

# **Gold Tiger Digital Servo Drive Installation Guide EtherCAT and CAN**



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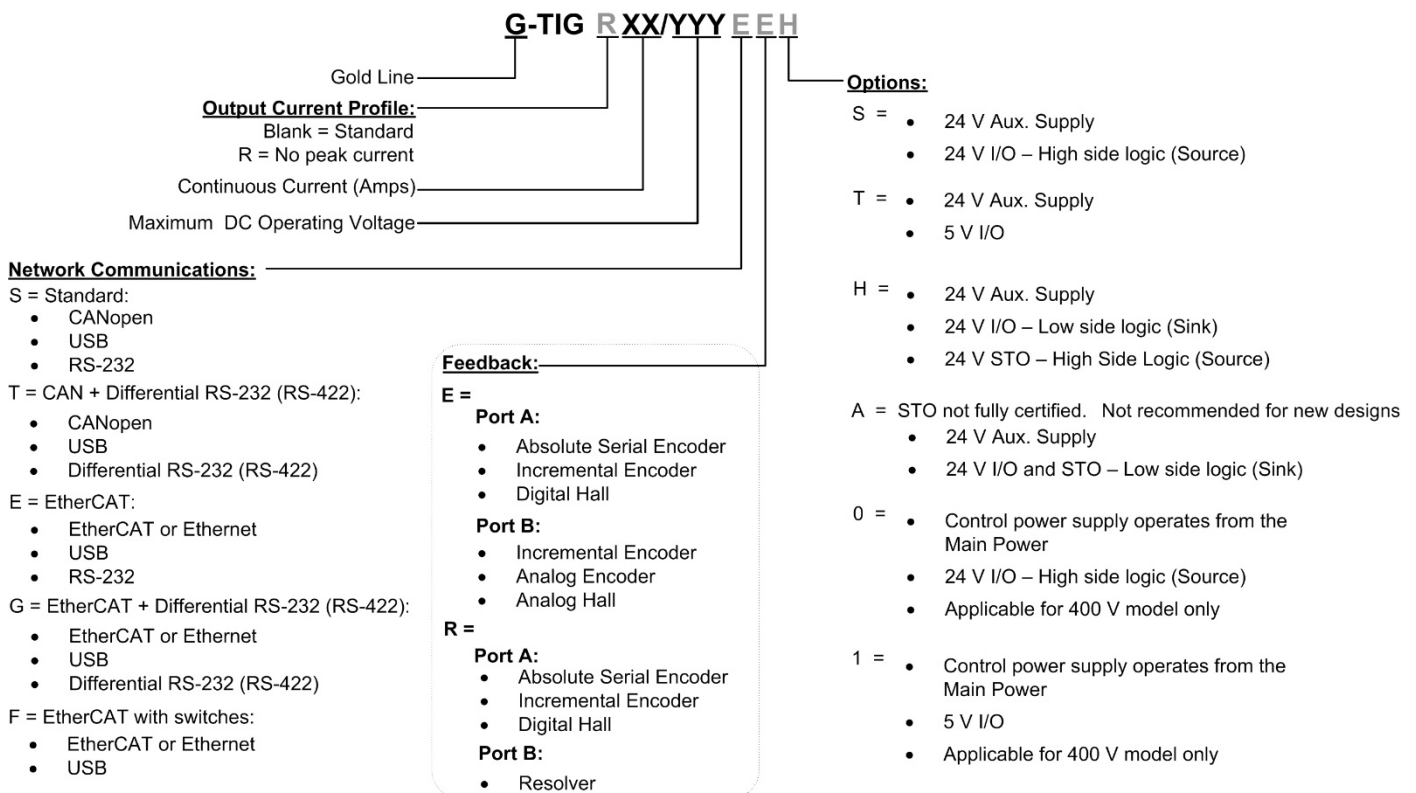
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## Catalog Number





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## ***Chapter 1: This Installation Guide***

This installation Guide details the technical data, pinouts, wiring, and power connectivity of the Gold Tiger. For a comprehensive detailed description of the functions refer to the MAN-G-Panel Mounted Drives Hardware manual which describe Panel Mounted products.

## ***Chapter 2: Safety Information***

In order to achieve the optimum, safe operation of the Gold Tiger, 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 Tiger 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 Tiger 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 Tiger 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 1 minute before touching or disconnecting parts of the equipment that are normally loaded with electrical charges (such as capacitors or contacts). Measuring the electrical contact points with a meter, before touching the equipment, is recommended.



## 2.2 Cautions

- The maximum DC power supply connected to the instrument must comply with the parameters outlined in this guide.
- When connecting the Gold Tiger to an approved isolated control power supply, connect it through a line that is separated from hazardous live voltages using reinforced or double insulation in accordance with approved safety standards.
- Before switching on the Gold Tiger, verify that all safety precautions have been observed and that the installation procedures in this manual have been followed.
- Make sure that the Safe Torque Off is operational

## 2.3 CE Marking Conformance

The Gold Tiger 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 Gold Tiger meets the provisions outlined in 2006/95/EC. The party responsible for ensuring that the equipment meets the limits required by EMC regulations is the manufacturer of the end product.

## 2.4 Warranty Information

The products covered in this manual are warranted to be free of defects in material and workmanship and conform to the specifications stated either within this document or in the product catalog description. All Elmo drives are warranted for a period of 12 months from the 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 3: Product Description

The Gold Tiger series of digital servo drives are highly resilient and designed to deliver the highest density of power and intelligence. The Gold Tiger delivers up to **10 kW of continuous power** or **16 kW of peak power** in a compact package.

The digital drives are part of Elmo's advanced Gold Line. They operate from a DC power source in current, velocity, position and advanced position modes, in conjunction with a permanent-magnet synchronous brushless motor, DC brush motor, linear motor or voice coil. They are designed for use with any type of sinusoidal and trapezoidal commutation, with vector control. The Gold Tiger 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 EASII application enables users to quickly and simply configure the servo drive for optimal use with their motor. The Gold Tiger, as part of the Gold Line, is fully programmable with Elmo's motion control language.

