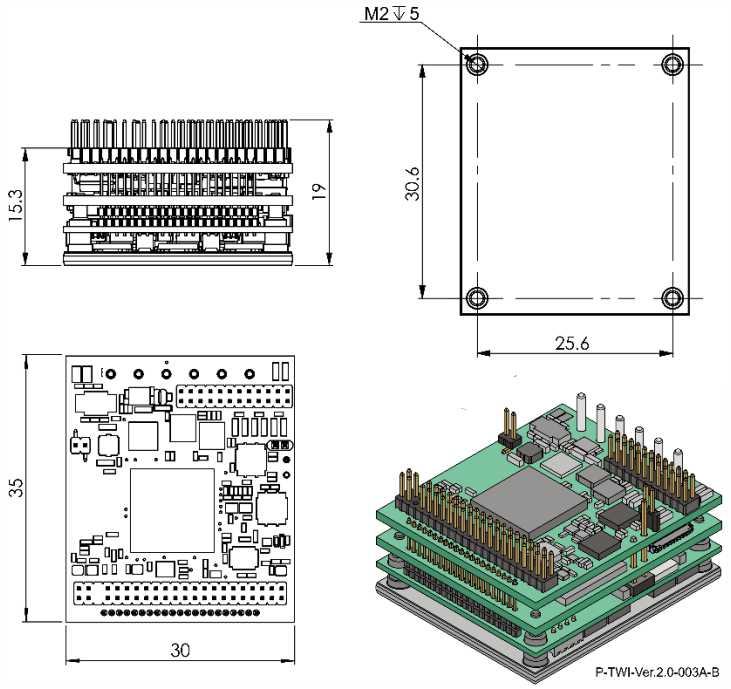


Figure 36: P-Twitter –EtherCAT version

10.2 EtherCAT with Heatsink

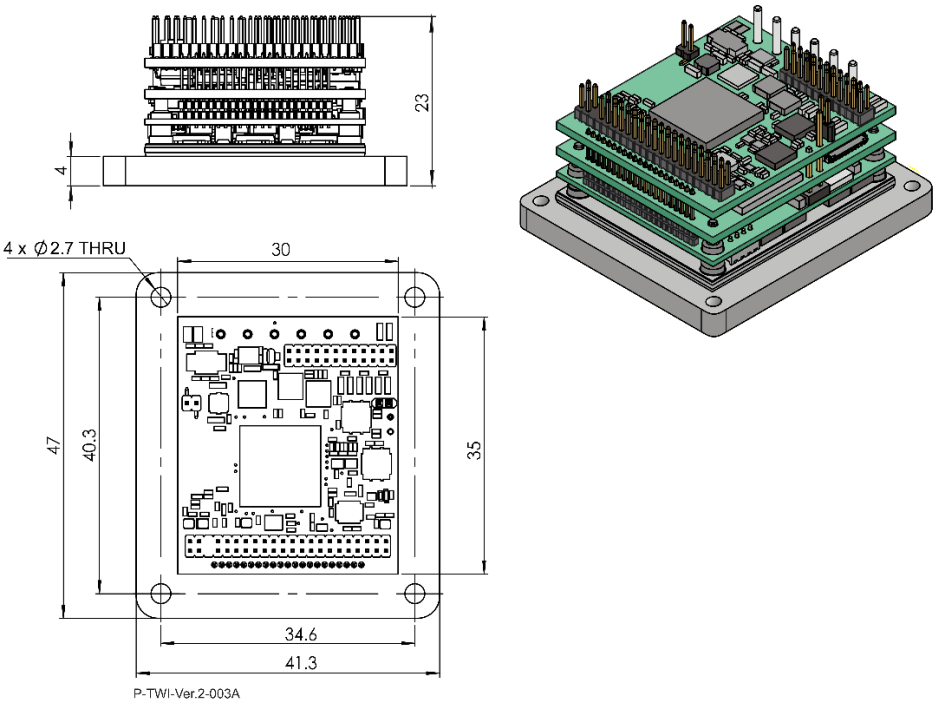


Figure 37: P-Twitter –EtherCAT version with Flat Heatsink

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