

Gold Double Twitter Digital Servo Drive Installation Guide CAN and EtherCAT



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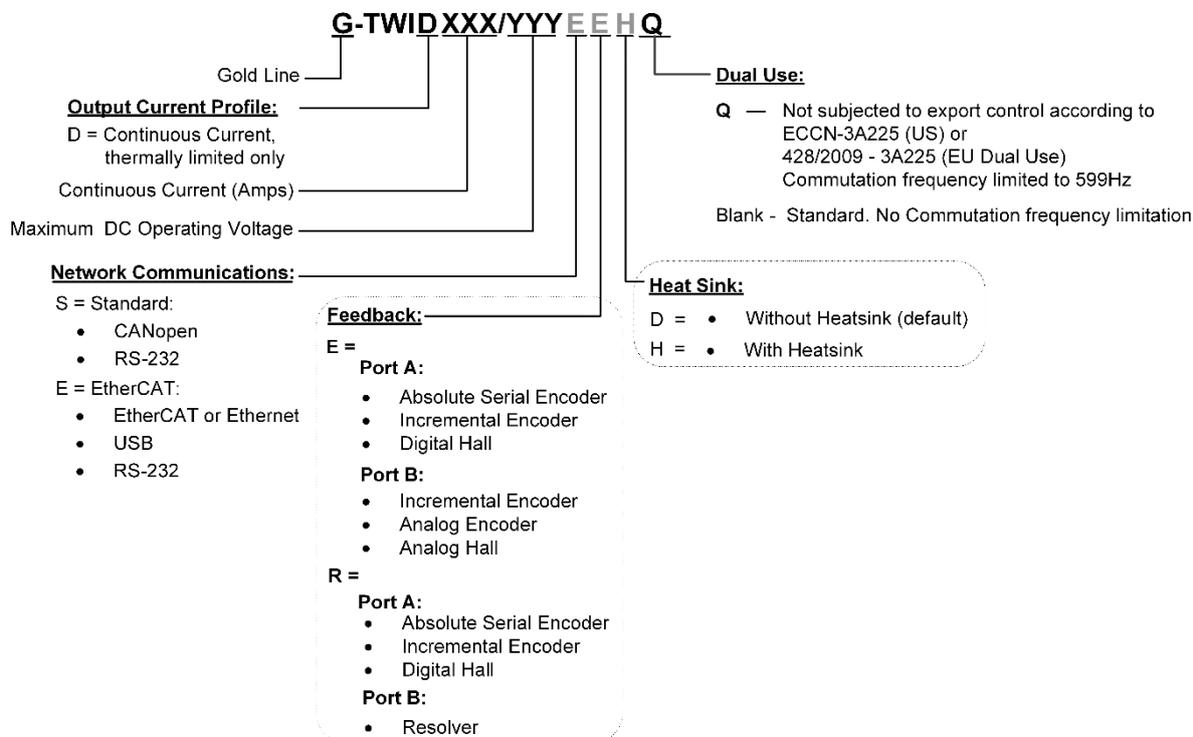
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- Chapter 1: This Installation Guide7**

- Chapter 2: Safety Information7**
 - 2.1. Warnings8
 - 2.2. Cautions.....8
 - 2.3. Warranty Information8

- Chapter 3: Product Description.....9**

- Chapter 4: Technical Information.....10**
 - 4.1. Physical Specifications.....10
 - 4.2. D Type Technical Data10
 - 4.3. Control Supply Input Voltage (VL).....11
 - 4.4. Product Features11
 - 4.5. Environmental Conditions.....12

- Chapter 5: Standards and Certifications13**
 - 5.1. Functional Safety13
 - 5.2. Electrical Safety13
 - 5.3. Electromagnetic Compatibility13
 - 5.4. Environmental14
 - 5.5. Other Compliant Standards.....14
 - 5.6. CE Declaration14
 - 5.7. Dual Use14

- Chapter 6: Unpacking the Drive Components15**

- Chapter 7: Mounting the Gold Double Twitter16**
 - 7.1. Mounting the Gold Double Twitter to a Heat Sink.....18
 - 7.1.1. Mounting the Gold Double Twitter (PN G-TWIDXXX/YYZZD).....18
 - 7.1.2. Mounting the Gold Double Twitter (PN G-TWIDXXX/YYZZH).....19

- Chapter 8: Integrating the Gold Double Twitter on a PCB20**
 - 8.1. Power Returns (PR)20
 - 8.2. COMRET.....20
 - 8.3. Earth Connection (PE)20
 - 8.4. Power Return (PR), Common Return (COMRET) and Earth Connections (PE).....21
 - 8.5. Logic and Control Cabling and Wiring22
 - 8.5.1. Feedback Ports, VL, RS232, USB, Analog Input22
 - 8.5.2. Digital Inputs/Outputs, STO.....22

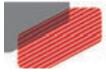
8.5.3.	EtherCAT or CAN Communication	22
8.5.4.	COMRET to PE Connection	22
8.6.	Power Conductors PCB layout.....	23
Chapter 9:	Wiring.....	24
9.1.	Wiring Legend.....	24
9.2.	The Gold Double Twitter Connection Diagram	25
Chapter 10:	Connections	27
10.1.	Main, Control, and Motor Power	30
10.1.1.	Motor Power	30
10.1.2.	Motor Power Connections	31
10.1.3.	Main Power and Control Connector.....	32
10.1.3.1.	Main Power	32
10.1.3.2.	Control Supply	33
10.1.3.3.	Dual Power Supply Topology.....	34
10.1.3.4.	Single Power Supply Topology (VP+< 95VDC)	36
10.2.	Feedback Connector FDB	38
10.2.1.	Port A.....	40
10.2.1.1.	Incremental Encoder	40
10.2.1.2.	Absolute Serial Encoder.....	41
10.2.1.3.	Hall Sensors	42
10.2.2.	Port B.....	43
10.2.2.1.	Incremental Encoder	43
10.2.2.2.	Interpolated Analog Encoder	44
10.2.2.3.	Resolver	45
10.2.3.	Port C – Emulated Encoder Output (FDB)	46
10.3.	Main Connector (MAIN).....	47
10.3.1.	Digital Inputs.....	50
10.3.2.	Digital Outputs.....	52
10.3.3.	STO (Safe Torque Off).....	55
10.3.4.	Analog Input	56
10.3.5.	CAN Option.....	57
10.3.5.1.	Interface	57
10.3.5.2.	CAN Layout	58
10.3.6.	RS232	59
10.4.	EtherCAT Module	60
10.4.1.	EtherCAT Module Connectors.....	60



- 10.4.1.1. ECT2 connector.....60
- 10.4.1.2. ECT1 connector.....61
- 10.4.1.3. ECT3 Connector61
- 10.4.1.4. 3.3V Connector61
- 10.4.2. EtherCAT Communication62
- 10.4.3. USB 2.0 Communication (for EtherCAT model only).....63

- Chapter 11: Powering Up64**
- 11.1. Initializing the System64
- 11.2. Heat Dissipation65
 - 11.2.1. Heat Dissipation Data65
 - 11.2.2. How to Use the Chart68

- Chapter 12: Dimensions69**
- 12.1. Gold Double Twitter EtherCAT Version without Heatsink69
- 12.2. Gold Double Twitter CAN Version without Heatsink70
- 12.3. Gold Double Twitter EtherCAT Version with Heatsink.....71
- 12.4. Gold Double Twitter CAN Version with Heatsink.....72



Chapter 1: This Installation Guide

This installation Guide details the technical data, pinouts, and power connectivity of the Gold Double Twitter. For a comprehensive detailed description of the functions and connections of the drive, refer to the Gold Board Level Module Hardware Manual.

Chapter 2: Safety Information

In order to achieve the optimum, safe operation of the Gold Double 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 Gold Double 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 Gold Double 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.



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.



2.1. Warnings

- To avoid electric arcing and hazards to personnel and electrical contacts, never connect/disconnect the servo drive while the power source is on.
- Power cables can carry a high voltage, even when the motor is not in motion. Disconnect the Gold Double Twitter from all voltage sources before servicing.
- The high voltage products within the Gold Line range contain grounding conduits for electric current protection. Any disruption to these conduits may cause the instrument to become hot (live) and dangerous.
- After shutting off the power and removing the power source from your equipment, wait at least 3 minutes 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.
- Control and communication circuits are separated from power circuits by only functional insulation. These circuits should be insulated according to the working voltage of the power circuit and the control or communication circuits based on the requirements of the end user application.



2.2. Cautions

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

2.3. Warranty Information

The products covered in this manual are warranted to be free of defects in material and workmanship and conform to the specifications stated either within this document or in the product catalog description. All Elmo drives are warranted for a period of 12 months from the time 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: Technical Information

4.1. Physical Specifications

Feature	Units	All Types
Weight without Heatsink	g (oz)	EtherCAT Version: ≈36 g (1.27 oz) CAN Version: ≈33 g (1.16 oz)
Weight with Heatsink	g (oz)	EtherCAT Version: ≈67 g (2.36 oz) CAN Version: ≈64 g (2.29 oz)
EtherCAT/CAN Version Dimension without Heatsink	mm (in)	47 x 36.2 x 19 mm (1.85" x 1.425" x 0.75")
EtherCAT/CAN Version Dimension with Heatsink	mm (in)	61 x 47 x 23 mm (2.4" x 1.85" x 0.91")
Mounting method		PCB mount
IP		IP00

4.2. D Type Technical Data

Feature	Units	D180/60	D160/80	D140/100	D40/200	D70/200
Minimum supply voltage	VDC	11	11	11	20	20
Nominal supply voltage	VDC	45	65	85	170	170
Maximum supply voltage	VDC	55	75	95	195	195
Maximum continuous Electrical power output	kW	8.6	10	11	6.4	11
Efficiency at rated power (at nominal conditions)	%	> 99				
Maximum output voltage		Up to 96% of DC bus voltage				
Amplitude sinusoidal continuous current	A	180	160	140	40	70
Sinusoidal continuous RMS current limit (I _c)	A	127	113	99	28	49
Current limit	A	Max Output current is guaranteed for T _{Heat-Sink} <85°C				



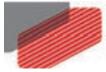
4.3. Control Supply Input Voltage (VL)

The Control Supply input voltage (VL) must be either SELV or PELV rated.

Feature	Unit	Details
Standard CAN (S option)		
Input range	V	11V – 95V
Power consumption (including 5 V/200 mA for encoder)	W	<2.5W
ETHERCAT (E option)		
Input range	V	11V – 95V
Power consumption (including 5 V/200 mA for encoder)	W	<4W

4.4. Product Features

Main Feature	Details	Presence / No.
STO	5V Logic Level, Opto isolated from the Control section	✓
Digital Input Option	5V Logic Level (Internally connected to COMRET)	6
Digital Output Option	5V logic (Internally connected to COMRET)	2
	3.3V logic (Internally connected to COMRET)	2
Analog Input	Differential ±10V	1
	Single Ended	1
Feedback	Standard Port A, B, & C	✓
Communication Option	USB (only for EtherCAT version)	✓
	EtherCAT <i>or</i>	✓
	CAN	✓
	RS232 TTL level	✓
	Standard RS232	✓



4.5. Environmental Conditions

You can guarantee the safe operation of the Gold Double Twitter by ensuring that it is installed in an appropriate environment. The following table describes the certified environmental conditions for STO of the Gold series servo drives.



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



Caution:
The Gold Double Twitter dissipates its heat by convection or by conduction. The maximum ambient operating temperature of 50 °C (122°F) must not be exceeded.

Feature	Details
Operating ambient temperature	0 °C to +50 °C (32 °F to +122 °F)
Storage temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Maximum non-condensing humidity according to IEC60068-2-78	95%
Maximum Operating Altitude	2,000 m (6562 feet) It should be noted that servo drives capable of higher operating altitudes are available on request.
Mechanical Shock according to IEC60068-2-27	15g / 11ms Half Sine
Vibration according to IEC60068-2-6	5 Hz ≤ f ≤ 10 Hz: ±10mm 10 Hz ≤ f ≤ 57 Hz: 4G 57 Hz ≤ f ≤ 500 Hz:5G



Chapter 5: Standards and Certifications

5.1. Functional Safety

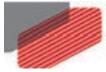
Standard	Item
IEC 61800-5-2:2017	Adjustable speed electrical power drive systems – Safety requirements – Functional
EN ISO 13849-1:2015	Safety of machinery — Safety-related parts of control systems.
EN 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems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

5.2. Electrical Safety

Specification	Details
Recognized UL 61800-5-1	Adjustable speed electrical power drive systems: Safety requirements – Electrical, thermal and energy
CSA C22.2 NO. 274-17	Adjustable speed drives

5.3. Electromagnetic Compatibility

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



5.4. Environmental

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

5.5. Other Compliant Standards

For other compliant standards refer to the

[MAN-G-Board Level Modules Hardware Manual section 17.7](#) or refer to the Elmo website:

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

5.6. CE Declaration

Refer to the complete EC Declaration of Conformity available on the internet at:

https://www.elmomc.com/wp-content/uploads/dlm_uploads/2018/05/Gold-Line-CE-Declaration-of-Conformity.pdf.

5.7. Dual Use

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

The operating frequency of the Gold 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: Unpacking the Drive Components

Before you begin working with the Gold Double Twitter, verify that you have all of its components, as follows:

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

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

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



GTWI_ADV-080D

4. Verify that the Gold Double 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.



Chapter 7: Mounting the Gold Double Twitter

The Gold Double Twitter was designed for mounting on a printed circuit board (PCB) via 1.27 mm pitch 0.40 mm square pins, 2 mm pitch 0.51 mm square pins, 1.02 mm round pin, 3.5 mm and 6.0 mm busbars. When integrating the Gold Double 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 Gold Double Twitter be soldered directly to the board (see detail diagrams in Chapter 12: Dimensions). If the PCB is enclosed in a metal chassis, we recommend that the Gold Double Twitter be screw-mounted to it as well to help with heat dissipation. The Gold Double Twitter has screw-mount holes on each corner of the heat-sink for this purpose – see below.

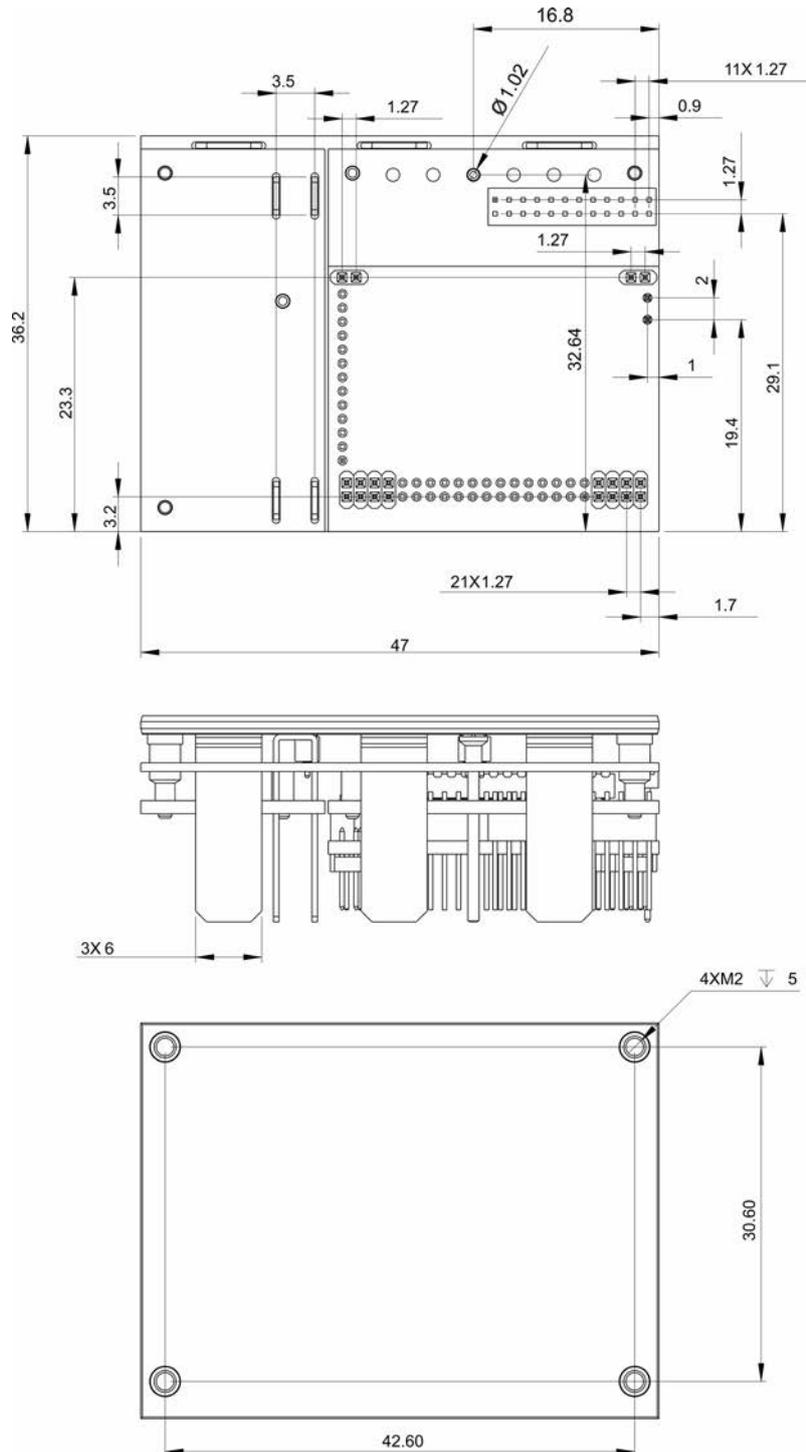


Figure 2: Gold Double Twitter EtherCAT Version Dimensions

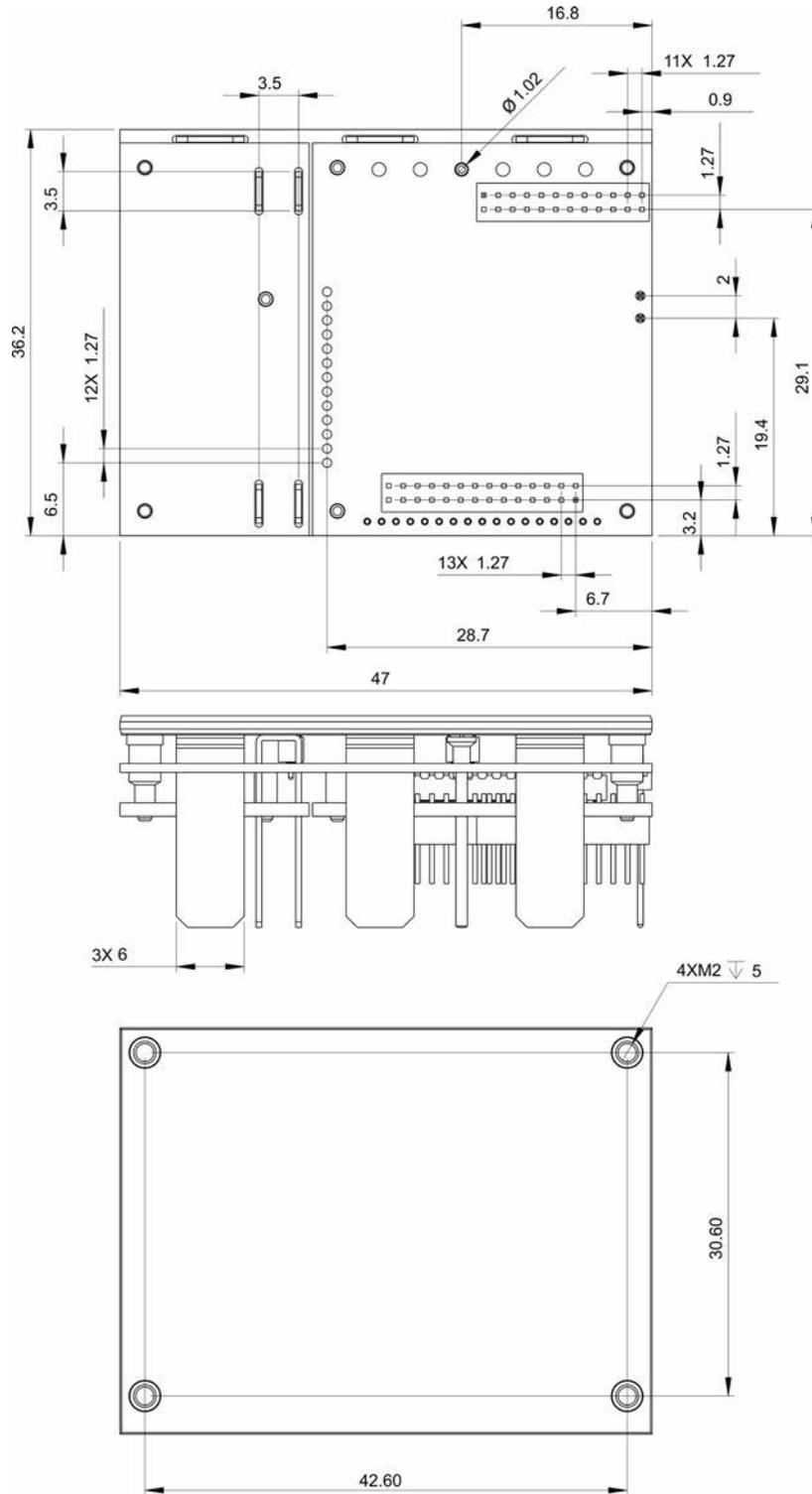


Figure 3: Gold Double Twitter CAN Version Dimensions



7.1. Mounting the Gold Double Twitter to a Heat Sink

The selected heat sink must be screwed to the surface of the Gold Double Twitter.