Power to the servo drive is provided by a DC power source (not included with the Gold Tiger).

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

If backup functionality is required to store control parameters in the event of a mains power outage, then an A, H, S, or T optional Gold Tiger should be used, with an external 24 VDC isolated supply connected to it.

**Note:** The backup functionality can operate from an isolated voltage source within the range of **18 to 30 VDC**.

Whenever backup functionality is not required, Gold Tiger models with the 0 or 1 Option (only for 400 V models) in the catalog number (section Catalog Number) can be used, i.e., they do not have a 24 V control supply. In these models, a smart control-supply algorithm enables the Gold Tiger to operate with only the main power supply VP+ and VN-, with no need for a 24 VDC control power supply for the logic.

The Gold Tiger is a stand-alone version of the Gold Panther module (PCB-mounted).



## Chapter 4: Technical Information

### 4.1 Physical Specifications

Feature	Units	All Types
Weight	g (oz)	750 g (26.46 oz) for standard L shape
Dimensions (excluding connectors)	mm (in)	105 x 160 x 47 (4.13" x 6.29" x 1.85")
Dimensions (including connectors)	mm (in)	109.5 x 175 x 47 (4.31" x 6.89" x 1.85")
Mounting method		Panel / Wall Mounted

### 4.2 Technical Data for the 400 V Type

Feature	Units	6/400	12/400	16/400	R17/400	R22/400
Minimum supply voltage	VDC	A, H, S, or T in P/N*: 50 0 or 1 Option in P/N: 100				
Nominal supply voltage	VDC	325				
Maximum supply voltage	VDC	400				
Maximum continuous power output	kW	2	4	5	5.5	7
Efficiency at rated power (at nominal conditions)	%	> 98				
Control supply voltage option	VDC	18 V to 30 V Only for Control Supply A/H/S/T Option Models				
Control power supply	VA	7				
Continuous current limit (Ic) Amplitude sinusoidal/DC trapezoidal commutation	A	6	12	16	17	22
Sinusoidal continuous RMS current limit (Ic)	A	4.2	8.5	11.3	12	15.5
Peak current limit	A	2 x Ic			No peak	

\*See the Catalog Number section for details on the part number. The A, H, S, or T Option appears in models where there is a 24 V control supply. If there is a 0 or 1 Option, the control power supply operates from the main power.

**Note on current ratings:** The current ratings of the Gold Tiger are given in units of DC amperes (ratings that are used for trapezoidal commutation or DC motors). The RMS (sinusoidal commutation) value is the DC value divided by 1.41.



### 4.3 Technical Data for the 800 V Type

Feature	Units	8/800	12/800	R11/800	R16/800
Minimum supply voltage	VDC	A, H, S, or T Option in P/N*: 95+			
Nominal supply voltage	VDC	560 for 400 VAC 680 for 480 VAC			
Maximum supply voltage	VDC	780			
Maximum continuous power output	kW	5	7.5	7	10
Efficiency at rated power (at nominal conditions)	%	> 98			
Control supply voltage option	VDC	18 V to 30 V Only for Control Supply A/H/S/T Option Models			
Control power supply	VA	7			
Continuous current limit (Ic) Amplitude sinusoidal/DC trapezoidal commutation	A	8	12	11	16
Sinusoidal continuous RMS current limit (Ic)	A	5.7	8.5	7.8	11.3
Peak current limit	A	2 x Ic		No peak	

\*See the Catalog Number section for details on the part number. The A, H, S, or T Option appears in models where there is a 24 V control supply. If there is a 0 or 1 Option, the control power supply operates from the main power.

**Note on current ratings:**

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



## 4.4 Technical Data for the 900 V Type

Feature	Units	8/900	12/900	R11/900	R16/900
Minimum supply voltage	VDC	A, H, S, or T Option in P/N*: 95+			
Nominal supply voltage	VDC	622 for 440 VAC			
Maximum supply voltage	VDC	840			
Maximum continuous power output	kW	5.5	8.4	7.7	11
Efficiency at rated power (at nominal conditions)	%	> 98			
Control supply voltage option	VDC	18 V to 30 V Only for Control Supply A/H/S/T Option Models			
Control power supply	VA	7			
Continuous current limit (Ic) Amplitude sinusoidal/DC trapezoidal commutation	A	8	12	11	16
Sinusoidal continuous RMS current limit (Ic)	A	5.7	8.5	7.8	11.3
Peak current limit	A	2 x Ic		No peak	

\*See the Catalog Number section for details on the part number. The A, H, S, or T Option appears in models where there is a 24 V control supply. If there is a 0 or 1 Option, the control power supply operates from the main power.

**Notes:**

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



## 4.5 Control Supply

Feature	Details
Control power supply	<i>Isolated DC source only</i>
Control supply input voltage	18 VDC to 30 VDC
Control supply input power	7

## 4.6 Product Features

Main Feature	Details	Presence and No.
<b>STO</b>	TTL, <i>or</i>	√
	PLC Source, <i>or</i>	√
	PLC Sink (is not fully certified, and not recommended for new designs)	√
<b>Digital Input Option</b>	TTL, <i>or</i>	6
	PLC Source, <i>or</i>	6
	PLC Sink	6
<b>Digital Output Option</b>	TTL, <i>or</i>	4
	PLC Source, <i>or</i>	4
	PLC Sink	4
<b>Analog Input</b>	Differential ±10V	1
<b>Feedback</b>	Standard Port A, B, & C	√
<b>Communication Option</b>	USB	√
	EtherCAT without switches <i>or</i>	√
	CAN	√
	EtherCAT with switches <i>or</i>	√
	RS-232 <i>or</i>	√
	RS-422	√



## 4.7 Environmental Conditions

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



**Caution:**

The Gold Tiger dissipates its heat by convection. The maximum ambient operating temperature of 70 °C (160 °F) must not be exceeded.