7.1.1. Mounting the Gold Double Twitter (PN G-TWIDXXX/YYZZD)

To mount the heat sink:

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

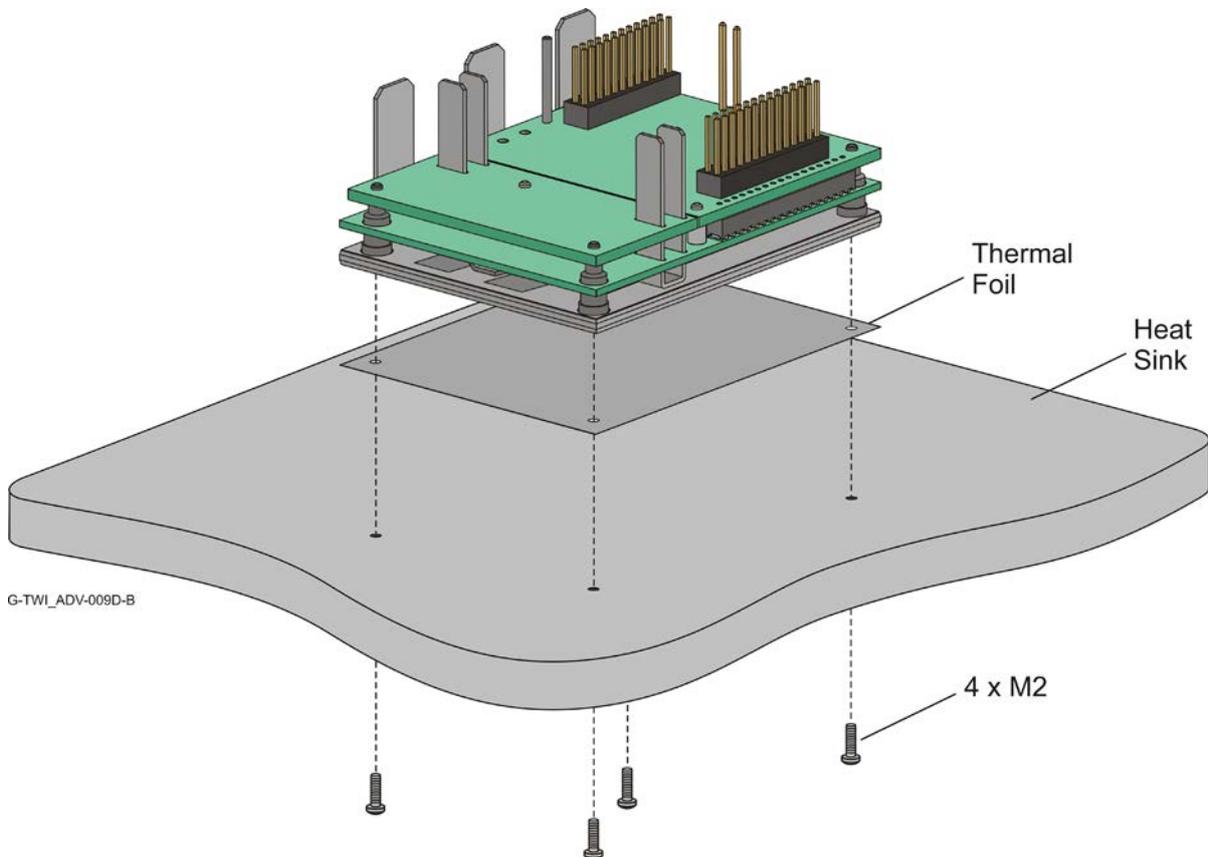


Figure 4: Mount the Heat Sink and Thermal Foil to the Gold Double Twitter for PN G-TWIDXXX/YYZZD



7.1.2. Mounting the Gold Double Twitter (PN G-TWIDXXX/YYYYZH)

To mount the heat sink:

1. Mount the heat sink under the base of the Gold Double Twitter.
2. Place the Thermal foil (PN IMT-DTWIALHFLAT01 purchased from Elmo) between the lower surface of the servo drive, and the upper surface of the heat sink
3. Use four M3 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 M3 stainless steel A2 screw.

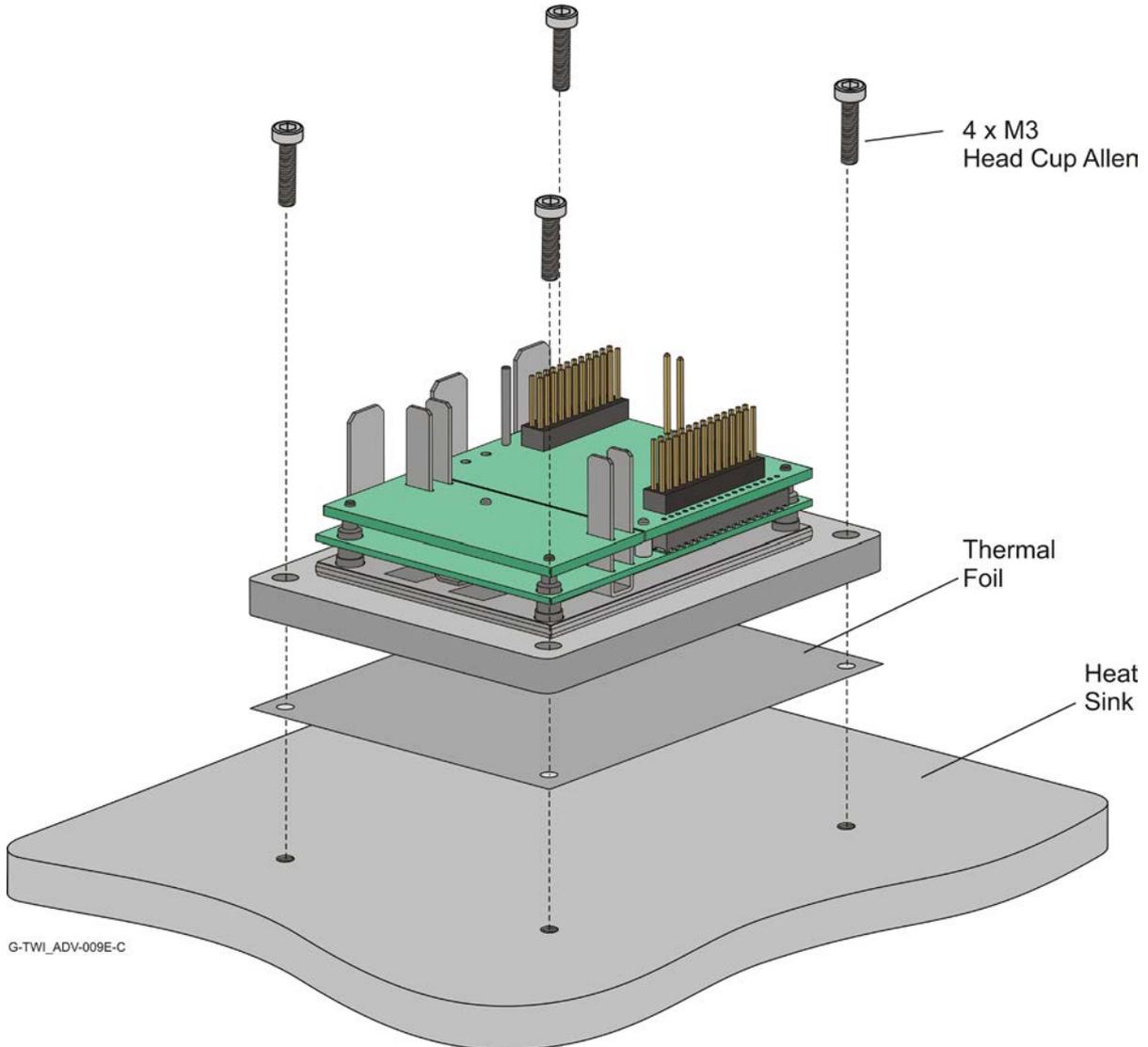


Figure 5: Mount the Heat Sink and Thermal Foil to the Gold Double Twitter for PN G-TWIDXXX/YYYYZH



Chapter 8: Integrating the Gold Double Twitter on a PCB

The Gold Double Twitter is designed to be mounted on a PCB by soldering its pins directly to the PCB. Refer to Chapter 5 in the MAN-G-Board Level Modules Hardware Manual for further information.

8.1. Power Returns (PR)

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

The maximum realistic Power Return is achieved using a plane, which connects between the Gold 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.

8.2. COMRET

For details of the COMRET, refer to the section 5.4 in the MAN-G-Board Level Modules Hardware Manual.

8.3. Earth Connection (PE)

The PE (Earth connection) terminal is connected internally in the drive to the Gold Double 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.



8.4. Power Return (PR), Common Return (COMRET) and Earth Connections (PE)

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:

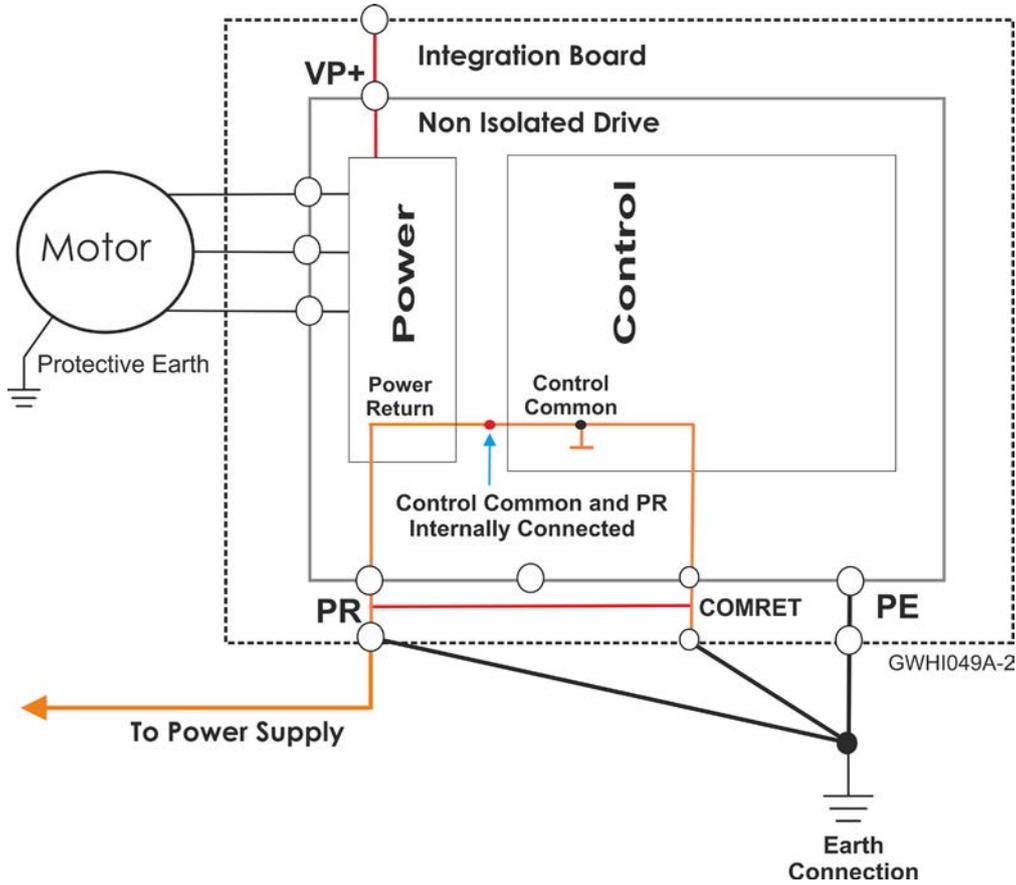


Figure 6: Gold Double Twitter Earth Connections

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.



8.5. Logic and Control Cabling and Wiring

8.5.1. Feedback Ports, VL, RS232, USB, Analog Input

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.

8.5.2. Digital Inputs/Outputs, STO

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

8.5.3. EtherCAT or CAN Communication

Always use CAT5e cables.

8.5.4. COMRET to PE Connection

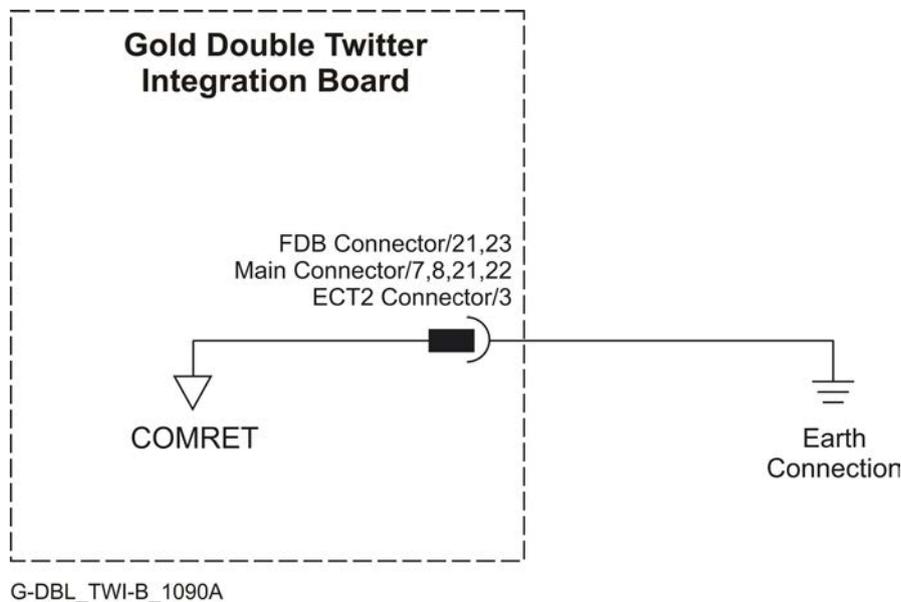


Figure 7: COMRET Connection to the PE

At least one COMRET pin (Figure 7) must be connected to the Protective Earth (PE).

Earthing the COMRET by connecting the Earth (PE) to the drive COMRET is mandatory to insure reliable operation, high noise immunity and rejection of voltage common mode interferences.



8.6. 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.

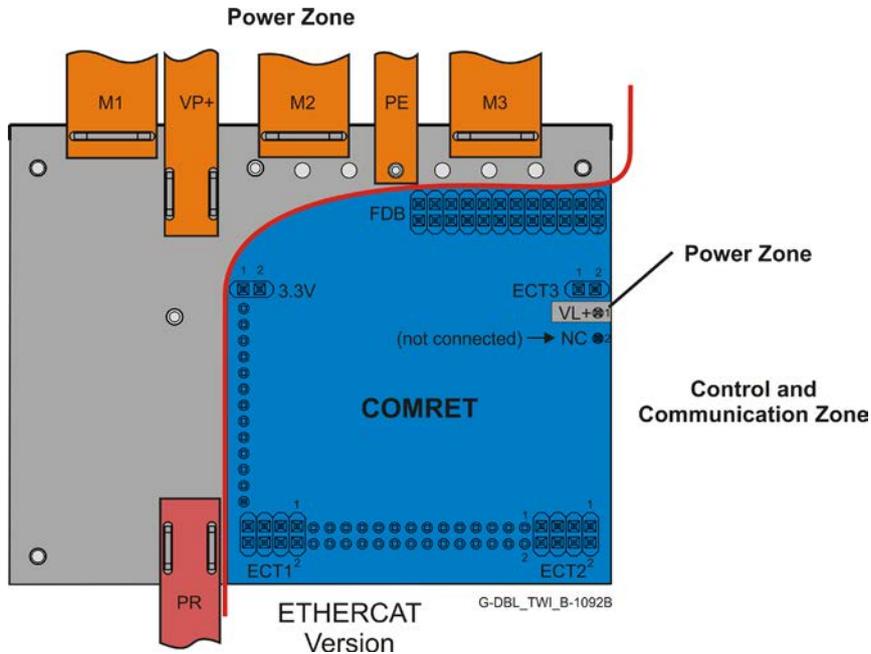


Figure 8: Gold Double Twitter EtherCAT Power Conductors PCB layout

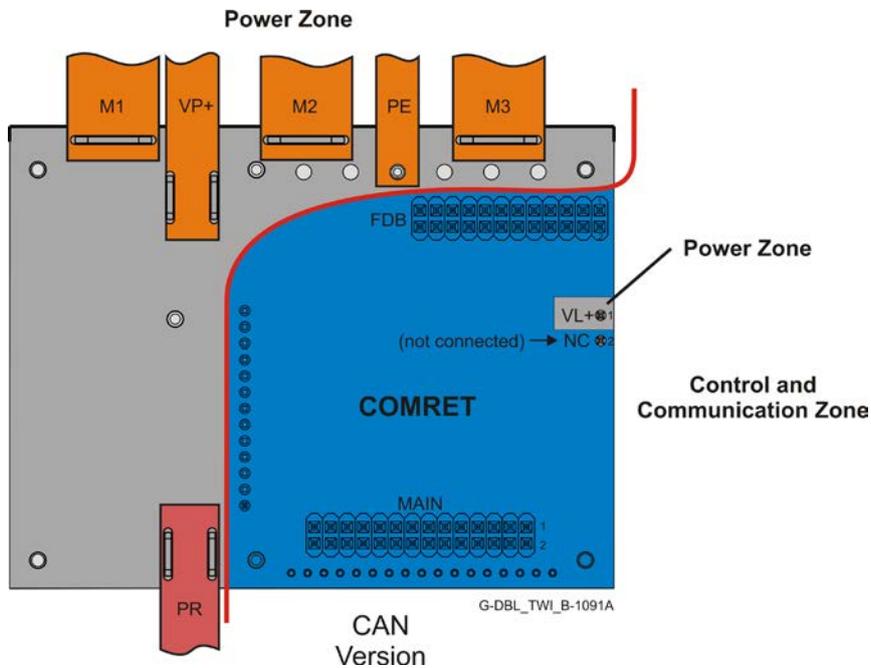


Figure 9: Gold Double Twitter CAN Power Conductors PCB layout

For more details, refer to the section 5.4 in the MAN-G-Board Level Modules Hardware Manual.



Chapter 9: Wiring

9.1. Wiring Legend

The following table legend describes the wiring symbols detailed in all installation guides. All the wiring diagrams show wiring for D-TYPE connectors.

Wiring Symbol	Description
	Earth connection (PE)
	Protective Earth Connection
	Common at the Controller
	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
<p>Encoder Earthing. The cable's shield is connected to the chassis (PE) in the connector. Earthing the Encoder and connecting the Earth (PE) to the drive COMRET is mandatory to insure reliable operation, high noise immunity and rejection of voltage common mode interferences.</p>	