The ExtrlQ series of drives support the following extended environmental conditions.

Feature	Operation Conditions	Range
<b>Ambient Temperature Range</b>	Non-operating conditions	-50 °C to +100 °C (-58 °F to 212 °F)
	Operating conditions	-40 °C to +70 °C (-40 °F to 160 °F)
<b>Temperature Shock</b>	Non-operating conditions	-40 °C to +70 °C (-40 °F to 160 °F) within 3 min
<b>Altitude</b>	Non-operating conditions	Unlimited
	Operating conditions	-400 m to 12,000 m (-1312 to 39370 feet)
<b>Maximum Humidity</b>	Non-operating conditions	Up to 95% relative humidity non-condensing at 35 °C (95 °F)
	Operating conditions	Up to 95% relative humidity non-condensing at 25 °C (77 °F), up to 90% relative humidity non-condensing at 42 °C (108 °F)
<b>Vibration</b>	Operating conditions	20 Hz to 2,000 Hz, 14.6 g
<b>Mechanical Shock</b>	Non-operating conditions	±40g; Half sine, 11 msec
	Operating conditions	±20g; Half sine, 11 msec
<b>Atmosphere</b>	Operating area atmosphere	No flammable gases or vapors permitted in area
<b>Protection level</b>		IP32



## 4.8 Gold Line Standards

The following table describes the Main Standards of the Gold Tiger servo drive. For further details refer to the MAN-G-Board Level Modules Hardware Manual.

Main Standards	Item
The related standards below apply to the performance of the servo drives as stated in the environmental conditions in section 4.7 Environmental Conditions above.	
<b>STO IEC 61800-5-2:2007 SIL 3</b>	Adjustable speed electrical power drive systems – Safety requirements – Functional
<b>EN ISO 13849-1:2008 PL e, Cat 3</b>	Safety of machinery — Safety-related parts of control systems.
<b>In compliance with IEC/EN 61800-5-1</b>	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
<b>In compliance with UL61800-5-1</b>	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
<b>Conformity with CE 2006/95/EC</b>	Low-voltage directive 2006/95/EC
<b>In compliance with CSA C22.2 NO. 14-13</b>	Industrial Control Equipment



## Chapter 5: Installation

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

### 5.1 Unpacking the Drive Components

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

- The Gold Tiger servo drive
- The Elmo Application Studio (EAS) software and software manual

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

#### To unpack the Gold Tiger:

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



GTIG001B


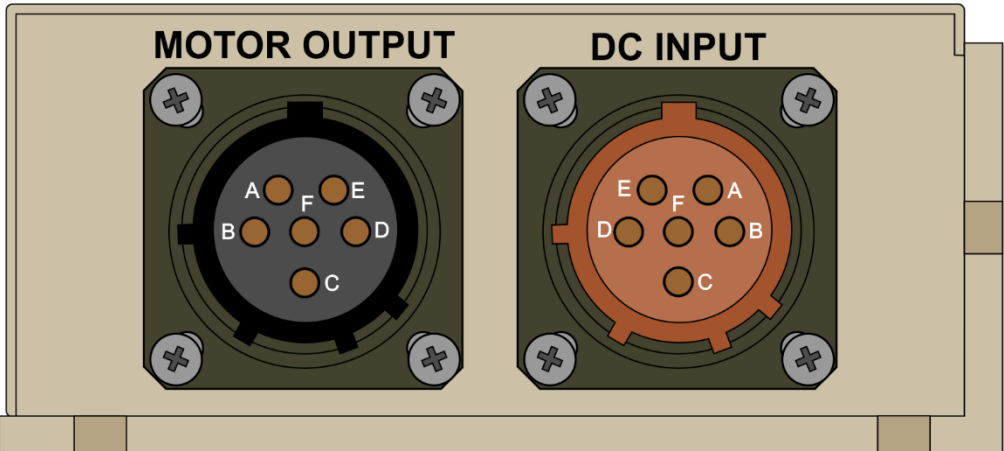
Figure 1: Gold Tiger Part Number Sticker

4. Verify that the Gold Tiger type is the one that you ordered, and ensure that the voltage meets your specific requirements.

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

## 5.2 Connector Types

The Gold Tiger has the following connectors.

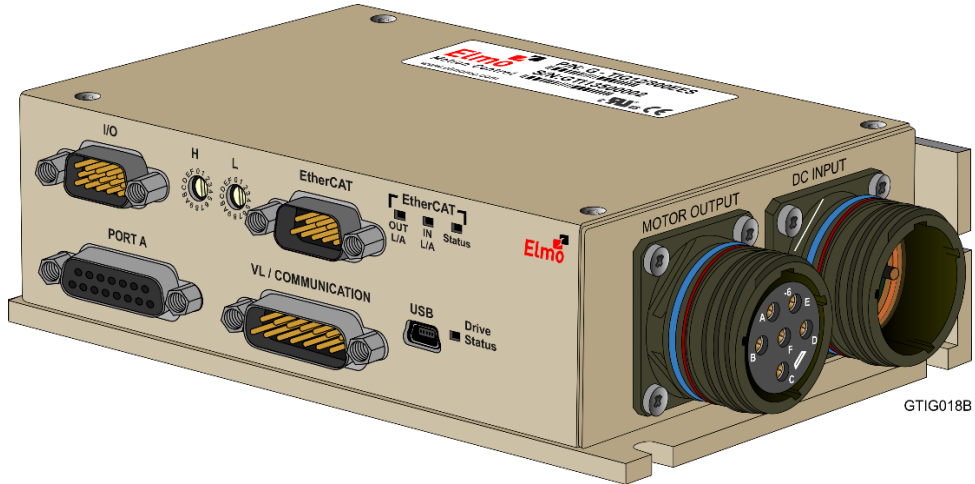
Pins	Type	Function
<b>Bottom Connectors</b>		
 		
6	Amphenol (Female)	Motor Connector
6	Amphenol (Male)	DC Input

GTIG027C



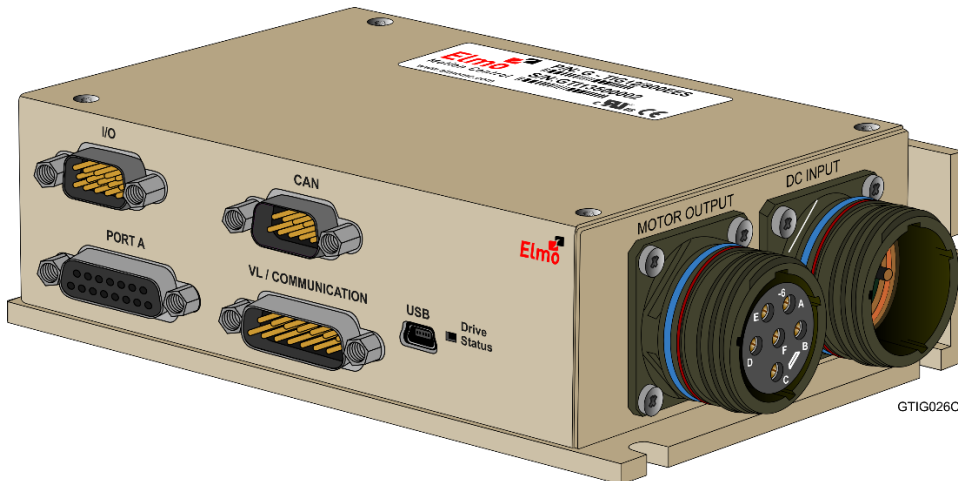
Pins	Type	Function
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**Front Connectors**



GTIG018B

**Front Connectors - EtherCAT**

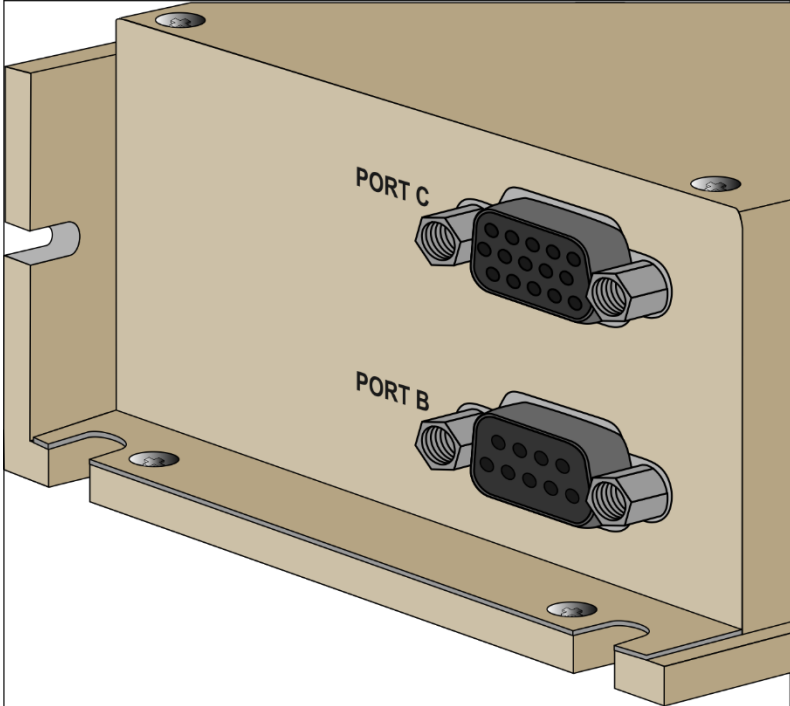


GTIG026C

**Front Connectors – CAN**

15	Plug D-Type	VL / Communication
15	Socket D-Type	Port A
15	Pin High Density D-Type	I/O
4	USB Device Type Mini B	USB communication
<b>EtherCAT Version</b>		
9	Pin D-Type	Ethernet/EtherCAT_IN/OUT communication
<b>CAN Version</b>		
9	Pin D-Type	CAN in/CAN out



Pins	Type	Function
<b>Side Connectors</b>		
 <p style="text-align: right;">GTIG022B</p>		
<b>Side Connectors</b>		
9	Socket D-Type	Port B
15	Socket High Density D-Type	Port C and STO

**Table 1: Connector Types**

The pinouts in the next sections describe the function of each pin in the Gold Tiger connectors that are listed in Table 1.