9.2. The Gold Double Twitter Connection Diagram

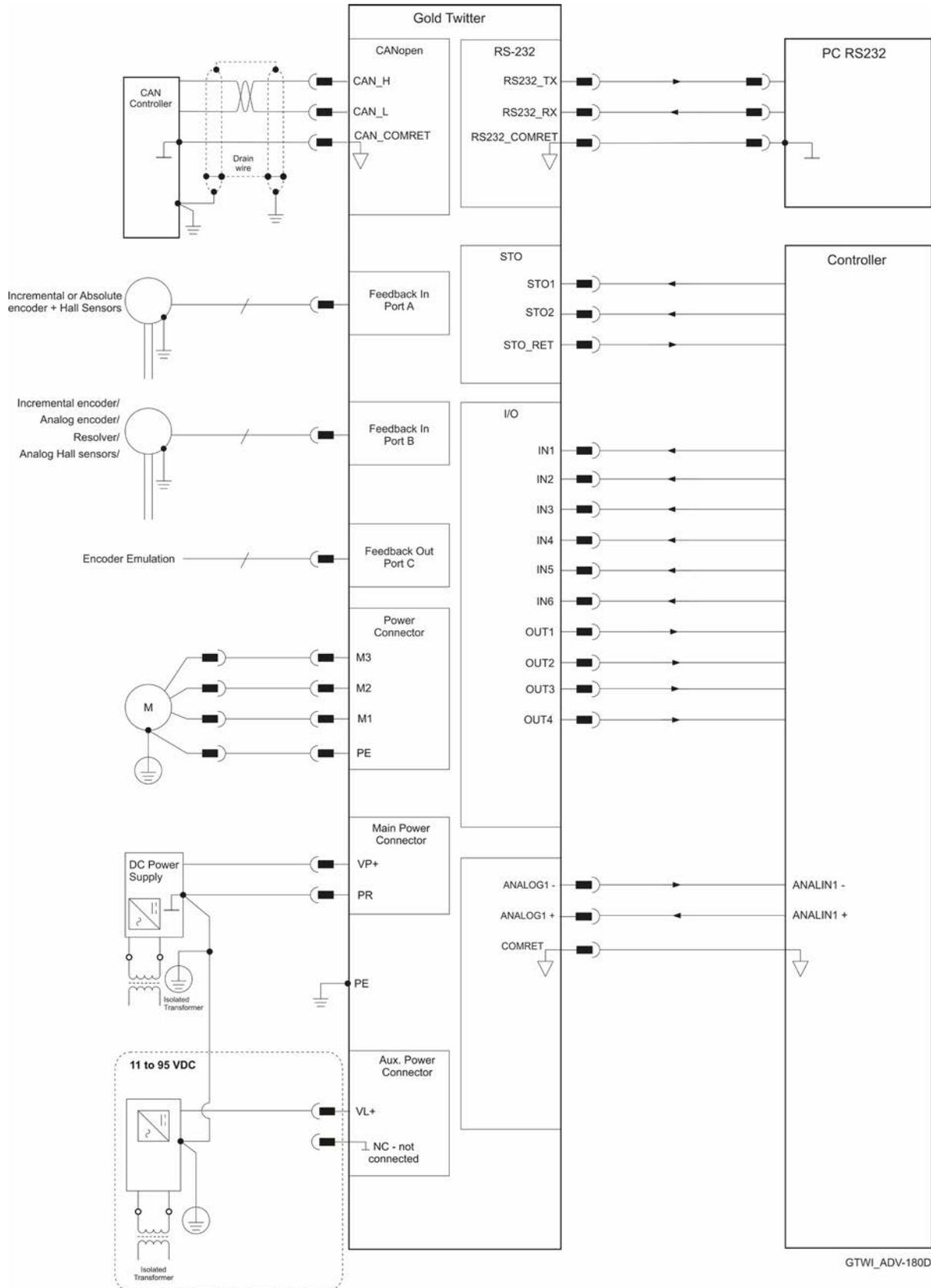


Figure 10: The Gold Double Twitter CAN Connection Diagram

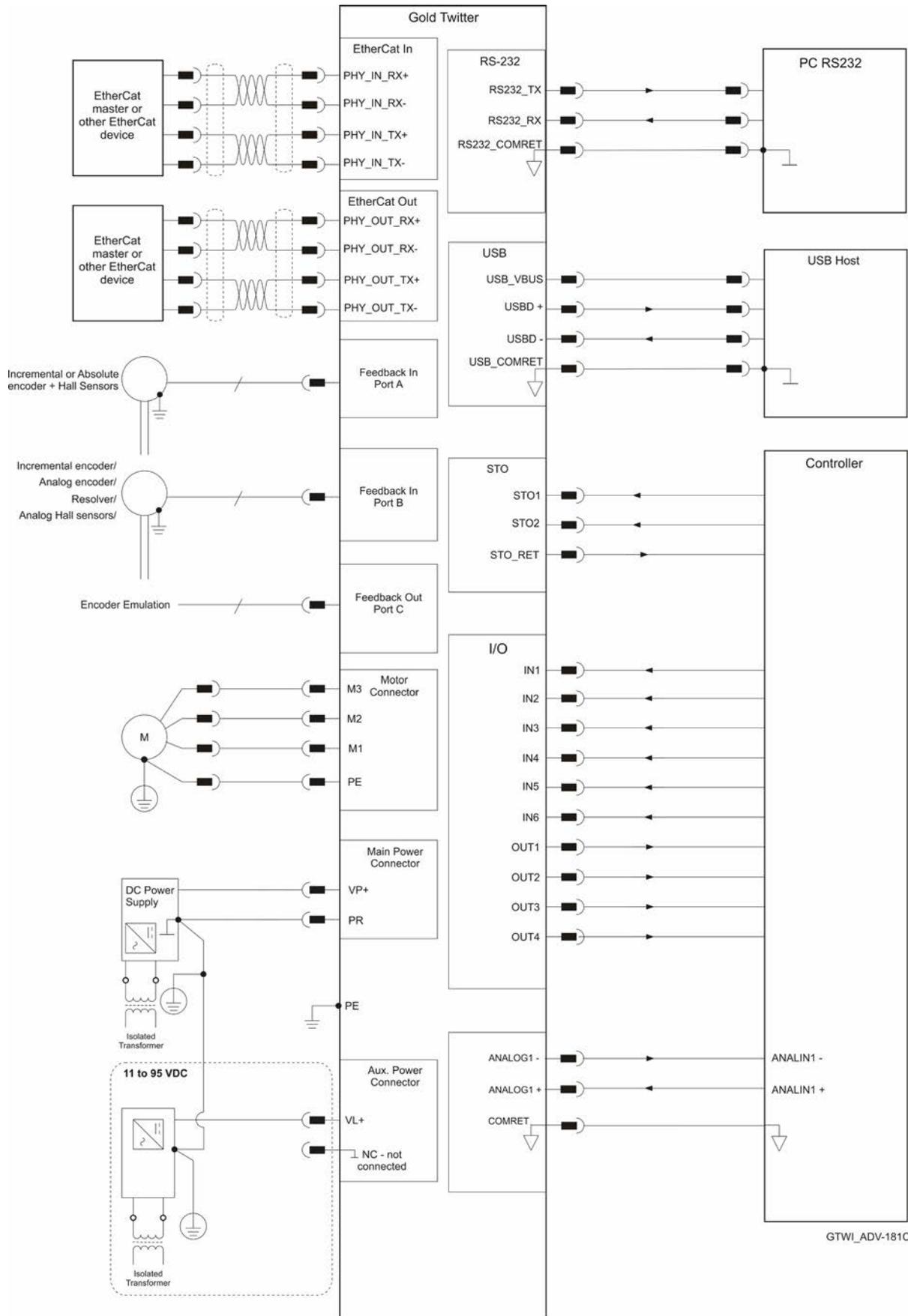


Figure 11: The Gold Double Twitter EtherCAT Connection Diagram



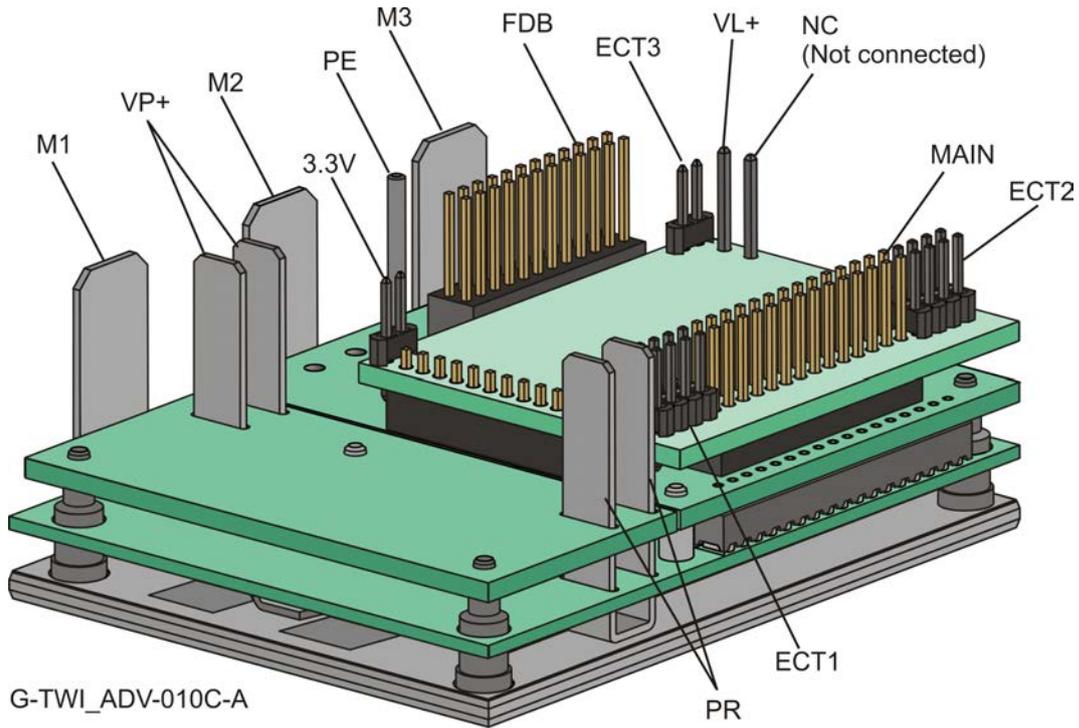
Chapter 10: Connections

The Gold Double Twitter has nine connectors.

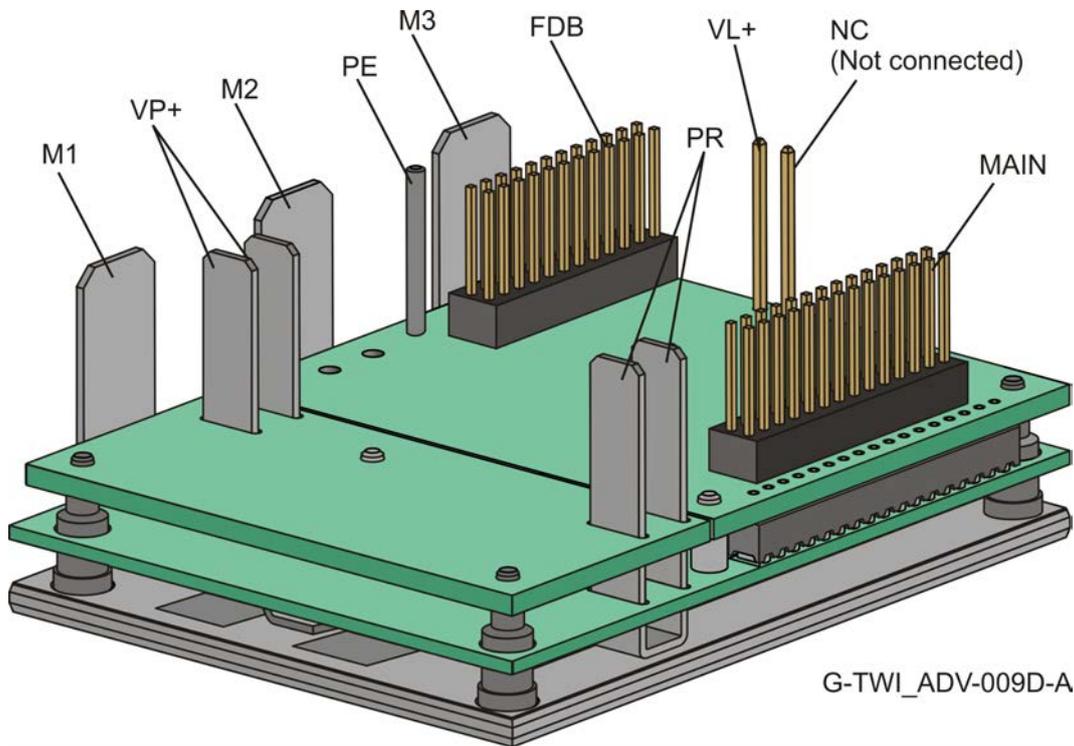
Port	Pins	Type	Function
FDB	2x12	1.27 mm pitch 0.40 mm sq.	Feedbacks, Digital Halls, Analog Inputs, Communications
M3	1x1	6.0 mm Busbar	Motor power output 3
M2	1x1		Motor power output 2
M1	1x1		Motor power output 1
PE	1x1	1.02 mm round pins	Protective earth
PR	1x1	3.5 mm Busbar	Power output return
VP+	1x1		DC Positive power input
VL+	1x2	2 mm pitch 0.51 mm sq.	VL+
NC			Terminal not connected
MAIN	2x14	1.27 mm pitch 0.40 mm sq.	I/O, LEDs, STO, CAN or EtherCAT
ECT1	2x4	1.27 mm pitch 0.40 mm sq.	Available only for EtherCAT Version
ECT2	2x4	1.27 mm pitch 0.40 mm sq.	Available only for EtherCAT Version
ECT3	1x2	1.27 mm pitch 0.40 mm sq.	Available only for EtherCAT Version
3.3 V	1x2	1.27 mm pitch 0.40 mm sq.	Available only for EtherCAT Version Only for LEDS end Transformer



Connectors Location



EtherCAT Version



CAN Version

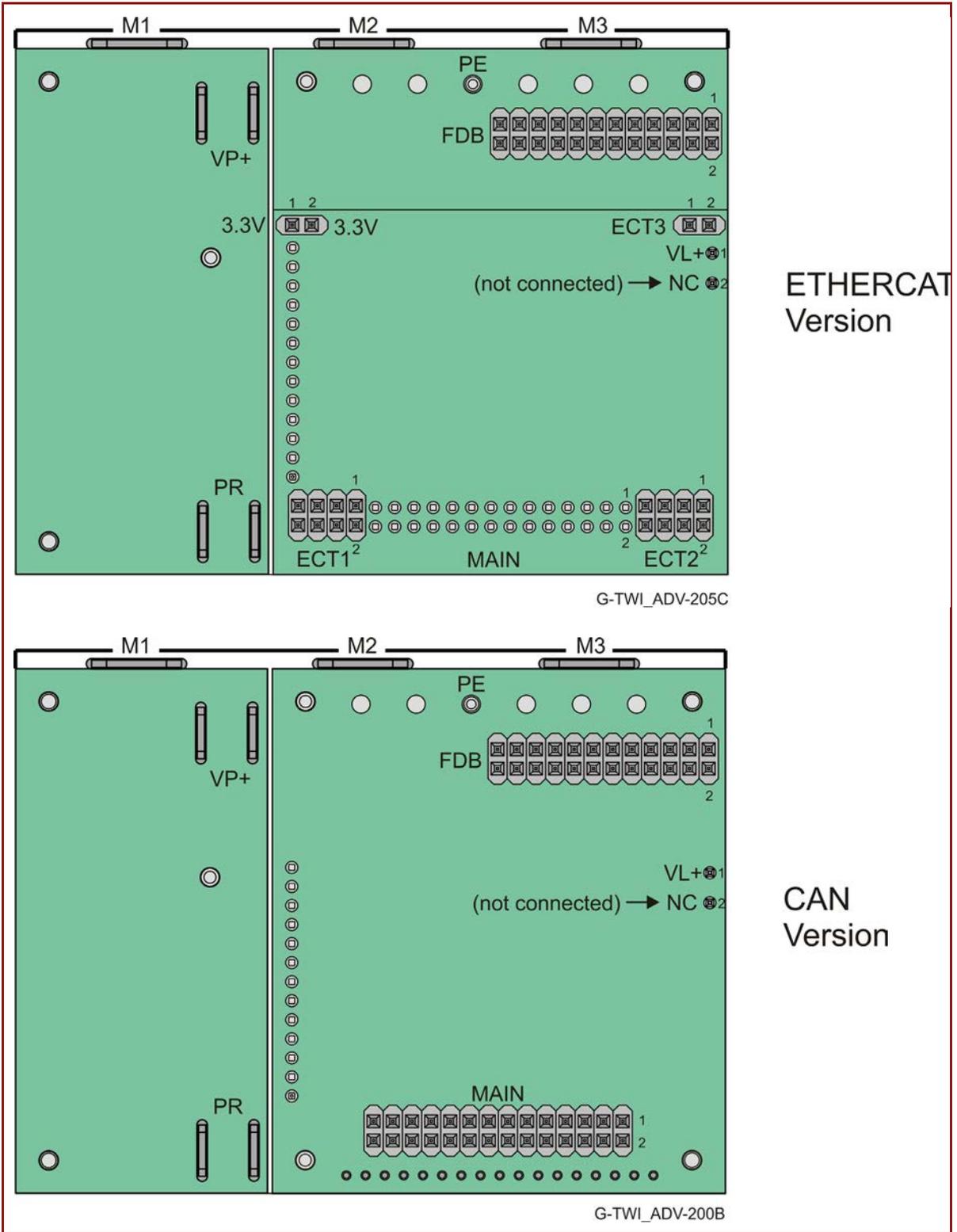


Table 1: Connector Types



10.1. Main, Control, and Motor Power

This section describes the Main, Control, and Motor Power.

10.1.1. Motor Power

For full details see Section 7.3 in the manual: MAN-G-Board Level Modules Hardware manual.

Pin	Function	Cable		Pin Positions
		Brushless Motor	Brushed DC Motor	
PE	Connection earth	Motor	Motor	
M1	Motor phase	Motor	N/C	
M2	Motor phase	Motor	Motor	
M3	Motor phase	Motor	Motor	

Table 2: Motor Connector

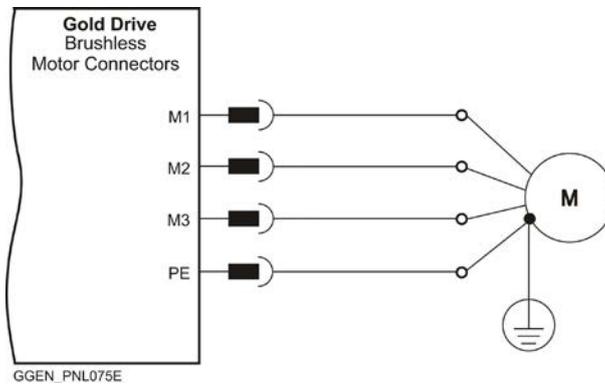


Figure 12: Brushless Motor Power Connection Diagram

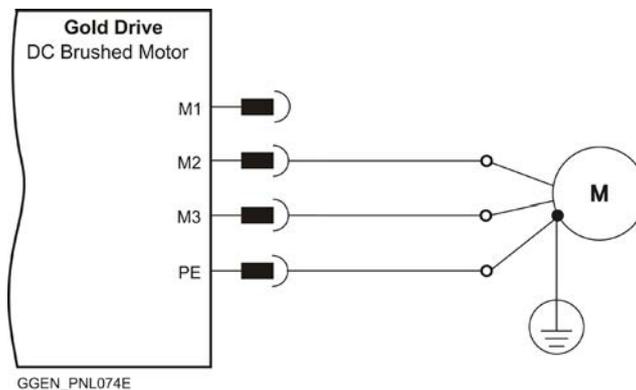


Figure 13: Brushed Motor Power Connection Diagram



10.1.2. Motor Power 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 Gold Double 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).



10.1.3. Main Power and Control Connector

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

10.1.3.1. Main Power

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

Pin	Function	Cable	Pin Positions
VP+	DC Pos. Power input	Power	
PR	Power input return	Power	
PE	Protective earth	Power	
			<p style="text-align: right;">G-TWI_ADV-200A-B</p>

Table 3: Connector for Main Power

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

To connect the Gold Double 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.



10.1.3.2. Control Supply

Connect the VL+ pin on the Gold Double Twitter in the manner described in the table and drawing below.

Pin	Signal	Function	Pin Positions
1	VL+	Control Supply Input	
2	NC	Not connected	
<p>1. Standard CAN (S option) Input range: 11VDC – 95VDC Power consumption: <2.5W (including 5 V/200 mA for encoder)</p> <p>2. EtherCAT (E option) Input range: 11VDC – 95VDC Power consumption: <4W (including 5 V/200 mA for encoder)</p>			

Table 4: Control Supply Pins

Connect the VL+ terminal to the Control Connector. **Make sure that the VL- terminal of the control supply is connected to the PR of the DC bus power supply.**

To connect the VL+ 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 terminal 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.



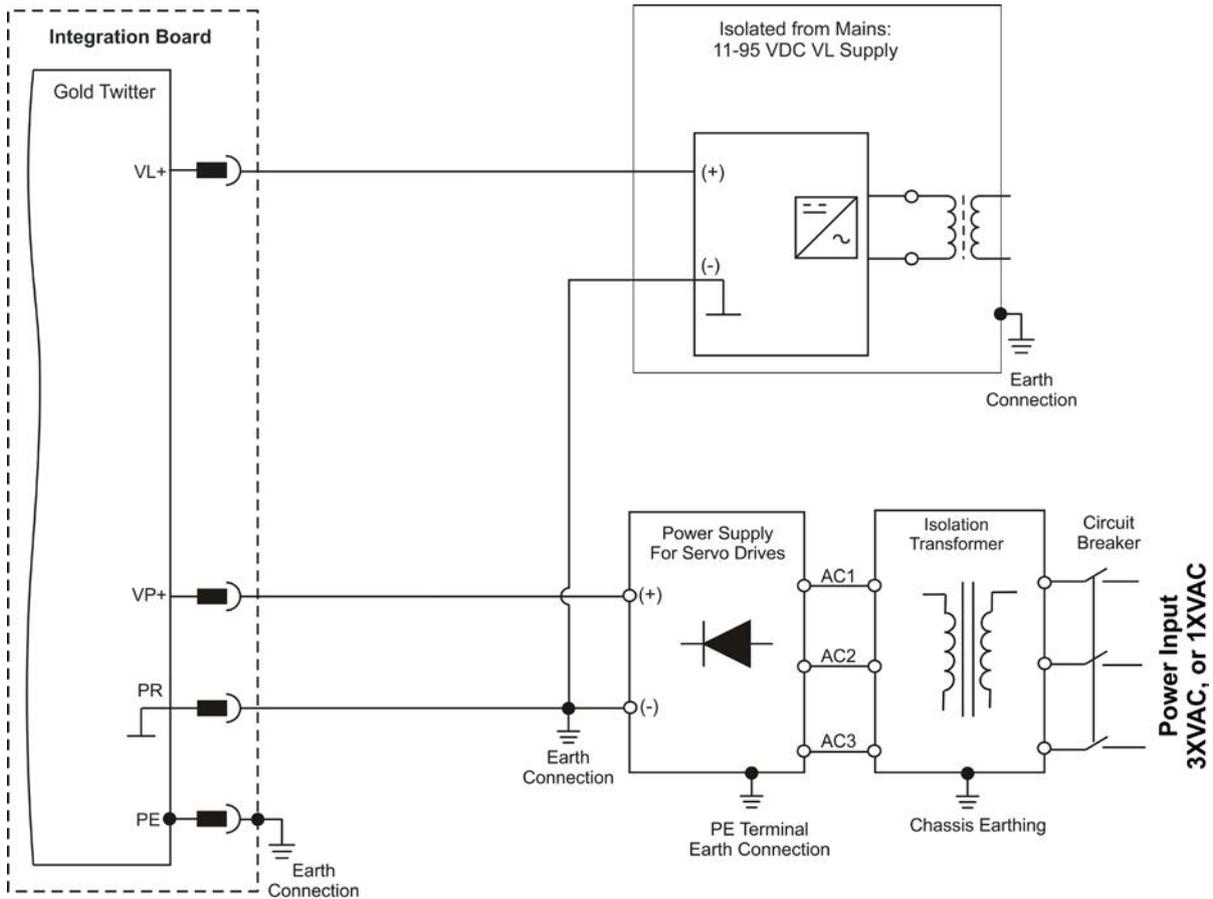
10.1.3.3. Dual Power Supply Topology

Two DC power sources isolated-from-the-mains are required:

- A main DC power source derived from the Mains, according to specification
- A control supply for the logic

10.1.3.3.a 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.



G-TWI_D-075D

Figure 14: 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 14).



10.1.3.3.b 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: $C_{\text{external}} > \text{“Drive’s Rated Current”} * 20\mu\text{F}$

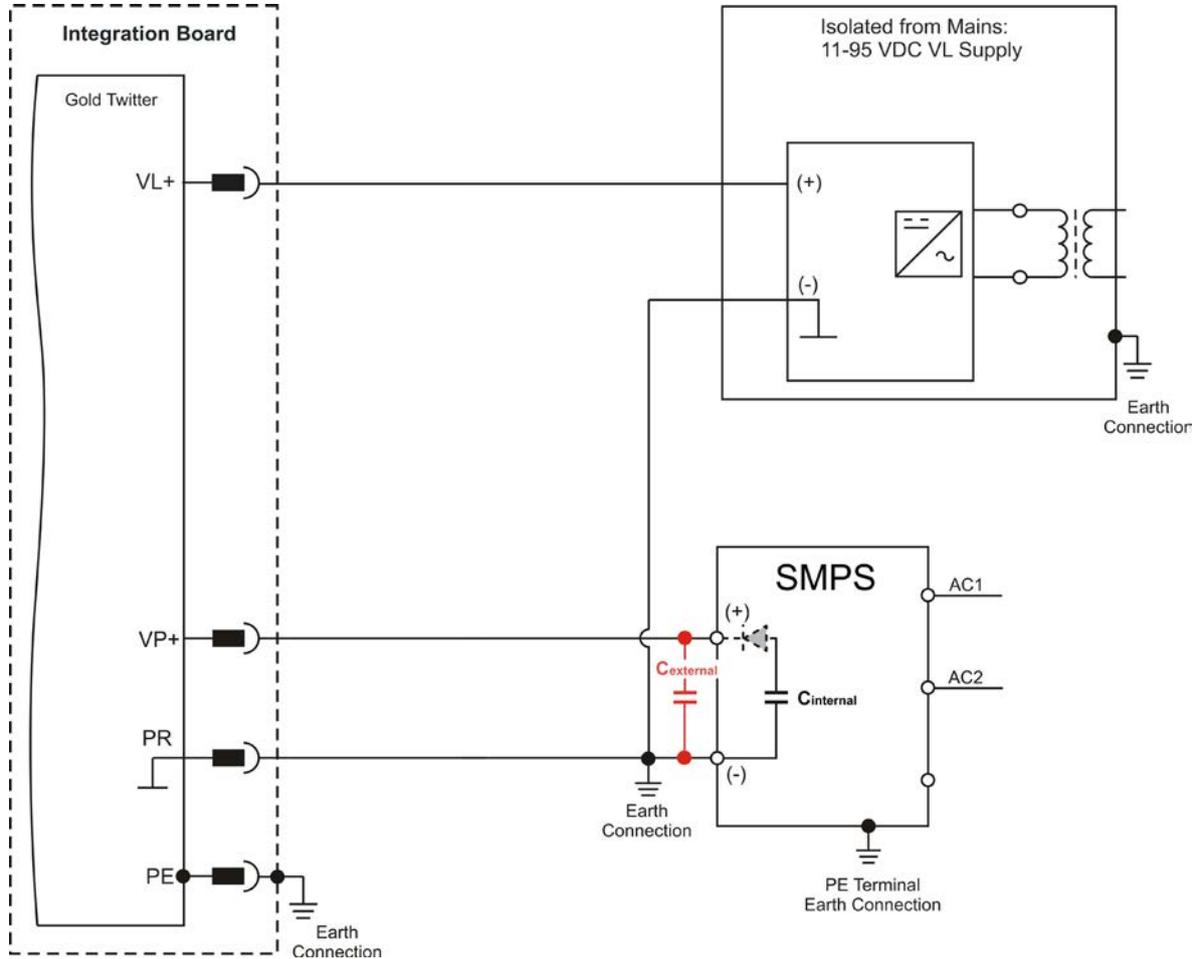


Figure 15: SMPS Option: Separate VP and VL Power Supplies Connection Diagram

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 15).



10.1.3.4. Single Power Supply Topology (VP+ < 95VDC)

A single power supply can be used to power both the main and control. For the 60V, 80V versions, the power voltage rating is 11VDC to 55VDC, 11VDC to 75VDC respectively, or a minimum 11VDC. For the 100V version, the power voltage rating is 11VDC to 95VDC.

10.1.3.4.a Recommended 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. In the configuration of the 200V Gold Double Twitter model, the max operating voltage is 195VDC, but the DC bus must be limited to VP+ < 95VDC to prevent failure of the VL supply.

The following figure describes a single connection of main power and control.

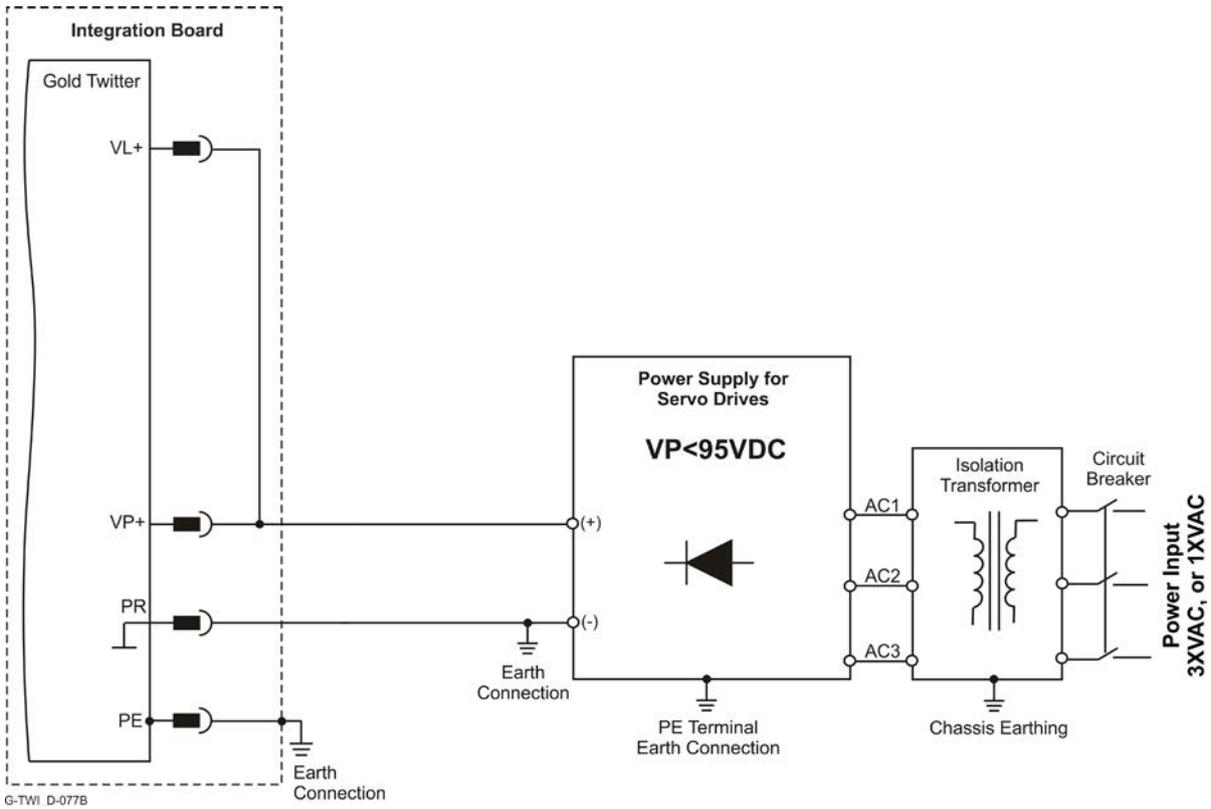


Figure 16: Recommended Single Power Supply (VP+ < 55VDC for “60V”, VP+ < 75VDC for “80V”, VP+ < 95V for “100V” & “200V”) Connection Diagram with VL+ Connected Internally

Note: This option is available for power supply up to 95VDC.

For applications where the recommended single power supply is used, the minimum capacitance of the Power supply: $C_{Power_Supply} > Drive's\ Rated\ Current * 20\mu F$



10.1.3.4.b SMPS Option

This option describes a main power and control topology 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.

In the configuration of the 200V Gold Double Twitter model, the max operating voltage is 195VDC, but the DC bus must be limited to $VP+ < 95\text{VDC}$ to prevent failure of the VL supply.

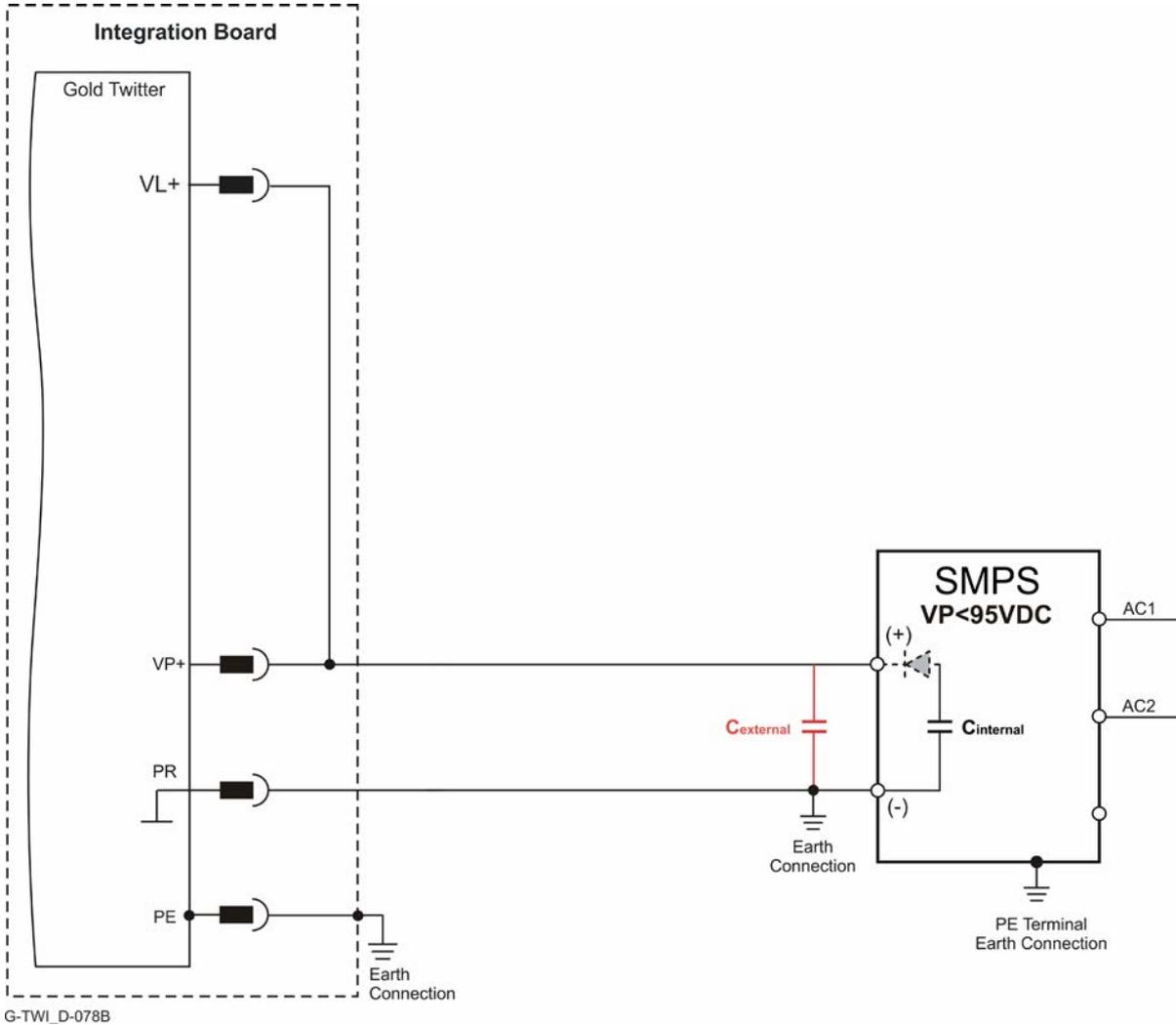


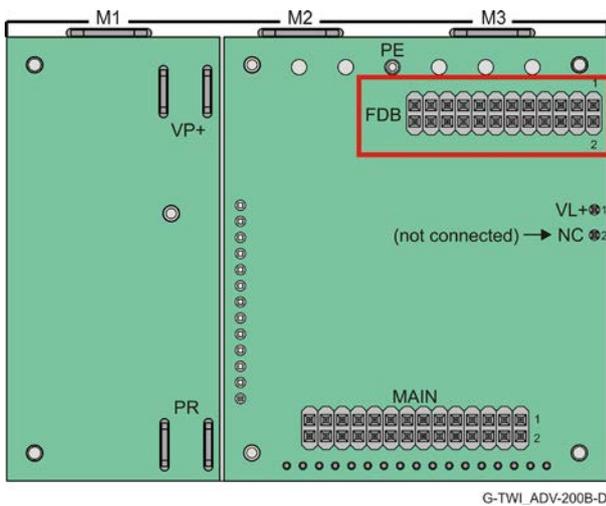
Figure 17: SMPS Single Power Supply ($VP < 55\text{VDC}$ for "60VDC", $VP < 75\text{VDC}$ for "80VDC", $VP+ < 95\text{V}$ for "100VDC" & "200VDC") Connection Diagram with VL+ Connected Internally

For applications where a SMPS single power supply is used, the following conditions must apply:

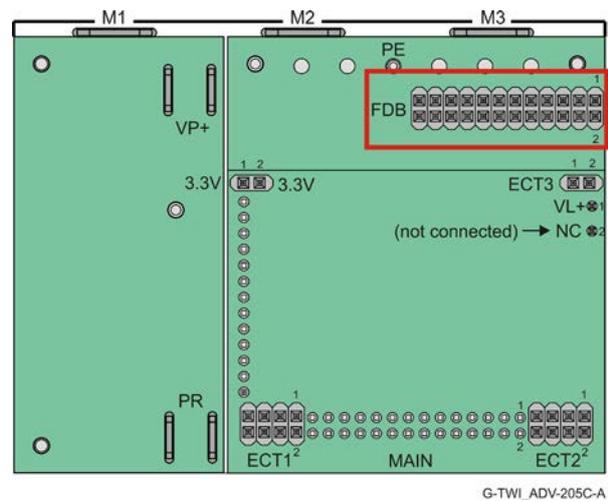
- External capacitance must be added on the DC bus.
- The Minimum capacitance of the Power supply: $C_{\text{external}} > \text{"Drive's Rated Current"} * 20\mu\text{F}$



10.2. Feedback Connector FDB



FDB Connector in the CAN option



FDB Connector in the EtherCAT option

Feedback A/B/C, Digital Halls – see Section 9.2 in the manual: MAN-G-Board Level Modules Hardware Manual.

Pin FDB	Signal	Function
1	PortA_ENC_A+ /ABS_CLK+	Port A- channel A/ Absolute encoder clock+
2	PortB_ENC_A-/SIN-	Port B - channel A complement
3	PortA_ENC_A-/ABS_CLK-	Port A- channel A complement / Absolute encoder clock-
4	PortB_ENC_A+/SIN+	Port B - channel A
5	PortA_ENC_B+/ABS_DATA+	Port A - channel B/ Absolute encoder Data+
6	PortB_ENC_B-/COS-	Port B - channel B complement
7	PortA_ENC_B-/ABS_DATA-	Port A - channel B complement / Absolute encoder Data-
8	PortB_ENC_B+/COS+	Port B - channel B
9	PortA_ENC_INDEX+	Port A – index
10	PortB_ENC_INDEX-/ANALOG_I-	Port B – index complement
	RESOLVER_OUT-	Vref complement
11	PortA_ENC_INDEX-	Port A - index complement
12	PortB_ENC_INDEX+/ANALOG_I+	Port B – index
	RESOLVER_OUT+	Vref
13	HA	Hall sensor A input



Pin FDB	Signal	Function
14	PortC_ENCO_A-	Port C- channel A complement output
15	HB	Hall sensor B input
16	PortC_ENCO_A+	Port C- channel A output
17	HC	Hall sensor C input
18	PortC_ENCO_B-	Port C - channel B complement output
19	+5VE	Encoder +5 V supply @ Limit 250 mA
20	PortC_ENCO_B+	Port C - channel B output
21	COMRET	Common return
22	PortC_ENCO_INDEX-	Port C - index complement output
23	COMRET	Common return
24	PortC_ENCO_INDEX+	Port C - index output

Table 5: Connector FDB – Feedback

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.



10.2.1. Port A

Refer to section 10.3 in the MAN-G-Board Level Modules Hardware Manual for further details of the Port A connections.

10.2.1.1. Incremental Encoder

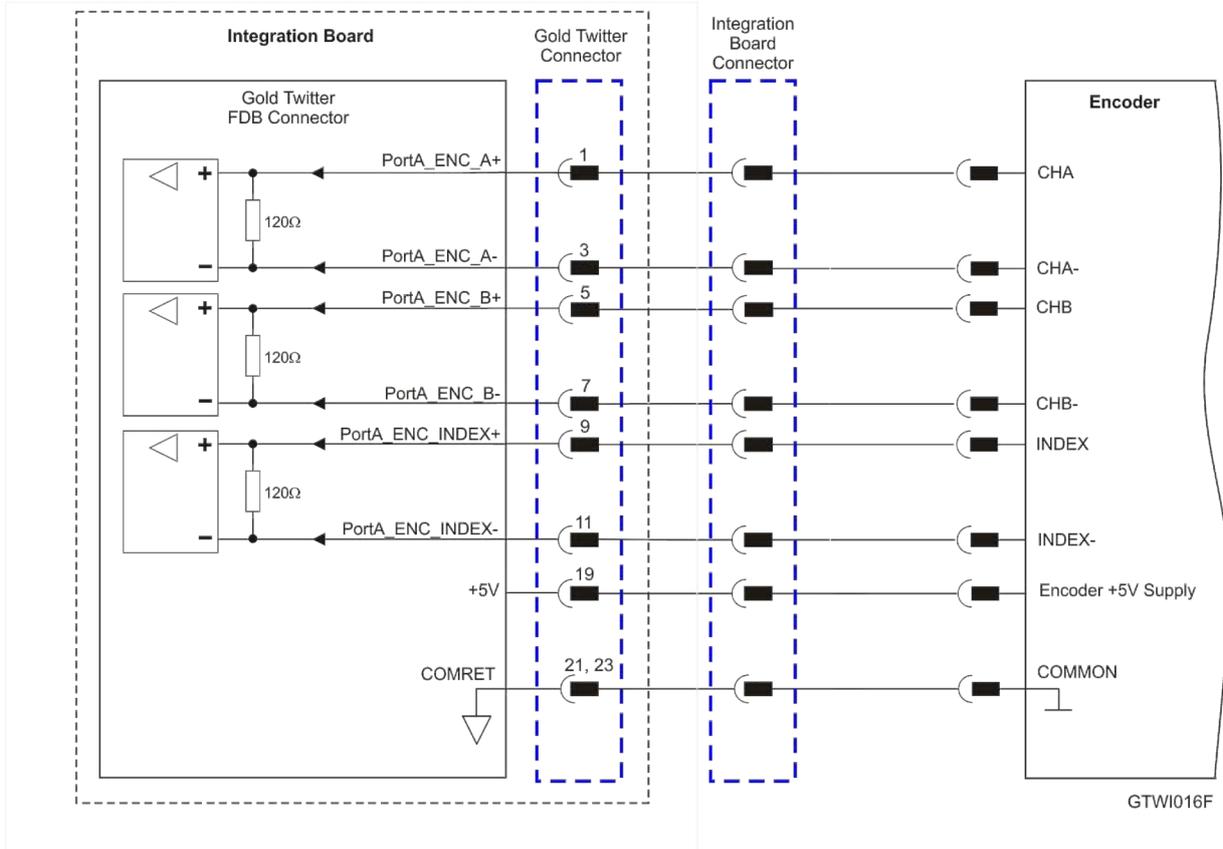


Figure 18: Port A Incremental Encoder Input – Recommended Connection Diagram

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.



10.2.1.2. Absolute Serial Encoder

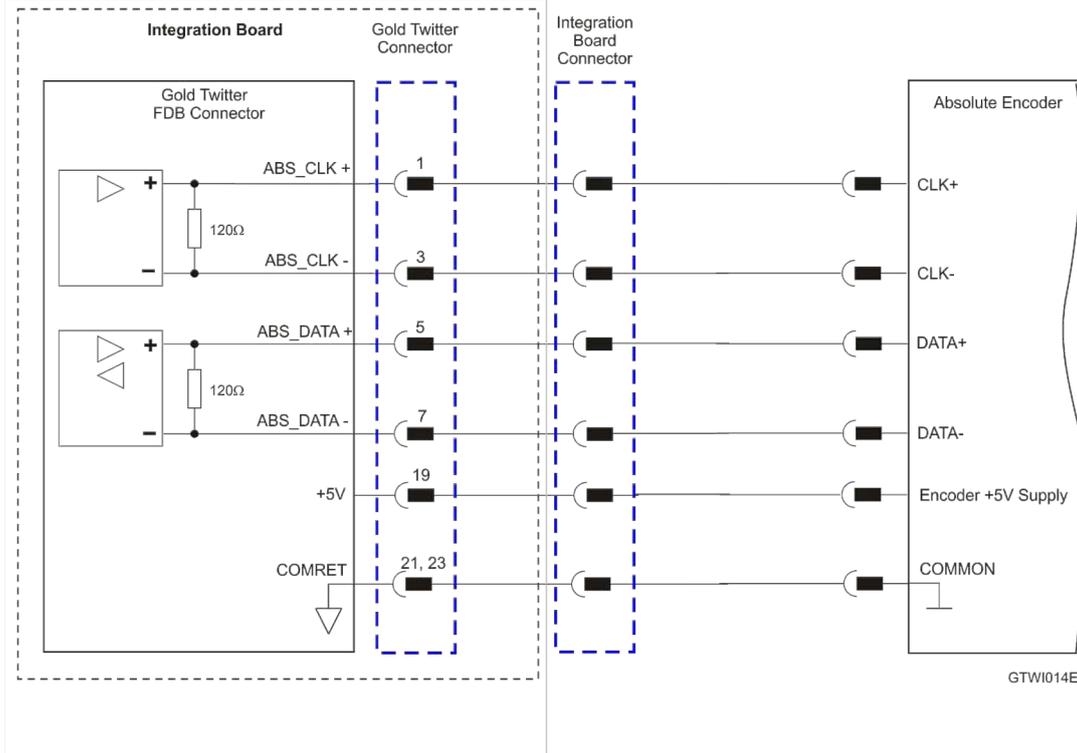


Figure 19: Absolute Serial Encoder – Recommended Connection Diagram for Sensors Supporting Data/Clock (e.g., Biss / SSI / EnDAT, etc.)

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.

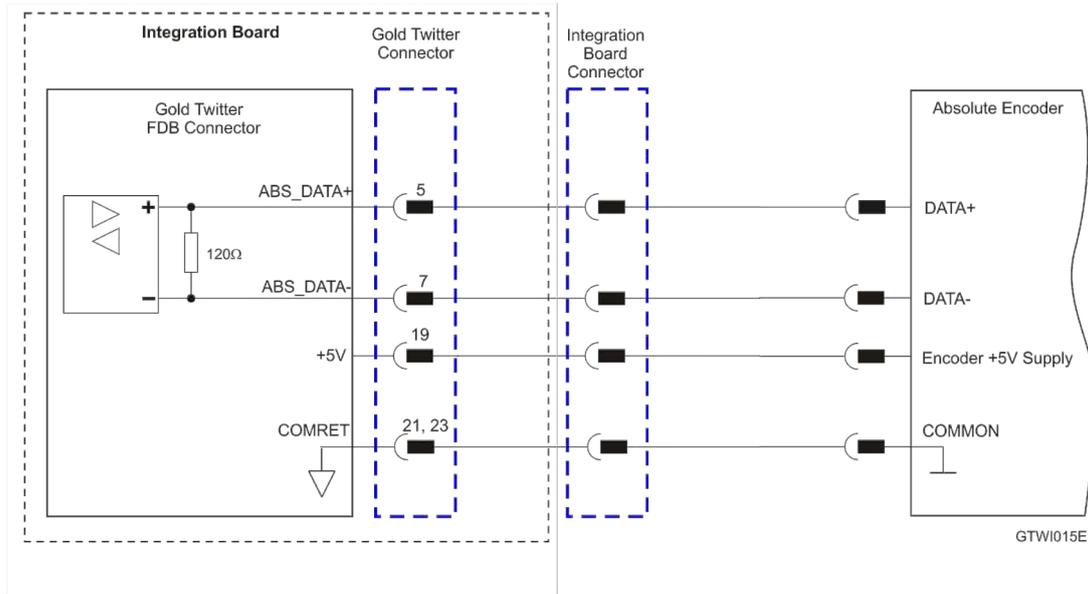


Figure 20: Absolute Serial Encoder – Recommended Connection Diagram for Sensors Supporting Data Line Only (NRZ types, e.g., Panasonic / Mitutoyo / etc.)

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.

10.2.1.3. Hall Sensors

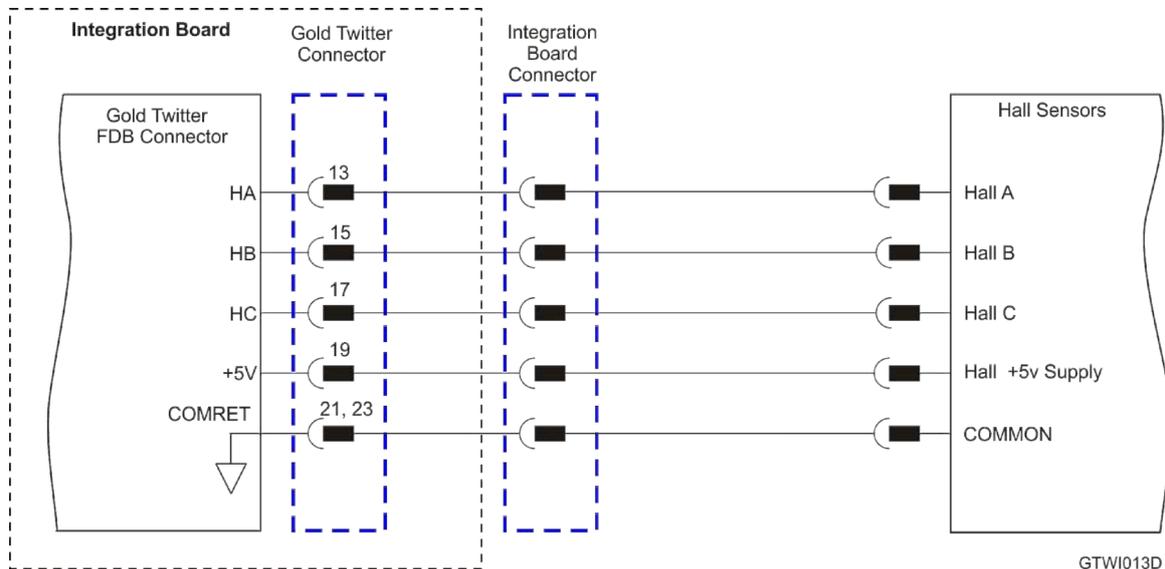


Figure 21: Hall Sensors Connection Diagram

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.