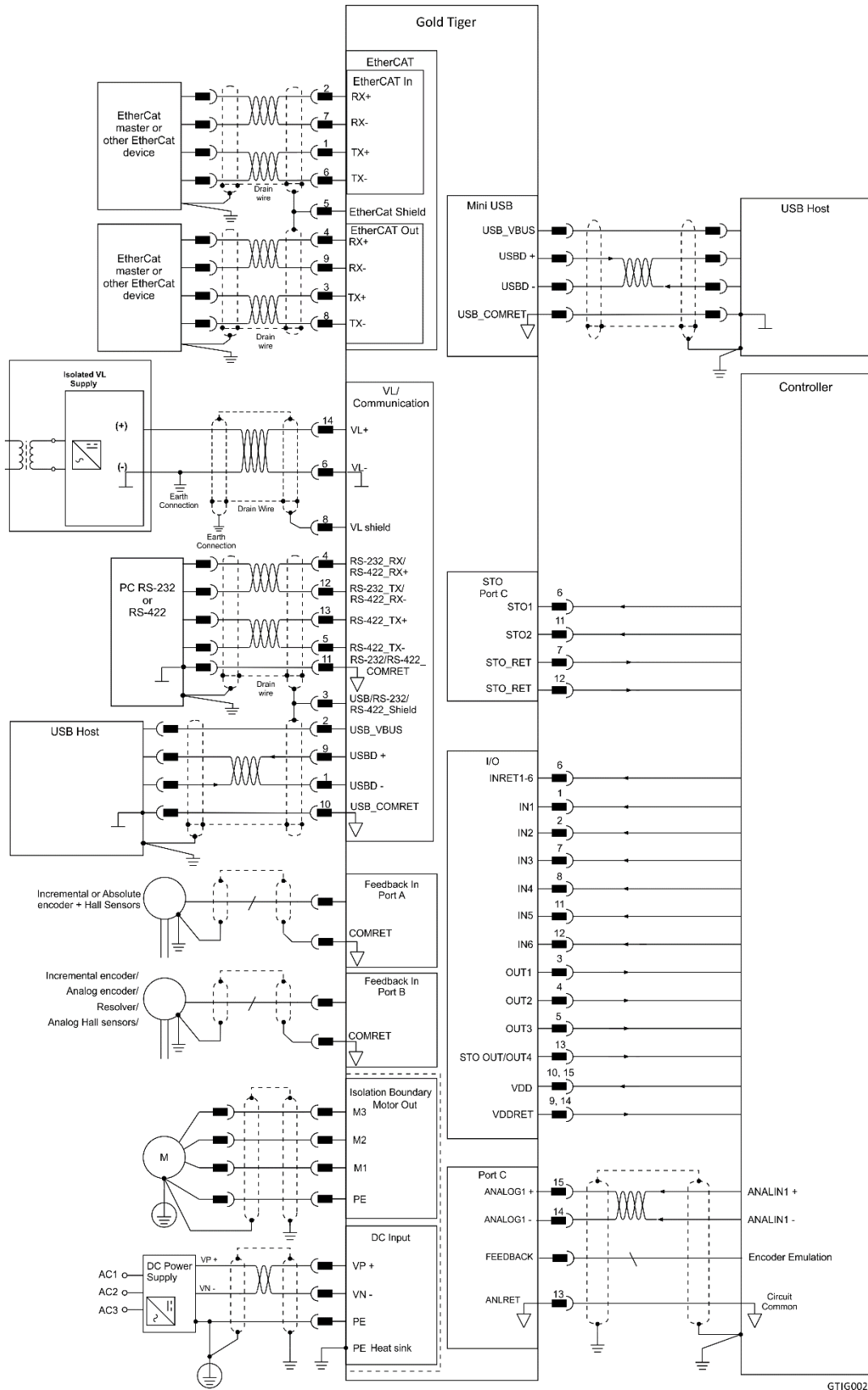
## 5.4 Connection Diagrams

There are two connection diagrams for EtherCAT and two for CAN that show the two different ways of connecting the power supply:

- 400 V and 800 V A, H, S, or T options (the catalog number has an A, H, S, or T option) that feature backup functionality and require an control 24 V backup supply. The drive will not be operative without the external 24 VDC supply.
- 400 V model without backup functionality with a 0 or 1 option. The drive's internal DC/DC converter is fed from the VP+ and VN- of the internal drive's bus line.

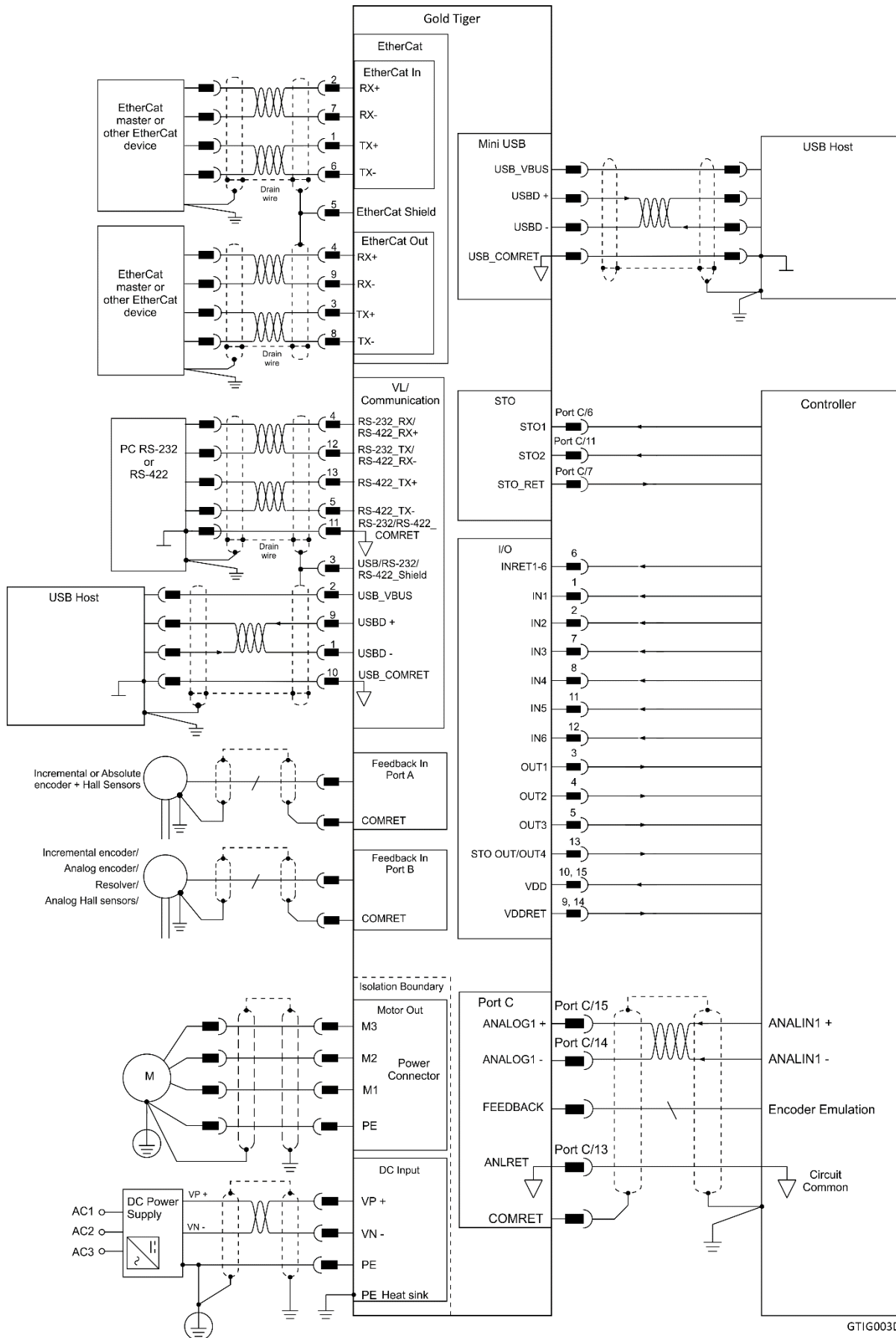
### 5.4.1 Connection Diagrams for EtherCAT Version