10.2.2. Port B

Refer to section 10.4 in the MAN-G-Board Level Modules Hardware Manual for further details of the Port B connections.

10.2.2.1. Incremental Encoder

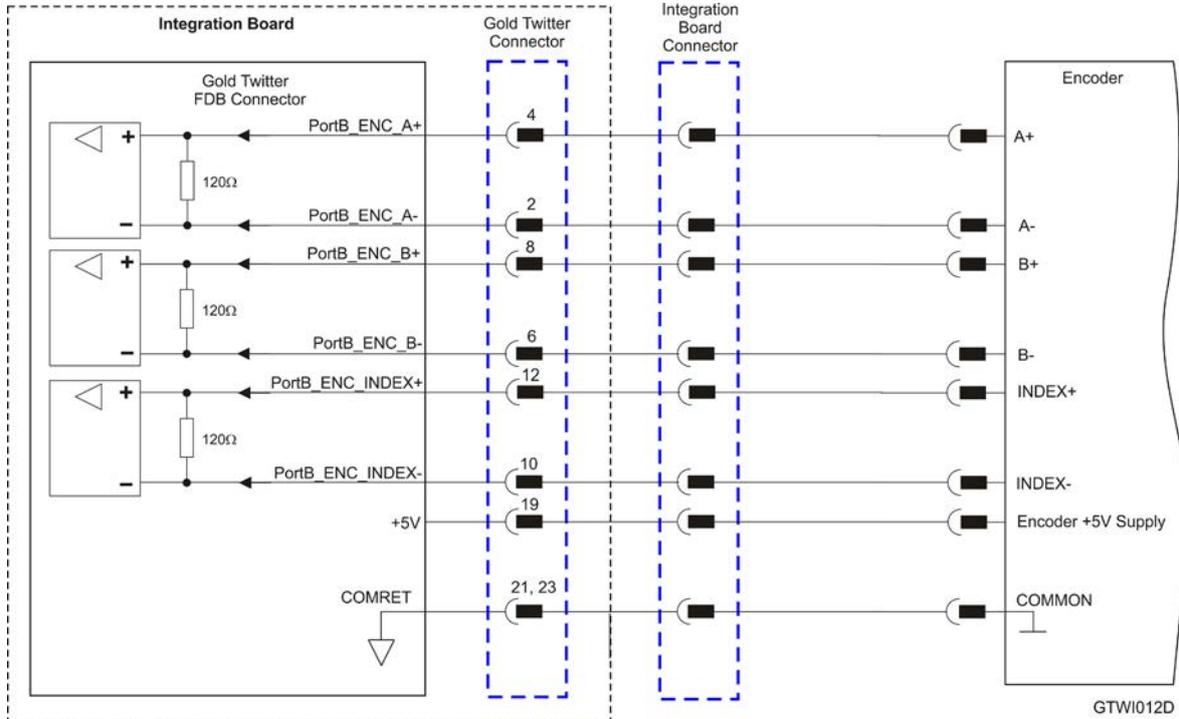


Figure 22: Port B Incremental Encoder Input – Recommended Connection Diagram

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.



10.2.2.2. Interpolated Analog Encoder

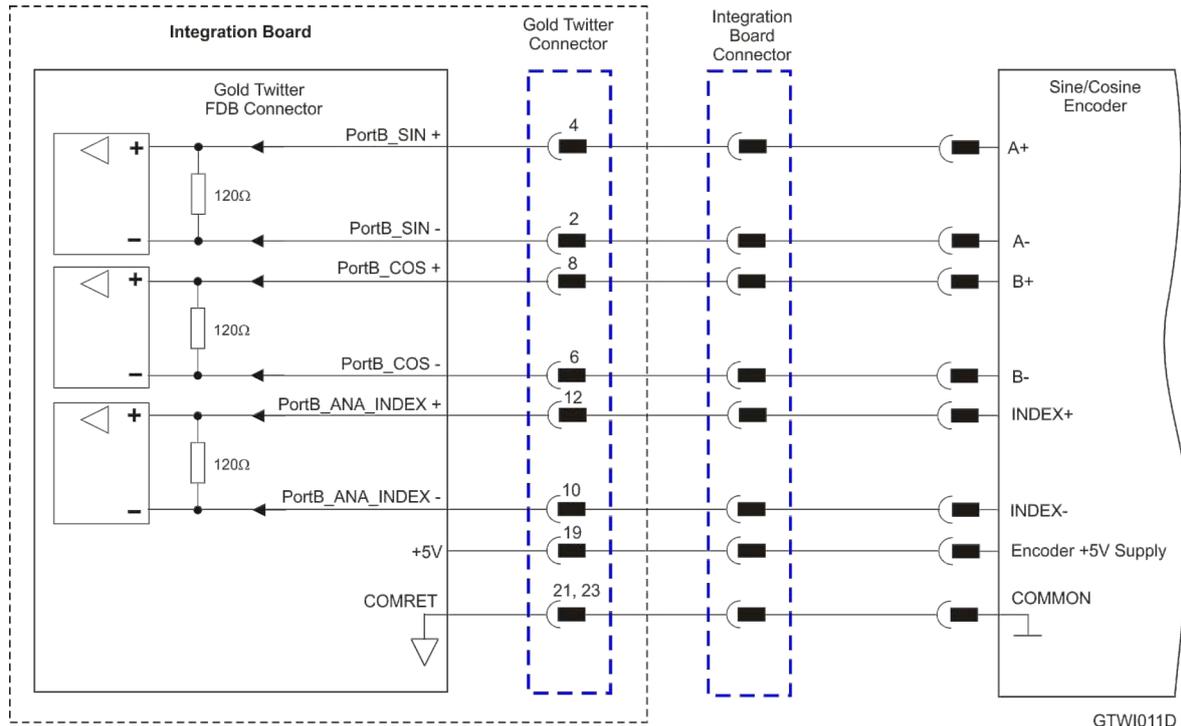


Figure 23: Port B - Interpolated Analog Encoder Connection Diagram

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.



10.2.2.3. Resolver

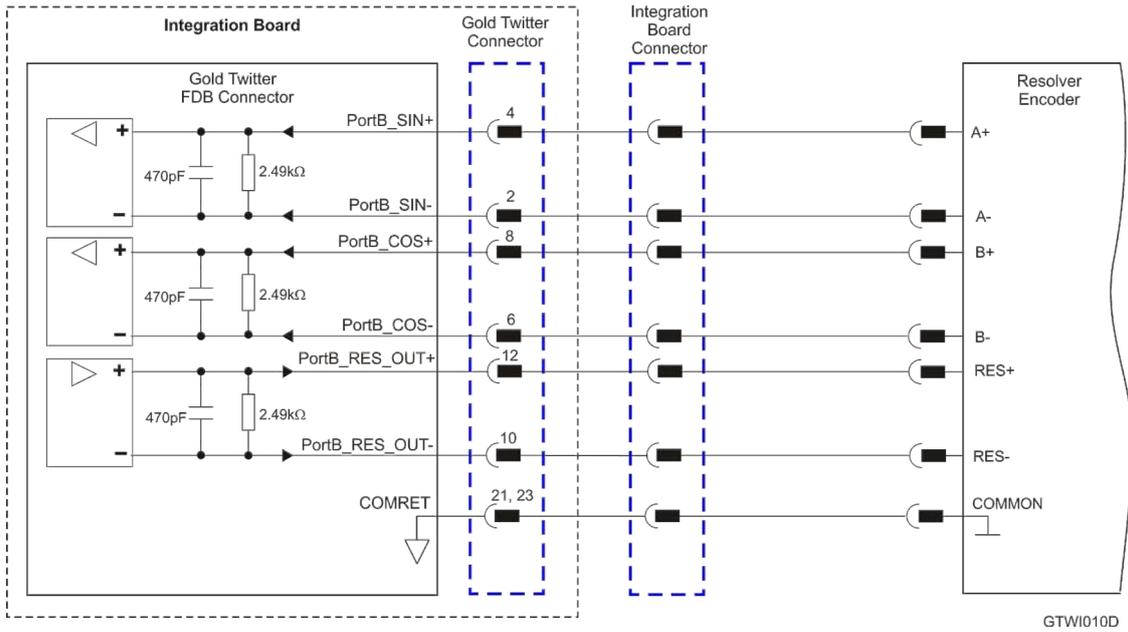


Figure 24: Port B – Resolver Connection Diagram

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.



10.2.3. Port C – Emulated Encoder Output (FDB)

See Section 10.5 in the manual: MAN-G-Board Level Modules Hardware Manual for further details of Port C.

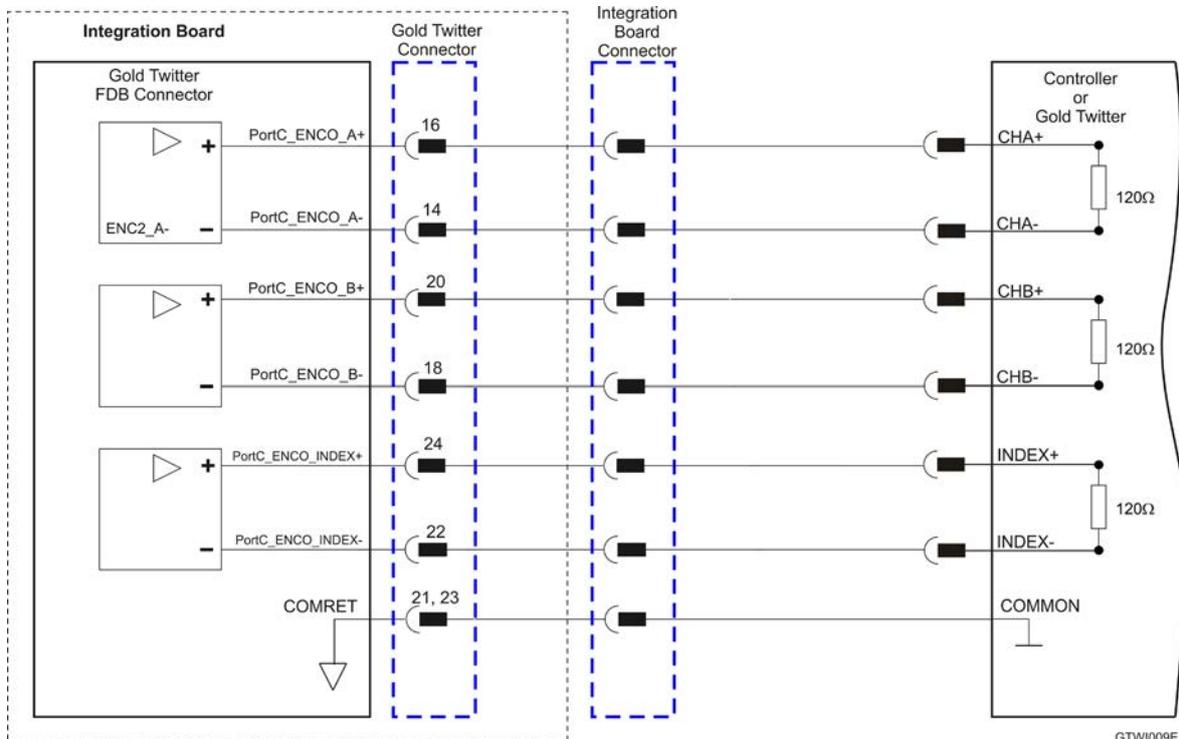
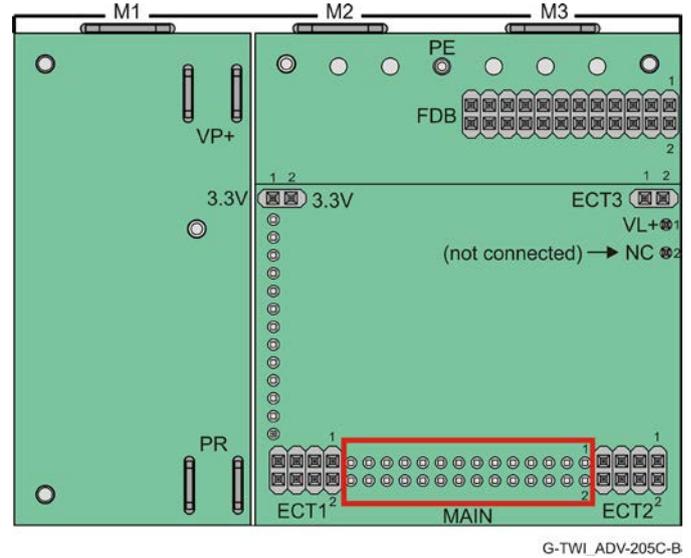
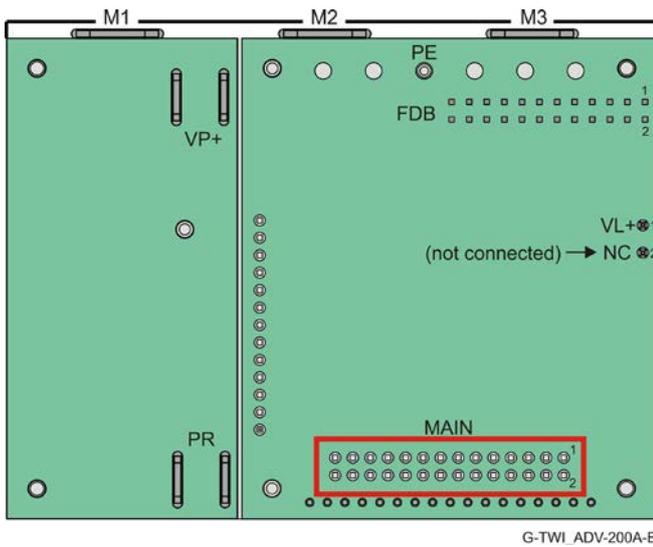


Figure 25: Emulated Encoder Differential Output – Recommended Connection Diagram

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.



10.3. Main Connector (MAIN)



MAIN Connector in the CAN option

MAIN Connector in the EtherCAT option

Pin (MAIN)	Signal	Function
1	CAN Version: CANH	CAN Version: CAN_H BUS Line(dominant high)
	ECAT Version: LED_ET_ERR	ECT Version: EtherCAT status LED Error
2	CAN Version: CANL	CAN Version: CAN_L BUS Line(dominant low)
	ECAT Version: LED_ET_RUN	ECT Version: EtherCAT status LED Run
3	RS232_TX_S	Standard RS232 transmit
4	RS232_RX_S	Standard RS232 receive
5	RS232_TX /SB_IN	There are two options for this pin: Option 1: TTL RS232 transmit (Default) Option 2: Serial Bus IN for extended I/O (refer to MAN-G-Board Level Modules Hardware manual) This option is only available for EtherCAT
6	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-G-Board Level Modules Hardware manual) This option is only available for EtherCAT
7	COMRET	Common return
8	COMRET	Common return



Pin (MAIN)	Signal	Function	
9	ANALOG1+	Analog input 1	There is no ANARET (analog return) pin. Instead the COMRET pin used.
10	ANALOG1-	Analog input 1 complement	
11	ANALOG_IN2	Analog input 2	
12	STO1	STO 1 input, opto isolated from control (COMRET)	
13	STO_RET	STO signal return. The two digital STO inputs are optically isolated from the other parts of the drive, and share one return line.	
14	STO2	STO 2 input	
15	LED1	Bi-color indication output 1 (Cathode) Internal Resistor 1K Ω	
16	LED2	Bi-color indication output 2 (Cathode) Internal Resistor 1K Ω	
17	OUT4	Programmable output 4 (connected to COMRET) (3.3V logic level)	
18	OUT2	Programmable output 2 (connected to COMRET) (5V logic level)	
19	OUT3	Programmable output 3 (connected to COMRET) (3.3V logic level)	
20	OUT1	Programmable output 1 (connected to COMRET) (5V logic level)	
21	COMRET	Common return	
22	COMRET	Common return	
23	IN6	Programmable digital input 6 (connected to COMRET) (5V logic level)	
24	IN5	Programmable digital input 5 (connected to COMRET) (5V logic level)	
25	IN4	Programmable digital input (connected to COMRET) (5V logic level)	
26	IN3	Programmable digital input 3 (connected to COMRET) (5V logic level)	
27	IN2	Programmable digital input 2 (connected to COMRET) (5V logic level)	
28	IN1	Programmable digital input 1 (connected to COMRET) (5V logic level)	

Table 6: Connector MAIN – I/O, STO, Analog, LEDs



LEDs

For full details on the LEDs, see Chapter 7, and section 12.2.1 in the in the MAN-G-Board Level Modules Hardware manual for full details.

STO (safety)

For full details on STO, see Chapter 9 in the in the MAN-G-Board Level Modules Hardware manual for full details.

For RS232, and Analog Input Wires

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.

For Digital Inputs/Outputs, STO

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

For CAN Communication

Always use CAT5e cables.



10.3.1. Digital Inputs

The following table describes the electrical specification of the inputs IN1 and 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 $V_T = 3.3V$, $R_1 < 3.3K\Omega$ If $V_T = 5V$, $R_1 < 10K\Omega$
Minimum pulse width	> 250 μ sec
Execution time (all inputs): the time from application of voltage on input until execution is complete	$0 < T < 250 \mu$ sec
High-speed inputs – 1–6 minimum pulse width, in high-speed mode	$T = 5 \mu$ sec 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	$T > 0.1 \mu$ sec if the differential input functionality is set to touch probe/capture (index/strobe).

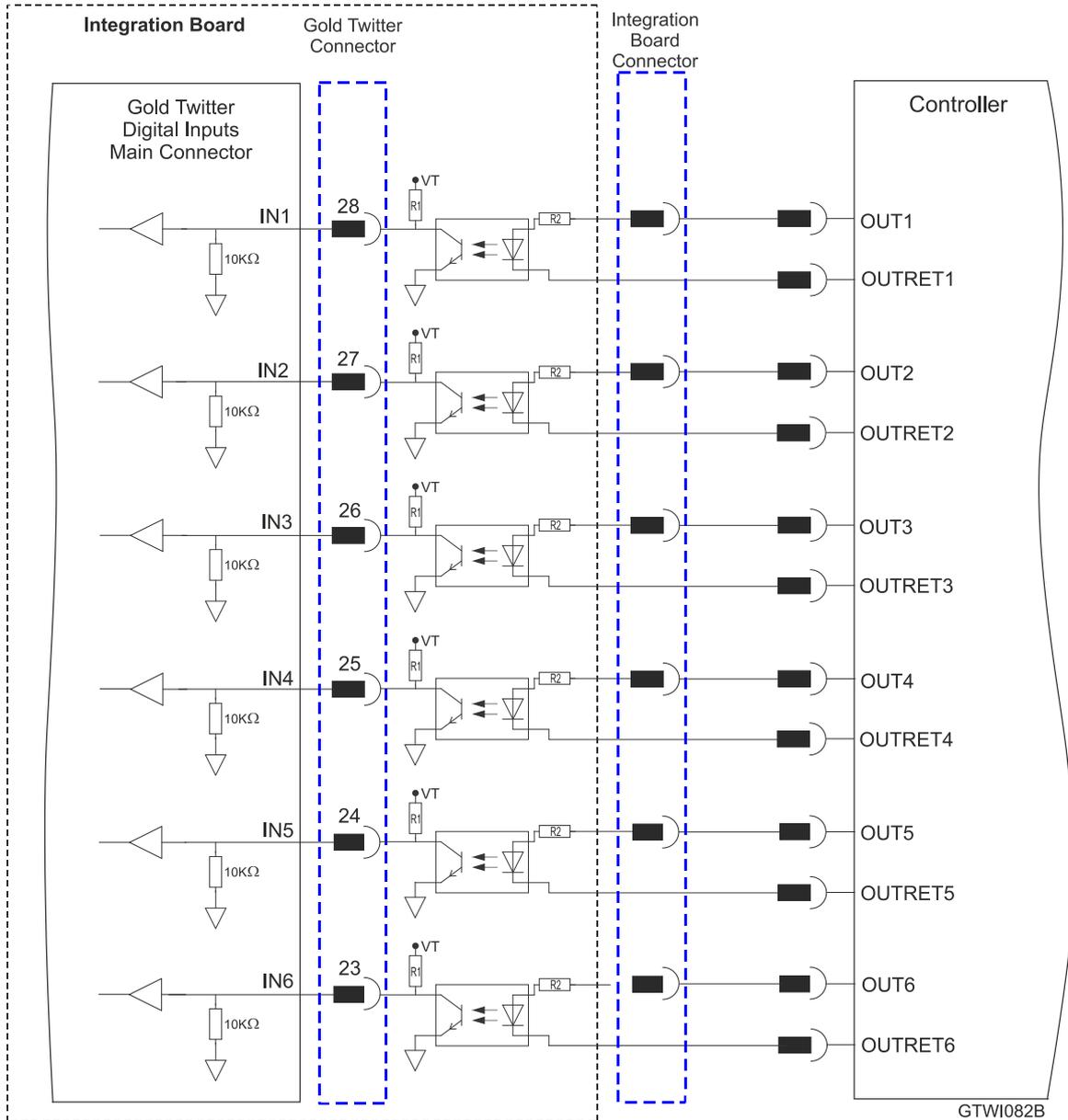


Figure 26: Digital Input 5V Logic level Mode Connection Diagram

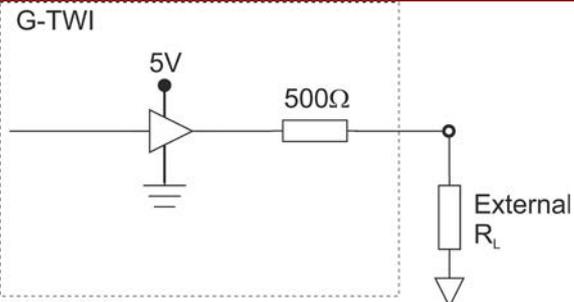
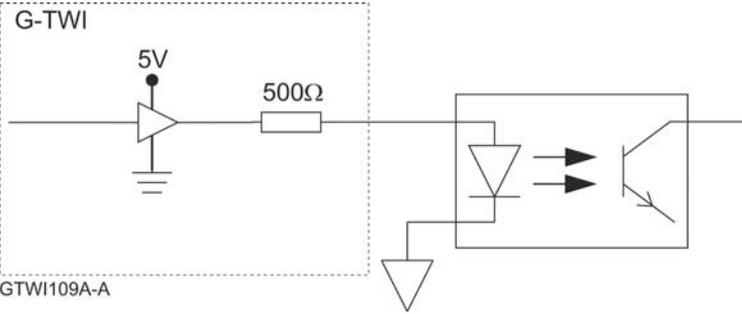


10.3.2. Digital Outputs

There are two types of Digital outputs:

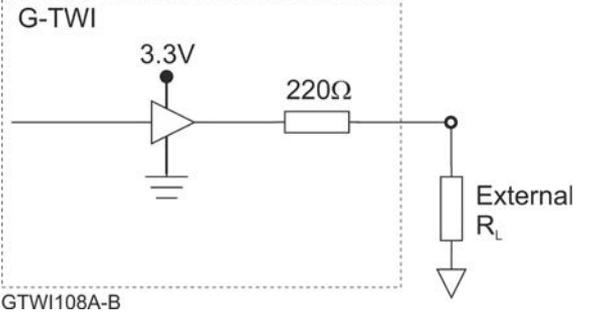
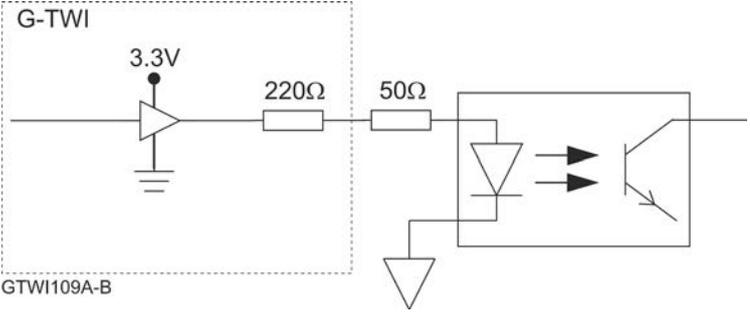
- Out1 and Out2 5V Logic
- Out3 and Out4 3.3V Logic

The following table describes the electrical specification of the outputs OUT1 and OUT2:

Feature	Details
Type of output	5V Logic
Output Configuration	 <p>GTWI108A-A</p>
V_{OL} max of TTL Buffer (low level)	$V_{out} (Low) \leq 0.44V @ 8mA$
V_{OH} min of TTL Buffer (High level)	$V_{out} (High) > 4.4V @ 8mA$
Output current	$I_{out(max)} = \frac{5V}{500\Omega + R_L (external)}$ <p>Where:</p> $V_{R_L(High)} = 5V - 500 * I_{out(max)}$
Example of connection to the opto-couplers	 <p>GTWI109A-A</p> <p>Where:</p> $I_{out(max)} = \frac{5V - 2.0V}{500\Omega} = 6.0mA$
T_{on} (time from low to high)	<1μsec
T_{off} (time from high to low)	<1μsec
Executable time	$0 < T < 250 \mu sec$



The following table describes the electrical specification of the outputs OUT3 and OUT4.