The following describes the connection diagrams for the EtherCAT version.



GTIG002D

Figure 3: Gold Tiger EtherCAT Connection Diagram – with Backup Functionality (A, H, S, or T Options)

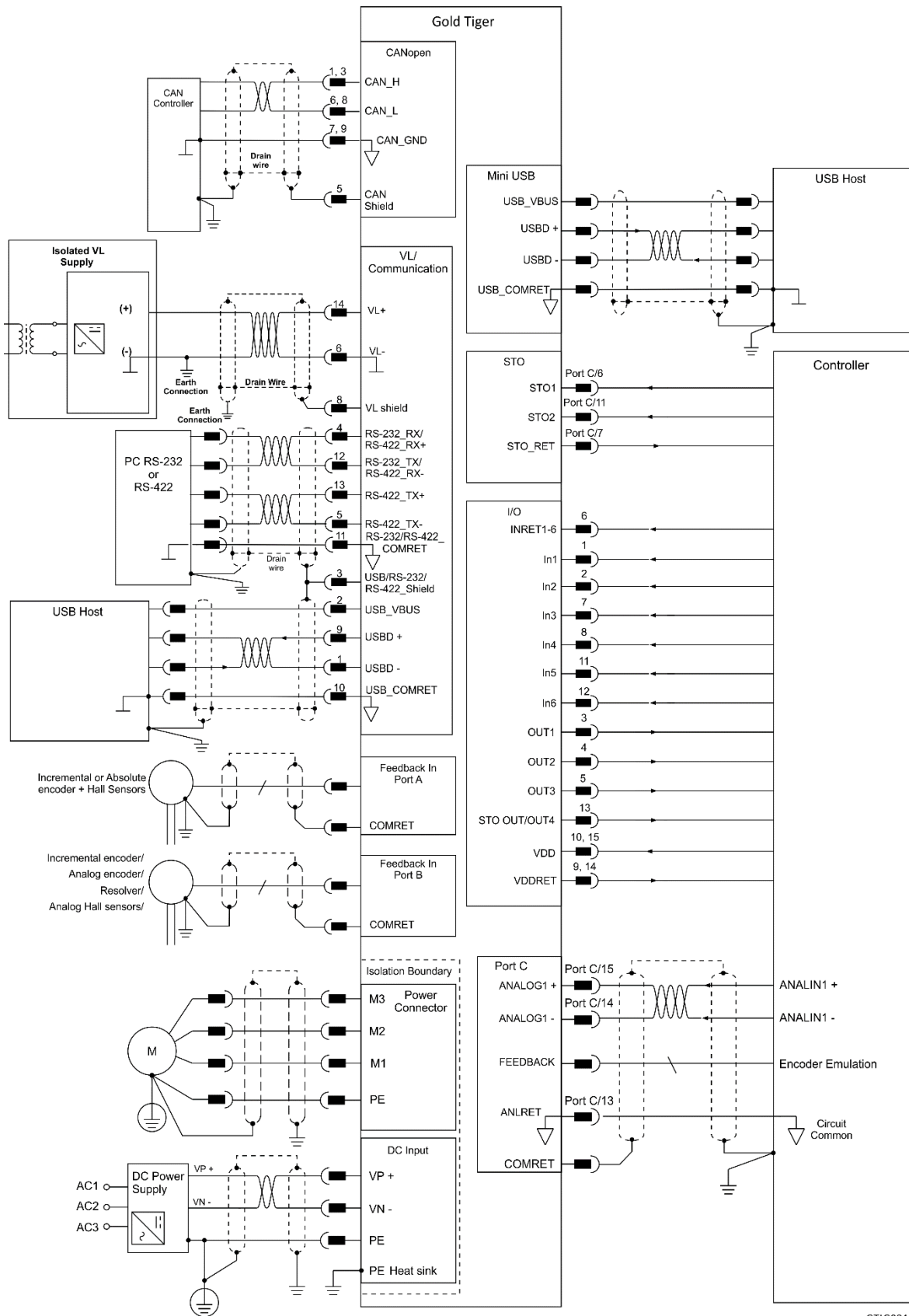


GTIG003D

Figure 4: Gold Tiger EtherCAT Connection Diagram – 400 V without Backup Functionality for Model Drives with 0 or 1 Options