Feature	Details
Type of output	3.3V Logic
Output Configuration	 <p>GTWI108A-B</p>
V_{OL} max of TTL buffer (low level)	$V_{out} (On) \leq 0.4V @ 8mA$
V_{OH} min of TTL buffer (High level)	$V_{out} (High) > 2.9V @ 8mA$
Output current	$I_{out(max)} = \frac{3.3V}{220\Omega + R_L (external)}$ <p>Where:</p> $V_{R_L(High)} = 3.3V - 220 * I_{out(max)}$
Example of connection to the opto-couplers	 <p>GTWI109A-B</p> <p>Where:</p> $I_{out(max)} = \frac{3.3V - 2.0V}{220\Omega + 50\Omega} = 4.8 mA$
T_{on} (time from low to high)	<1usec
T_{off} (time from high to low)	<1usec
Executable time	$0 < T < 250 \mu sec$

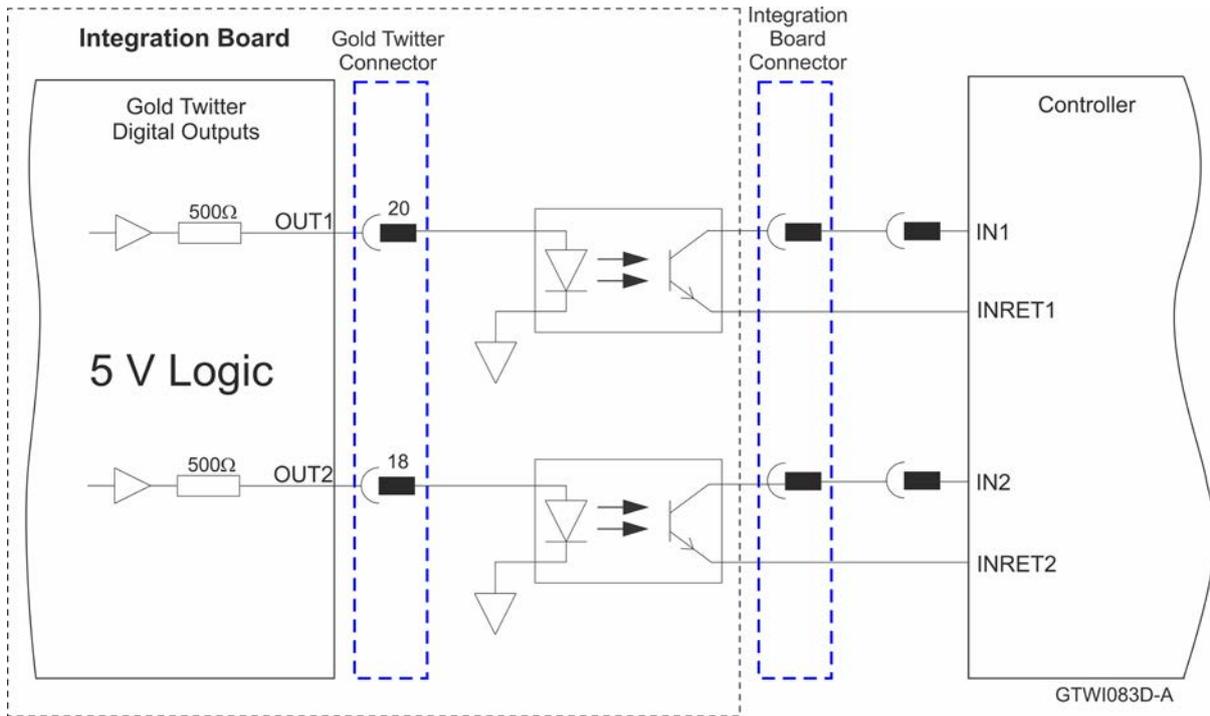


Figure 27: Digital Output 5V Logic Mode Connection Diagram

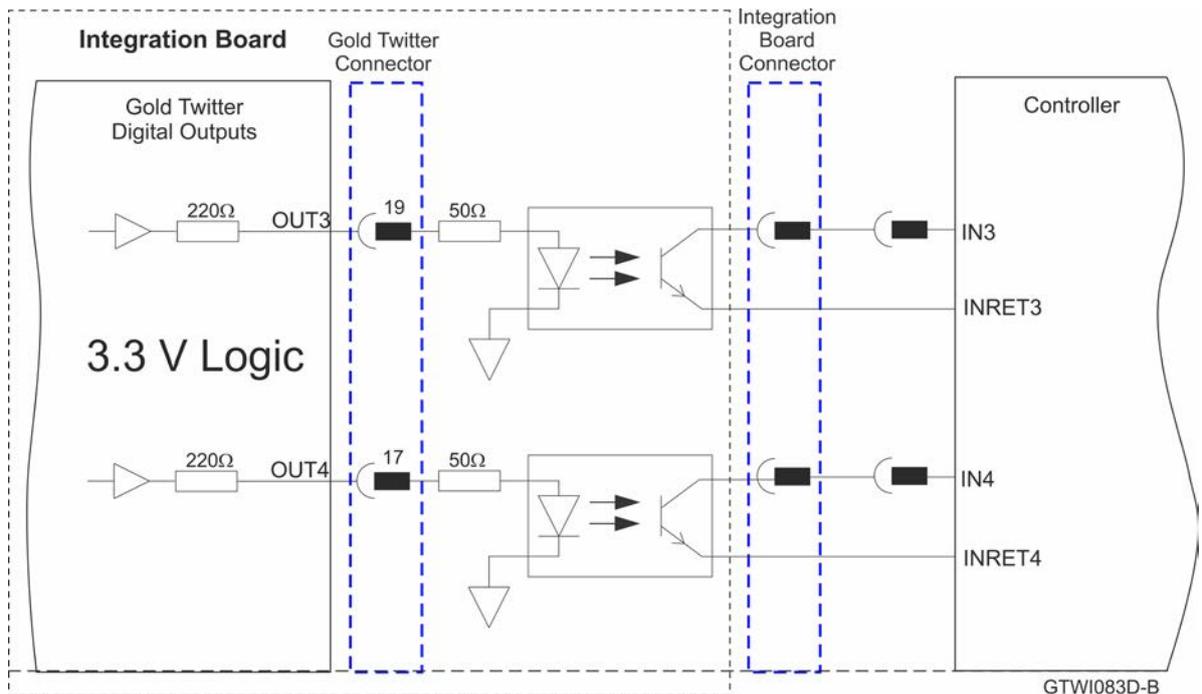


Figure 28: Digital Output 3.3V Logic Mode Connection Diagram



10.3.3. STO (Safe Torque Off)

For full details on STO, see Chapter 9 in the MAN-G-Board Level Modules Hardware manual.

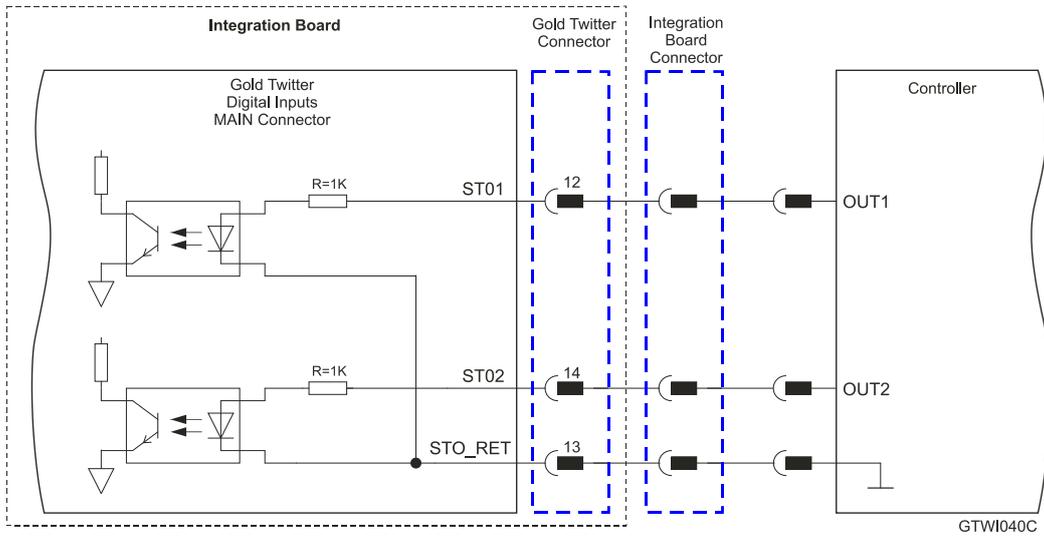


Figure 29: STO Input Connection – 5V Logic Level

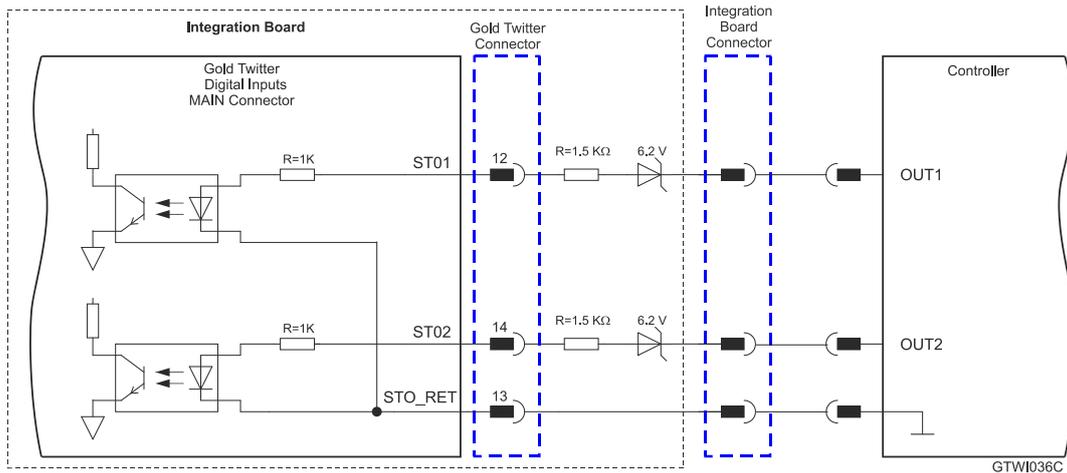


Figure 30: STO Input Connection – PLC (24V Logic)



10.3.4. Analog Input

For full details on Analog Inputs, see section 11.3 in the MAN-G-Board Level Modules Hardware manual.

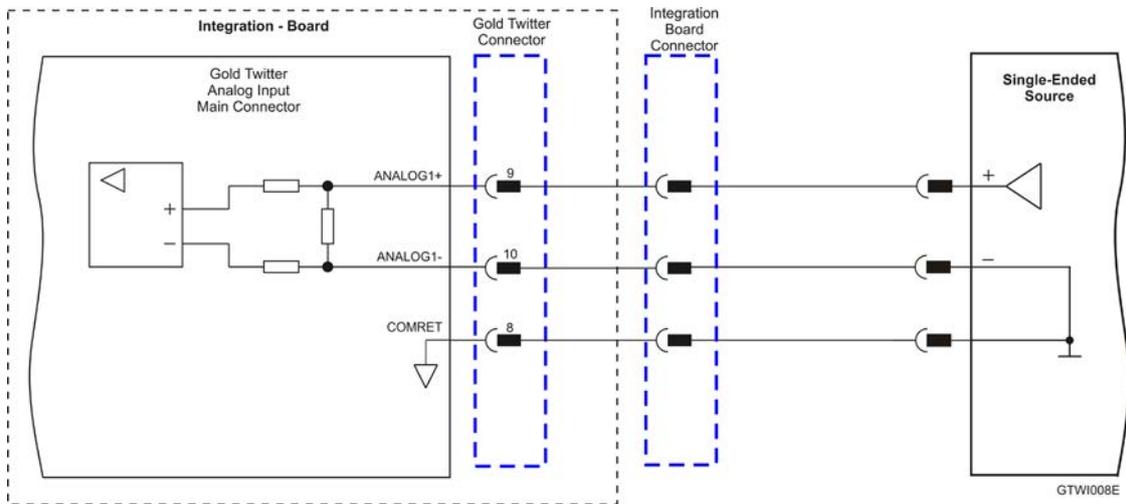


Figure 31: Analog Input

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.



10.3.5. CAN Option

For full details on CANopen communication, see section 14.3 in the MAN-G-Board Level Modules Hardware manual.

10.3.5.1. Interface

The PCB-Mounted Module includes the CAN transceiver and mode choke. Therefore it is required to add a CAN Bus Protector for ESD and other harmful transient voltage events.

The following signals describe how to connect CAN to the external connector.

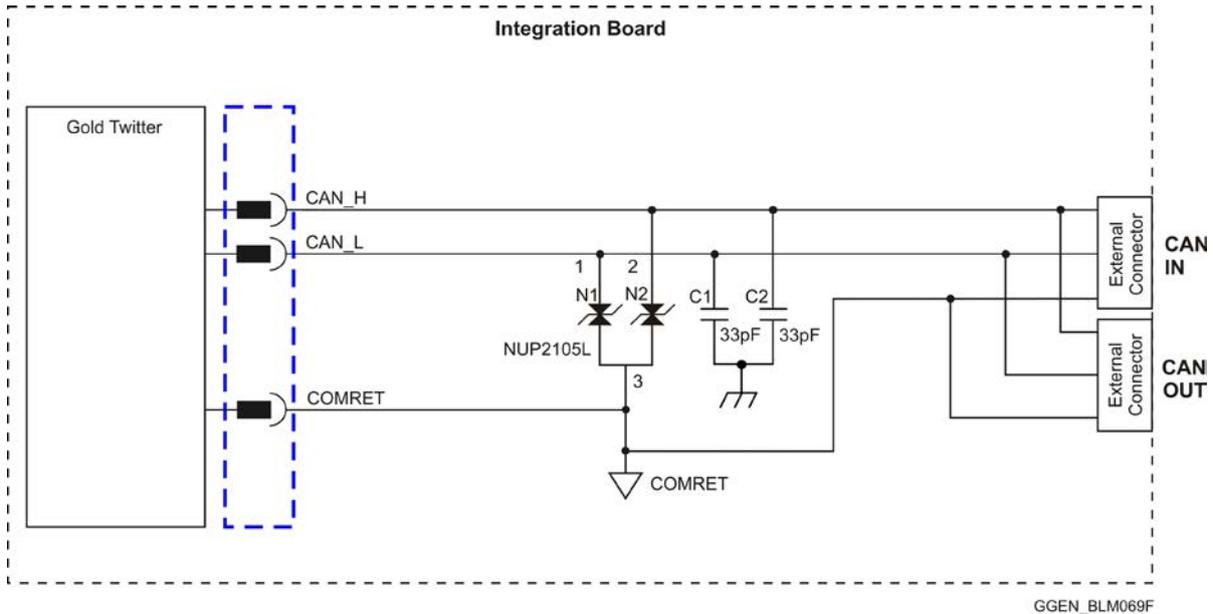


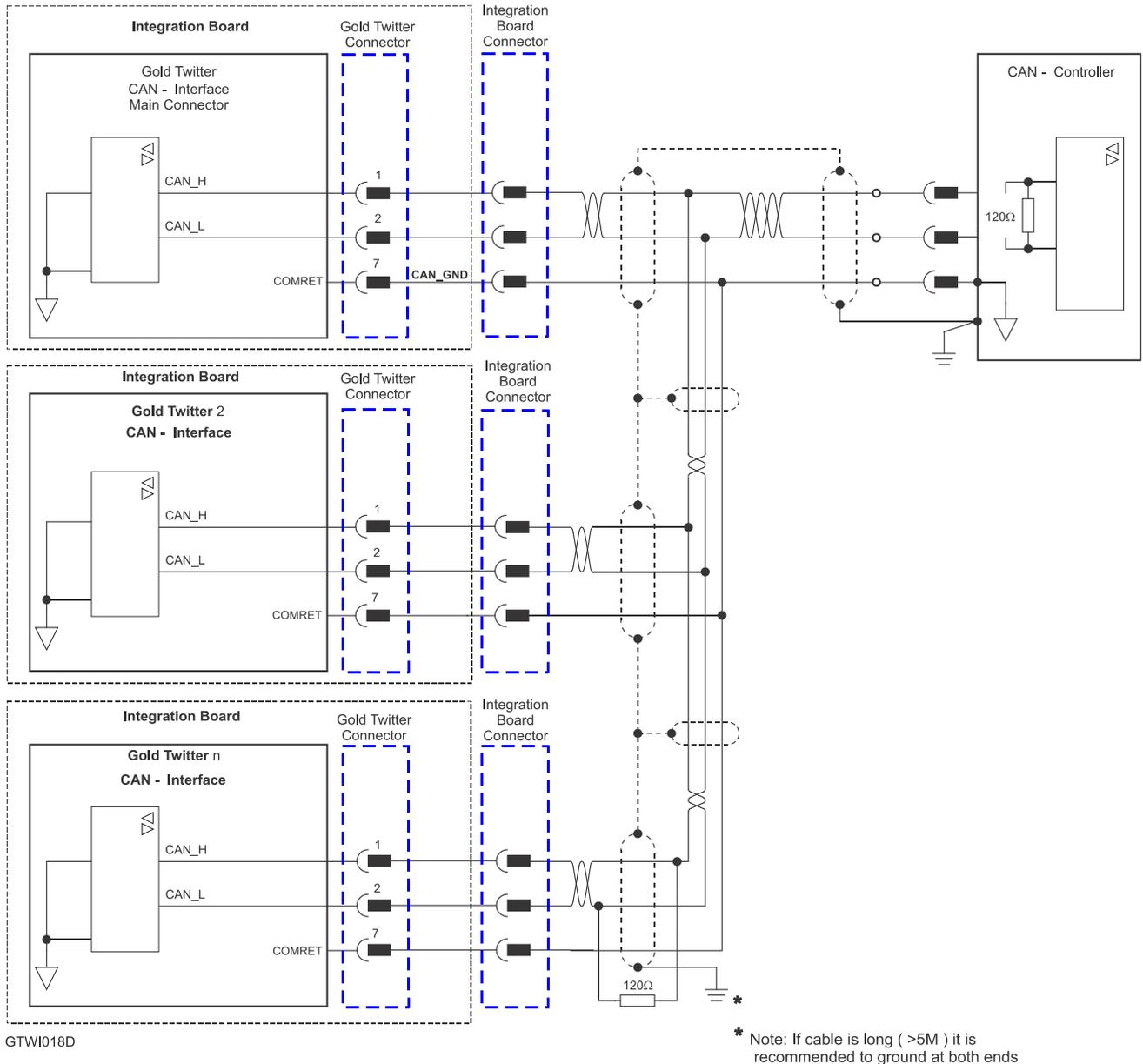
Figure 32: CAN Interface

The following are examples of the components described in Figure 32.

Interface Components	Part	P/N
33PF/50V,NPO,10%	AVX	06035A330JAT1A
DUAL BIDIRECTIONAL VOLTAGE SUPPRESSOR,NUP2105L	ON SEMIC	NUP2105LT1G



10.3.5.2. CAN Layout



GTWI018D

Figure 33: CAN Network Diagram



Caution: When installing CAN communication, ensure that each servo drive is allocated a unique ID. Otherwise, the CAN network may “hang”.

Note: Always use CAT5e cables.



10.3.6. RS232

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

Figure 34 describes the Standard RS232 connection diagram.

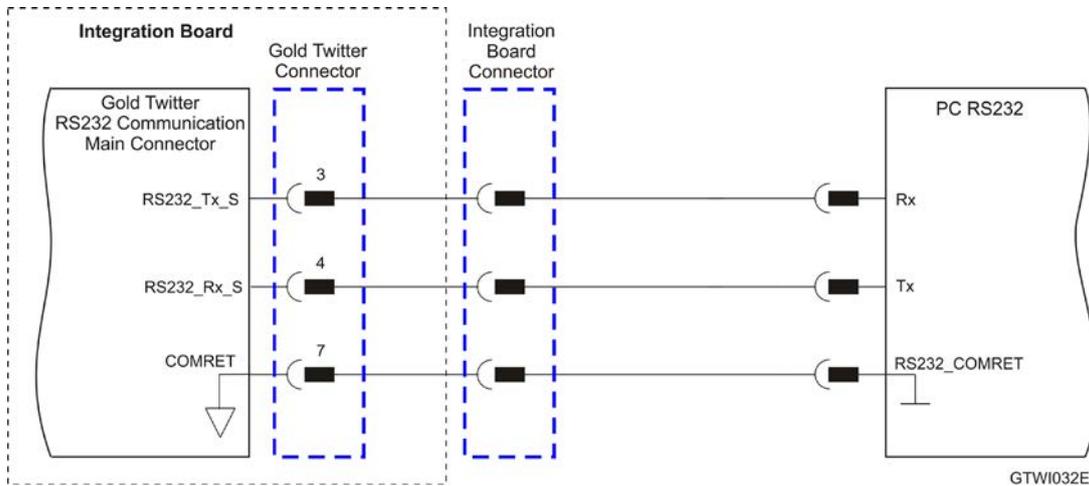


Figure 34: RS232 Connection Diagram

For full details on RS232 TTL Level communication, see section 12.5.1 in the MAN-G-Board Level Modules Hardware manual.

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.

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

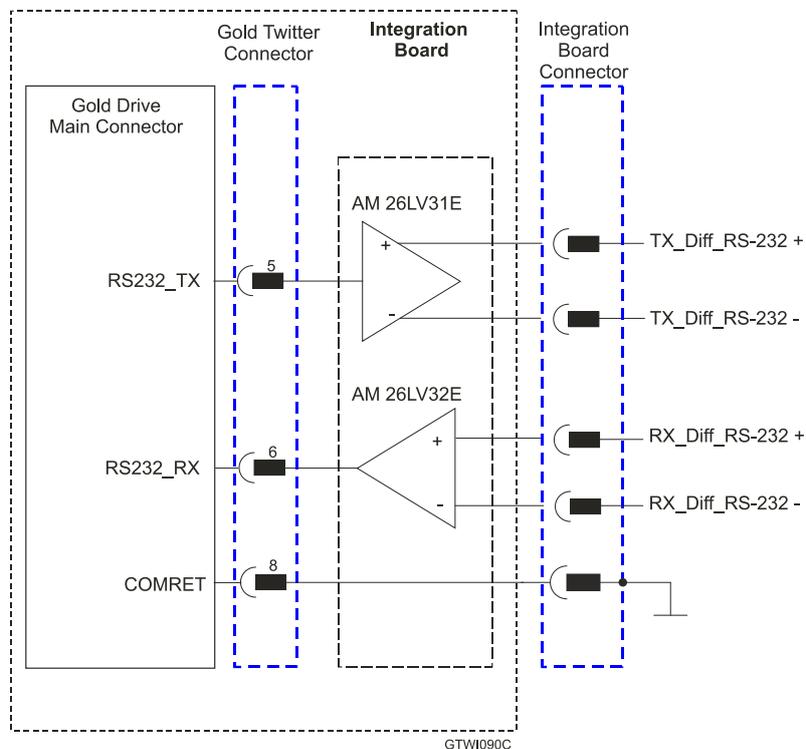
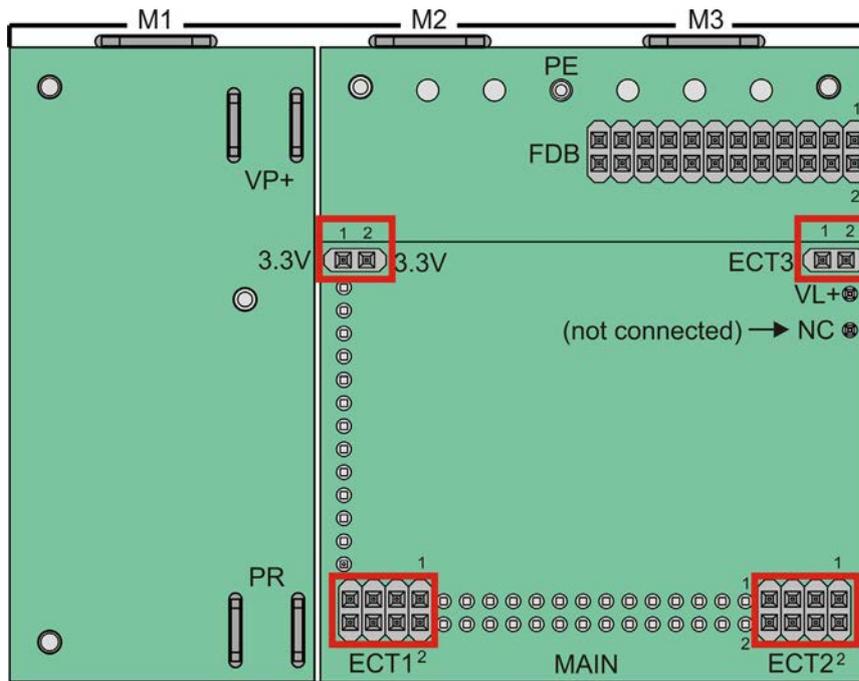


Figure 35: Differential RS232 (RS422) Connection Diagram



10.4. EtherCAT Module



For full details on EtherCAT communication, see Section 12.2 in the in the MAN-G-Board Level Modules Hardware manual.

G-TWI_ADV-205C-C

10.4.1. EtherCAT Module Connectors

10.4.1.1. ECT2 connector

Pin (ECT2)	Signal	Function
1	USB_VBUS	USB VBUS 5V Detector
2	USBD+	USB_P line
3	COMRET	USB communication return
4	USBD-	USB_N line
5	PHY_IN_LINK_ACT	Indicates EtherCAT IN/Ethernet LINK input
6	PHY_OUT_LINK_ACT	Indicates EtherCAT OUT LINK
7	PHY_IN_SPEED	Indicates EtherCAT IN/Ethernet Speed input
8	PHY_OUT_SPEED	Indicates EtherCAT OUT Speed

Table 7: Connector ECT2

For USB Wires

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.



10.4.1.2. ECT1 connector

Pin (ECT1)	Signal	Function
1	PHY_OUT_RX+	EtherCAT OUT RX+ Line
2	PHY_OUT_TX+	EtherCAT OUT TX+ Line
3	PHY_OUT_RX-	EtherCAT OUT RX- Line
4	PHY_OUT_TX-	EtherCAT OUT TX- Line
5	PHY_IN_RX+	EtherCAT IN/Ethernet RX+ Line
6	PHY_IN_TX+	EtherCAT IN/Ethernet TX+ Line
7	PHY_IN_RX-	EtherCAT IN/ Ethernet RX- Line
8	PHY_IN_TX-	EtherCAT IN/Ethernet TX- Line

Table 8: Connector ECT1

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

Note: Always use CAT5e cables.

10.4.1.3. ECT3 Connector

Pin (ECT3)	Signal	Function
1	SB_Clock	Serial Bus_Clock (9.375Mhz) for extended IO (refer to the MAN-G-Panel Mounted Drives Hardware Manual)
2	SB_Load	Serial Bus Load for extended IO (refer to the MAN-G-Panel Mounted Drives Hardware Manual)

Table 9: Connector ECT3

10.4.1.4. 3.3V Connector

Pin	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 10: 3.3V Connector



10.4.2. EtherCAT Communication

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



When the EtherCAT is connected and the FoE is in operation, the USB cable connection must be disconnected.

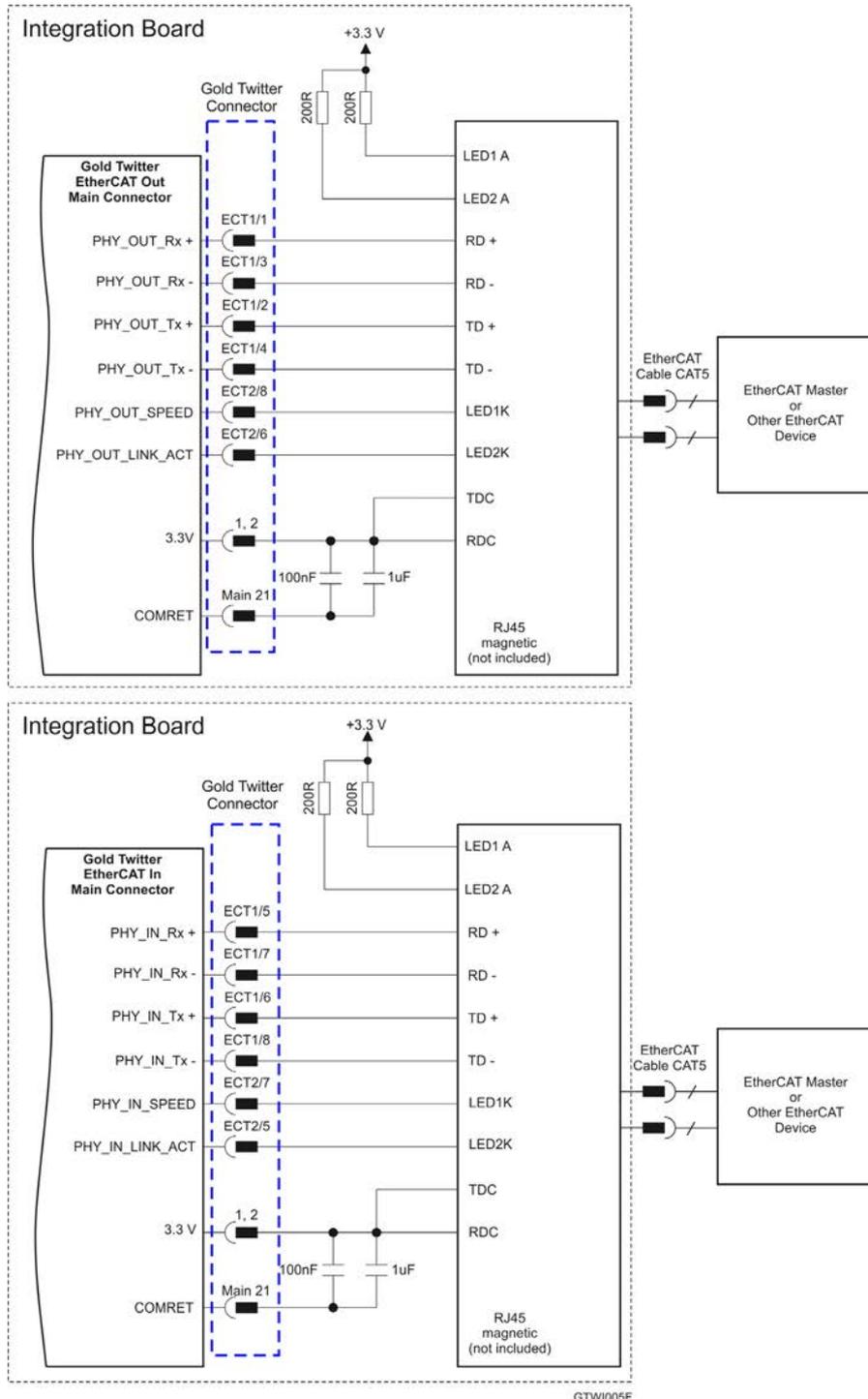


Figure 36: EtherCAT Connection Schematic Diagram

Note: Always use CAT5e cables.



10.4.3. USB 2.0 Communication (for EtherCAT model only)

For full details on USB communication, see section 12.1 in the MAN-G-Board Level Modules Hardware manual.

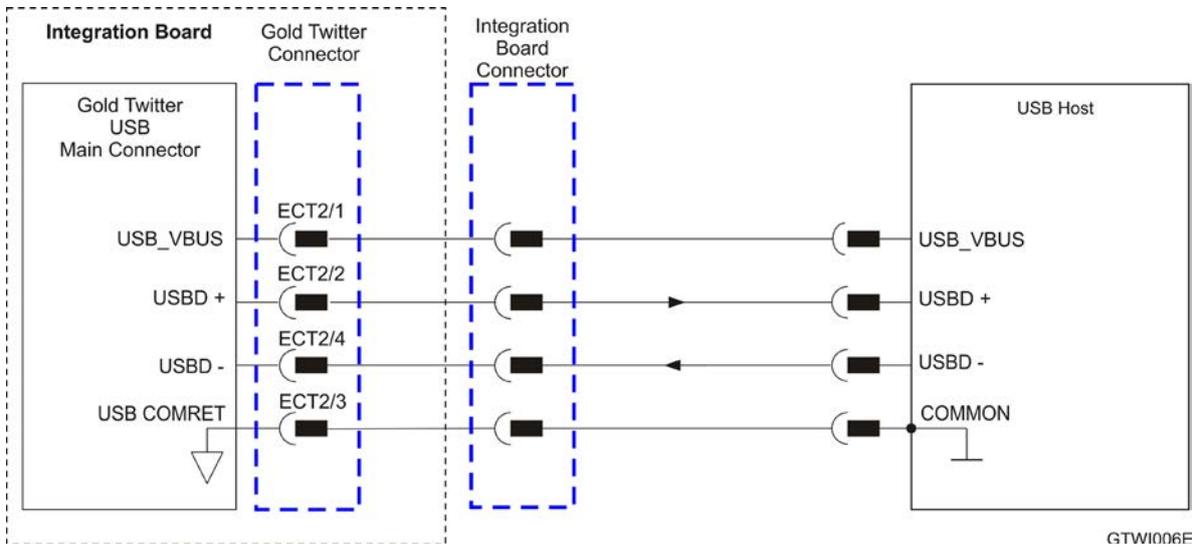


Figure 37: USB Network Diagram

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.



Chapter 11: Powering Up

After the Gold Double 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.

11.1. Initializing the System

After the Gold Double 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*.

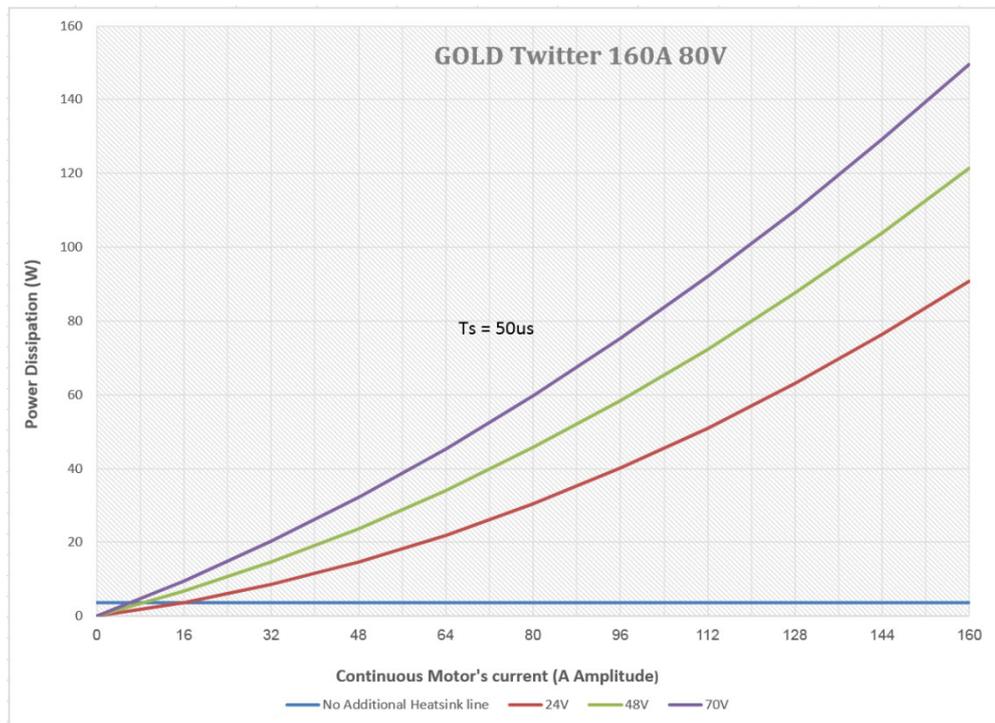
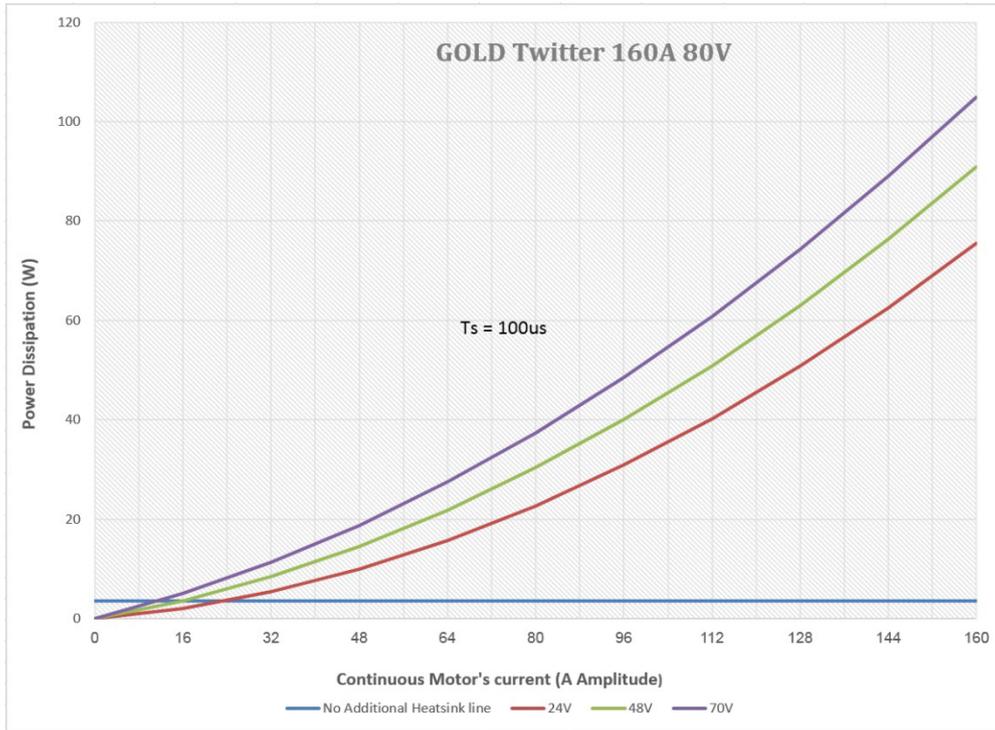


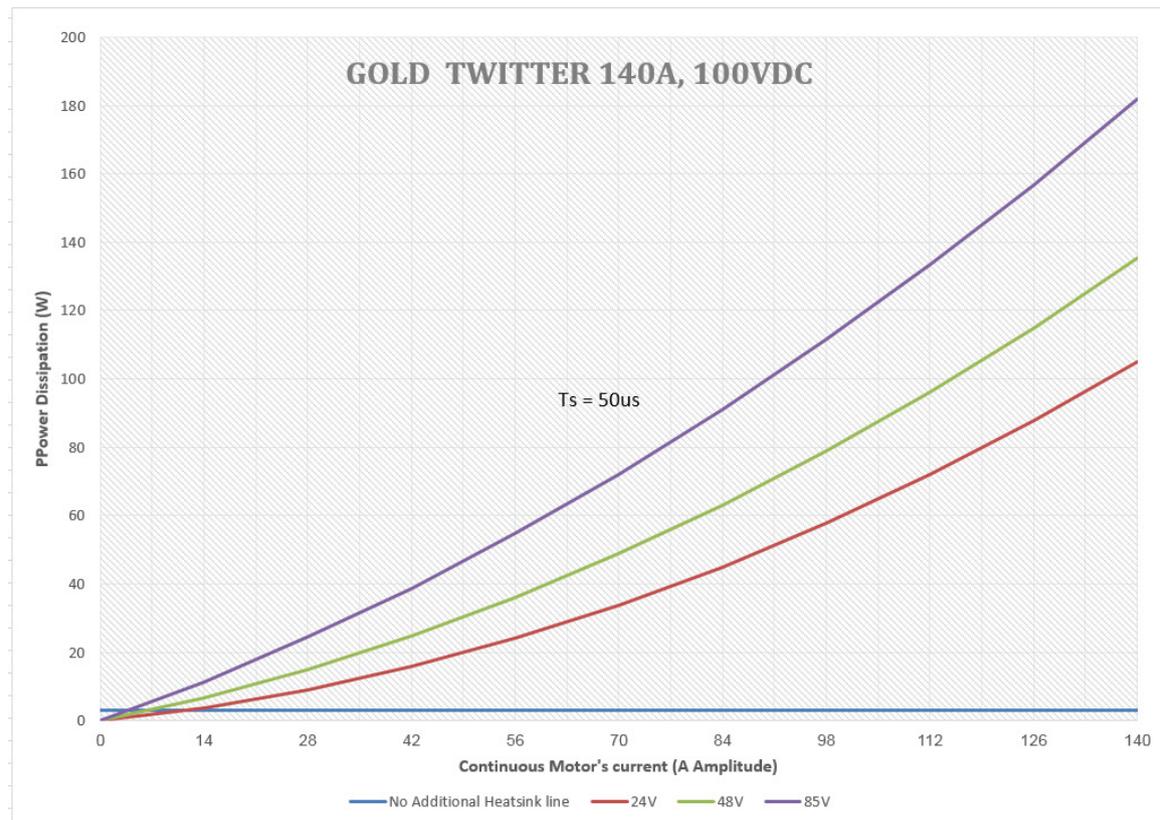
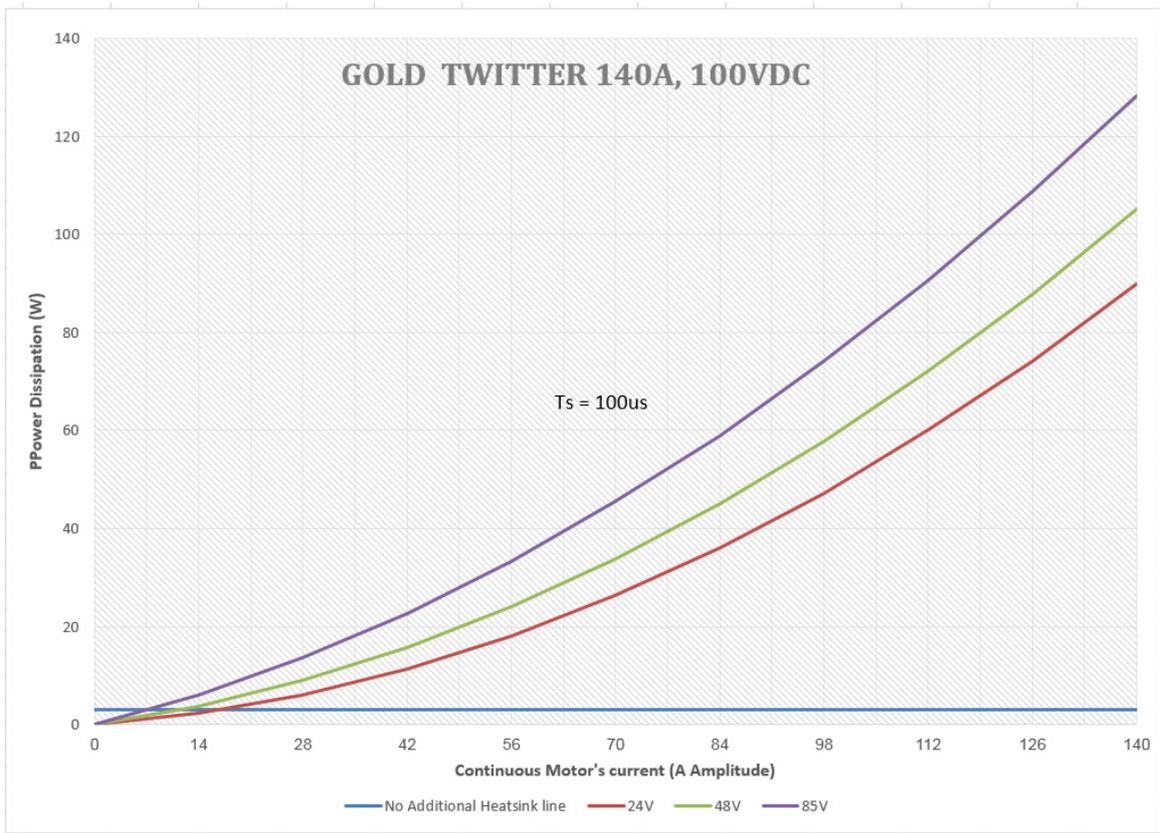
11.2. Heat Dissipation