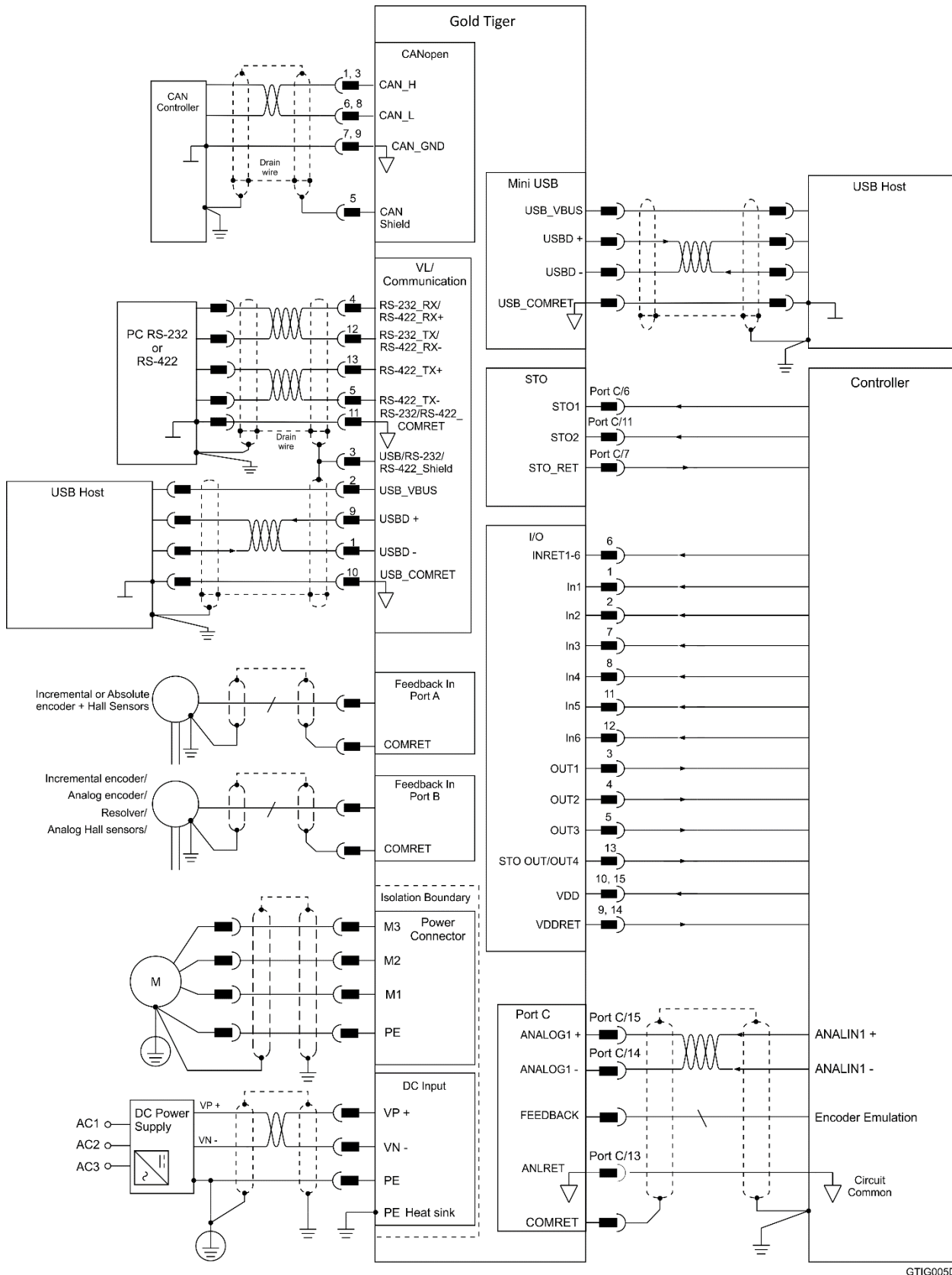
## 5.4.2 Connection Diagrams for CAN Version

The following describes the connection diagrams for the CAN version.



GTIG004D

Figure 5: Gold Tiger CAN Connection Diagram – with Backup Functionality (A, H, S, or T Options)




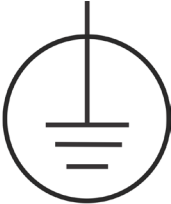
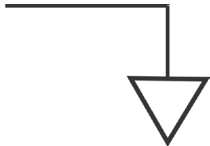
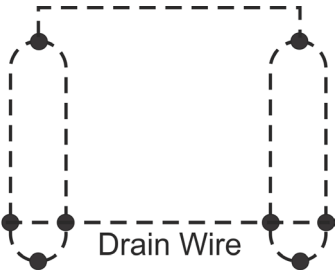
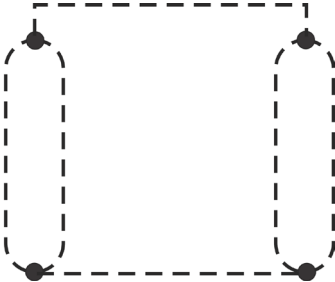
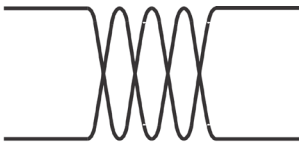
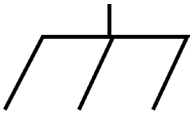
GTIG005D

**Figure 6: Gold Tiger CAN Connection Diagram – 400 V without Backup Functionality for Model Drives with 0 or 1 Options**