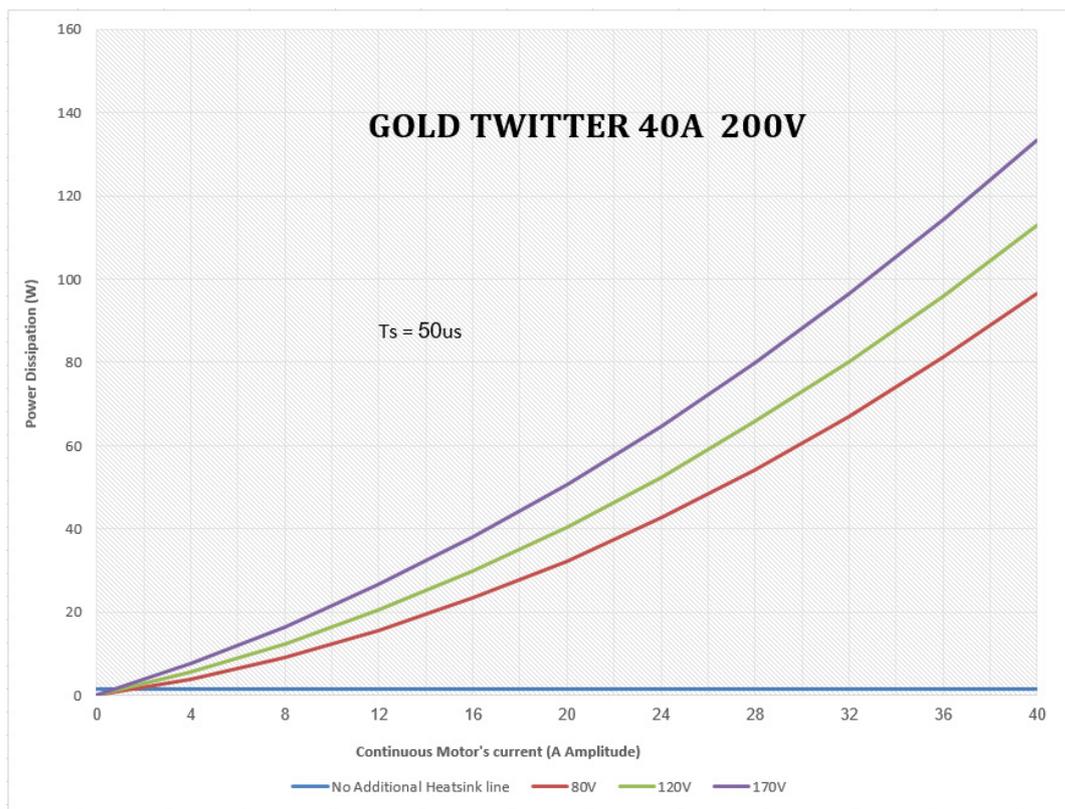
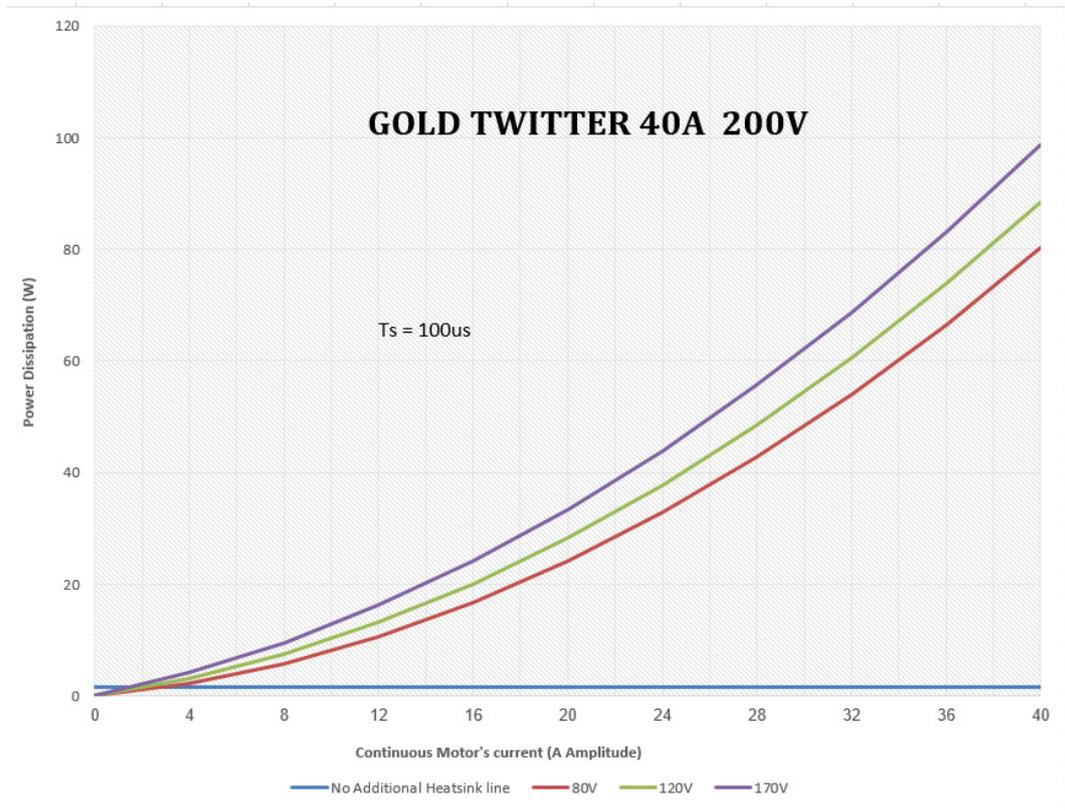
The best way to dissipate heat from the Gold Double Twitter is to mount it so that its heat-sink is attached to the machine chassis. If mounted with its heat-sink suspended, then for best results mount the servo drive faced upwards and leave approximately 10 mm of space between the Gold Double Twitter's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

11.2.1. Heat Dissipation Data

Heat Dissipation is shown graphically below. The graphs below describe the basic drive (G-TWIDXXX/YYEED). It should also be noted that the Heat Sink of the model G-TWIDXXX/YYEEH can dissipate up to 6.0 W.









11.2.2. How to Use the Chart

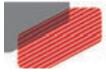
The charts above are based upon the theoretical worst-case scenario. The actual test results display a 20% -30% lower power dissipation.

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 $\approx 85^{\circ}\text{C}$, the Gold Double 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 **G-TWIDXXX/YYYYED**
If the average heat dissipation is less than $\approx 3\text{W}$ to 4W (Average operating power of 300W to 500W) there will be no requirement for an external Heatsink.
If the average Heat dissipation is higher than 3W then an additional heat dissipation means is required, usually by connecting to an external Heatsink.
For model **G-TWIDXXX/YYYYEH**
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 Heatsink.
5. When an external Heatsink is required, calculate the thermal resistance of the heatsink according to:

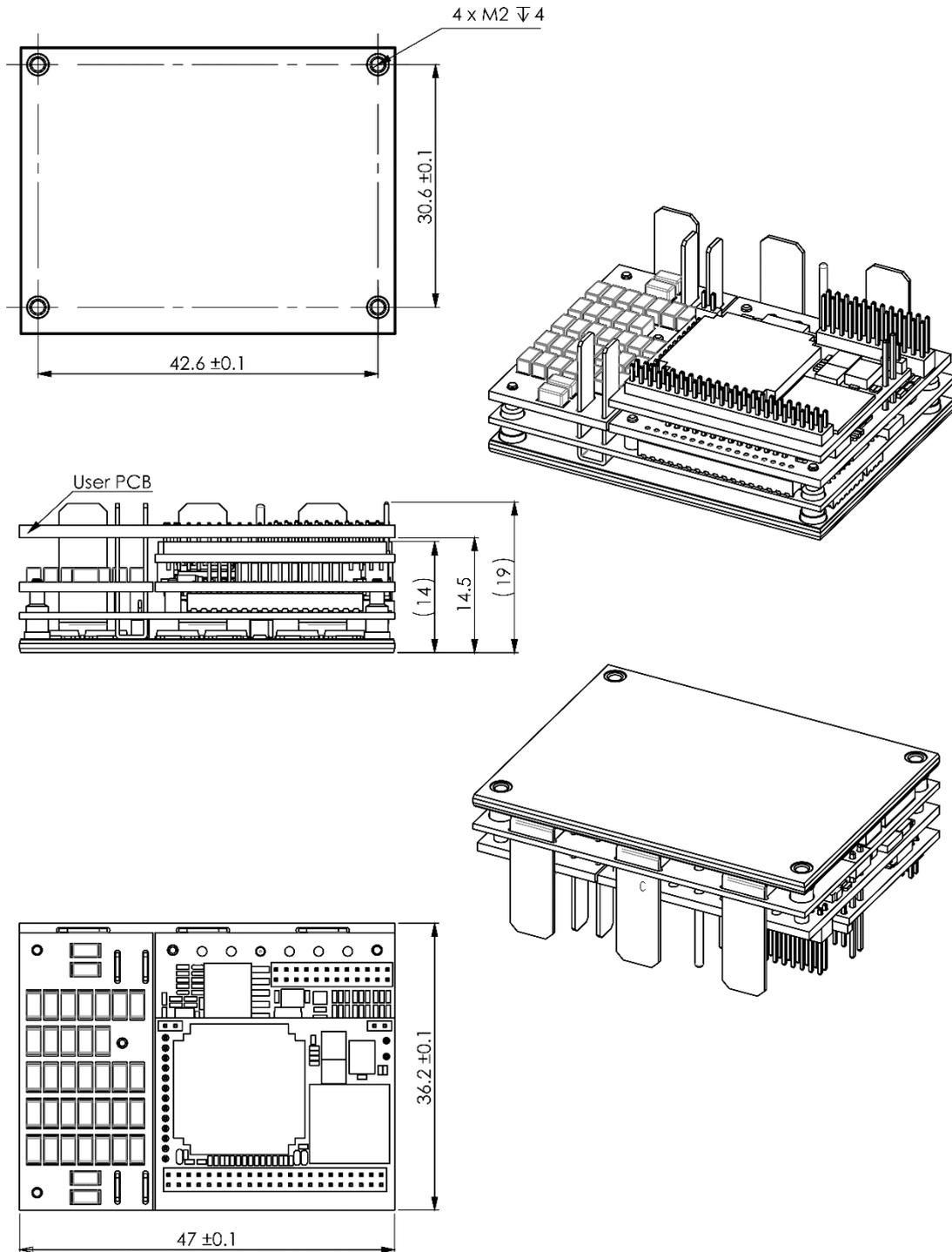
$$\theta_{\text{C/W}} = \frac{80^{\circ}\text{C} - T_{\text{Ambient}}}{\text{Heat Dissipation}}$$



Chapter 12: Dimensions

This chapter provides detailed technical dimensions regarding the Gold Double Twitter.

12.1. Gold Double Twitter EtherCAT Version without Heatsink

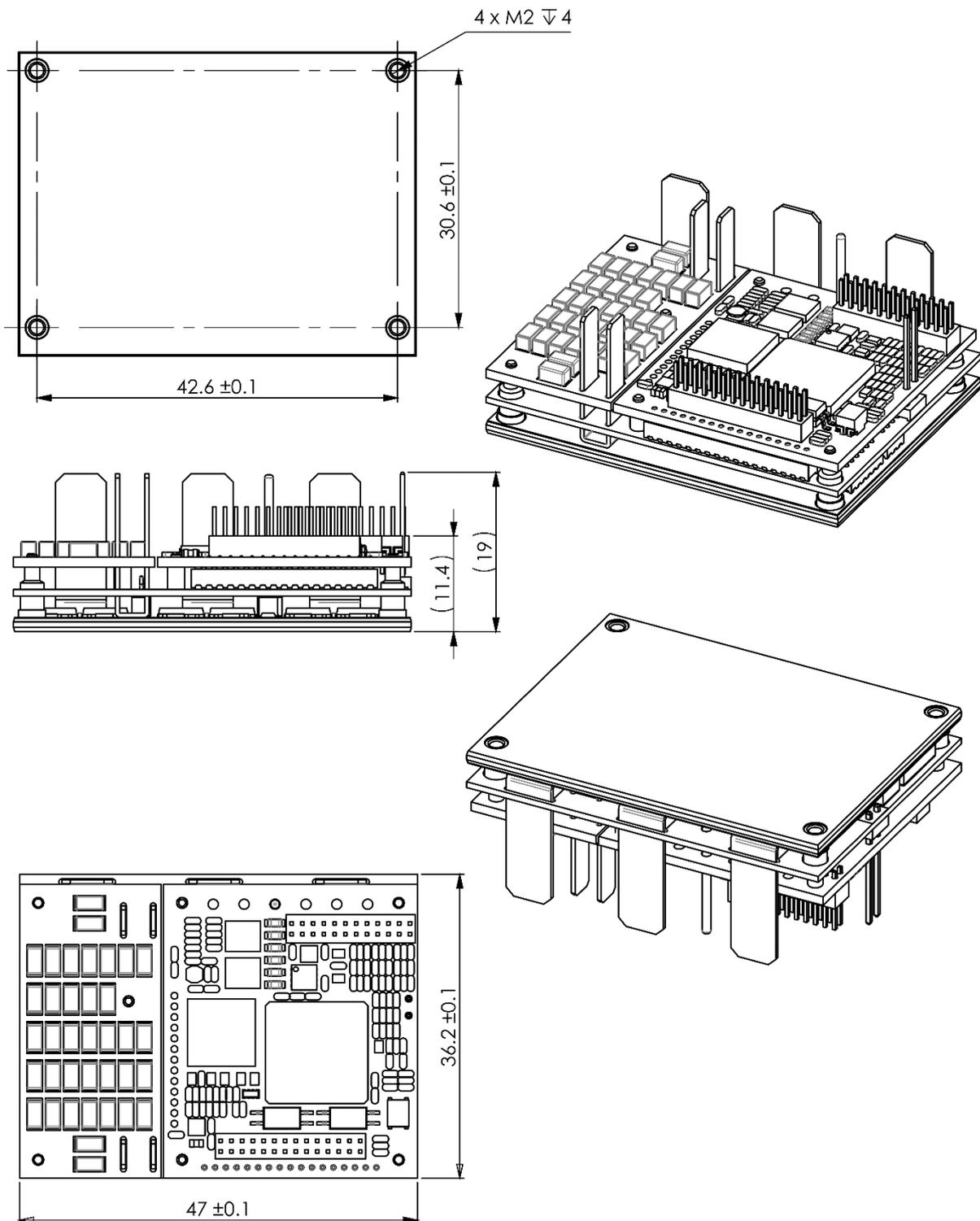


G-TWI DOUBLE ECAT without HS

Figure 38: Gold Double Twitter EtherCAT Version without Heatsink

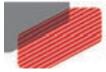


12.2. Gold Double Twitter CAN Version without Heatsink

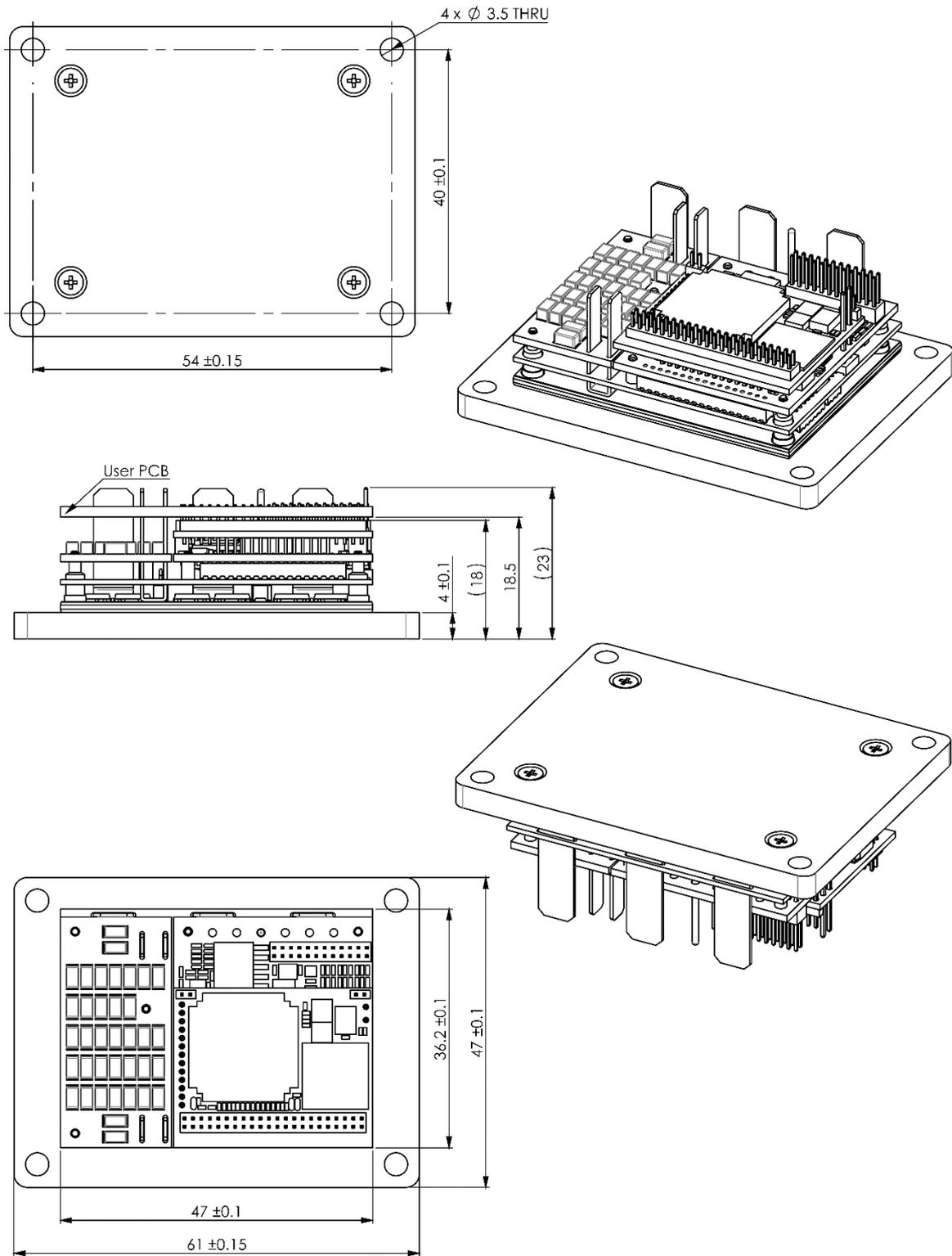


G-TWI DOUBLE CAN without HS

Figure 39: Gold Double Twitter CAN Version without Heatsink

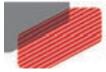


12.3. Gold Double Twitter EtherCAT Version with Heatsink

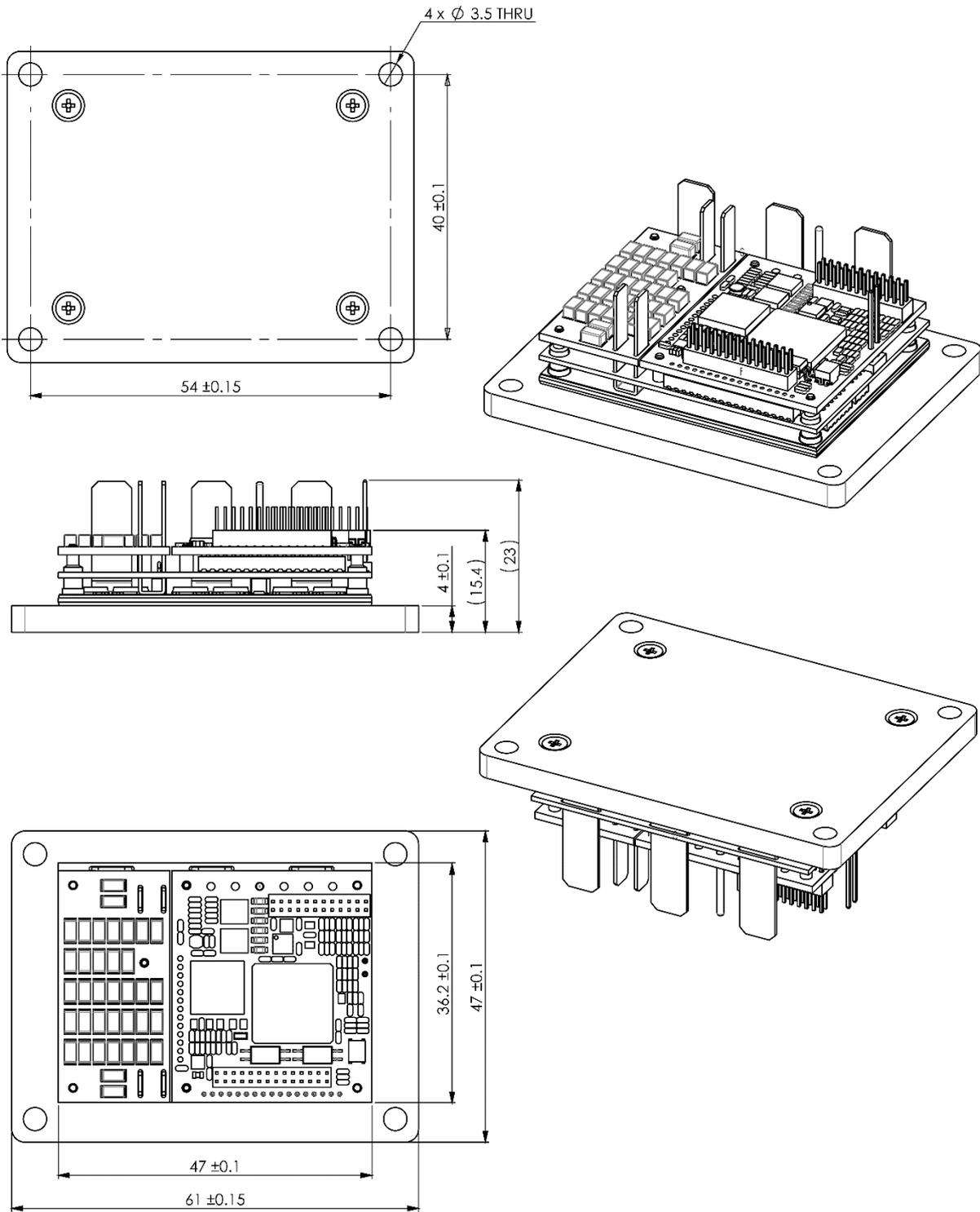


G-TWI DOUBLE ECAT + HS

Figure 40: Gold Double Twitter EtherCAT Version with Heatsink



12.4. Gold Double Twitter CAN Version with Heatsink



G-TWI DOUBLE CAN + HS

Figure 41: Gold Double Twitter CAN Version with Heatsink

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