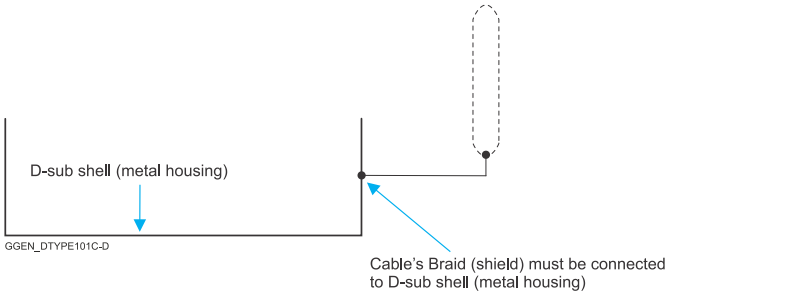
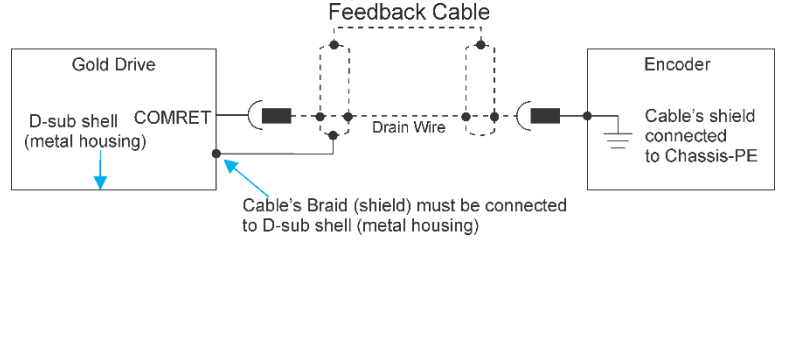
## Chapter 6: Wiring

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

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

Wiring Symbol	Description
 <p>GGEN_101D-A</p>	Earth connection (PE)
 <p>GGEN_101D-B</p>	Earth Connection
 <p>GGEN_101D-C</p>	Common at the Controller
 <p>GGEN_101D-D</p>	<p>Shielded cable with drain wire.</p> <p>The drain wire is a non-insulated wire that is in direct contact with the braid (shielding).</p> <p>Shielded cable with drain wire significantly simplifies the wiring and earthing.</p>
 <p>GGEN_101D-E</p>	Shielded cable braid only, without drain wire.
 <p>GGEN_101D-F</p>	Twisted-pair wires
 <p>GGEN_101D-K</p>	Analog Ground



Wiring Symbol	Description
 <p>D-sub shell (metal housing)</p> <p>GGEN_DTTYPE101C-D</p> <p>Cable's Braid (shield) must be connected to D-sub shell (metal housing)</p>	<p>D-type Connector: The cable's braid (Shield) must be connected to the D-sub shell (metal housing)</p>
 <p>Gold Drive</p> <p>D-sub shell (metal housing)</p> <p>COMRET</p> <p>Feedback Cable</p> <p>Drain Wire</p> <p>Encoder</p> <p>Cable's shield connected to Chassis-PE</p> <p>Cable's Braid (shield) must be connected to D-sub shell (metal housing)</p>	<p>Encoder Earthing.</p> <p>The cable's shield is connected to the chassis (PE) in the connector.</p> <p>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>





## 6.1 Basic Recommendations

### 6.1.1 General

1. Use shielded cables. For best results, the cable should have an aluminum foil shield covered by copper braid, and should contain a drain wire.  
Use 24, 26 or 28 AWG twisted-pair shielded with drain wire cables.
2. Keep the cable as short as possible.  
Do not mount the power cables of the motor and power bus in the proximity of the control and feedback cables.
3. Ensure that in normal operating conditions, the “earth connection” wires and shield of the control cables *carry no current*. The only time these conductors carry current is under abnormal conditions, when electrical equipment has become a potential shock or fire hazard while conducting external EMI interferences directly to ground, in order to prevent them from affecting the drive. Failing to meet this requirement might result in drive/controller/host failure.
4. After completing the wiring, carefully inspect all wires to ensure tightness, good solder of joints and general safety.

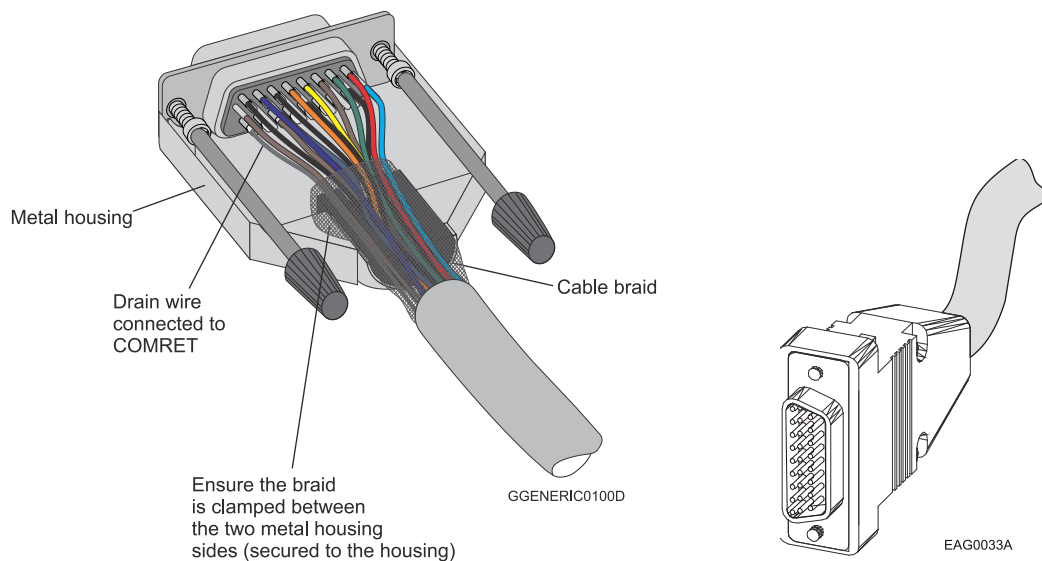


Figure 7: D-Type Cable Assemblies

5. Use only a D-Sub connector with a **metal housing** (Figure 7).
6. Make sure the braid shield is in tight contact with the metal housing of the D-type connector (Figure 7).

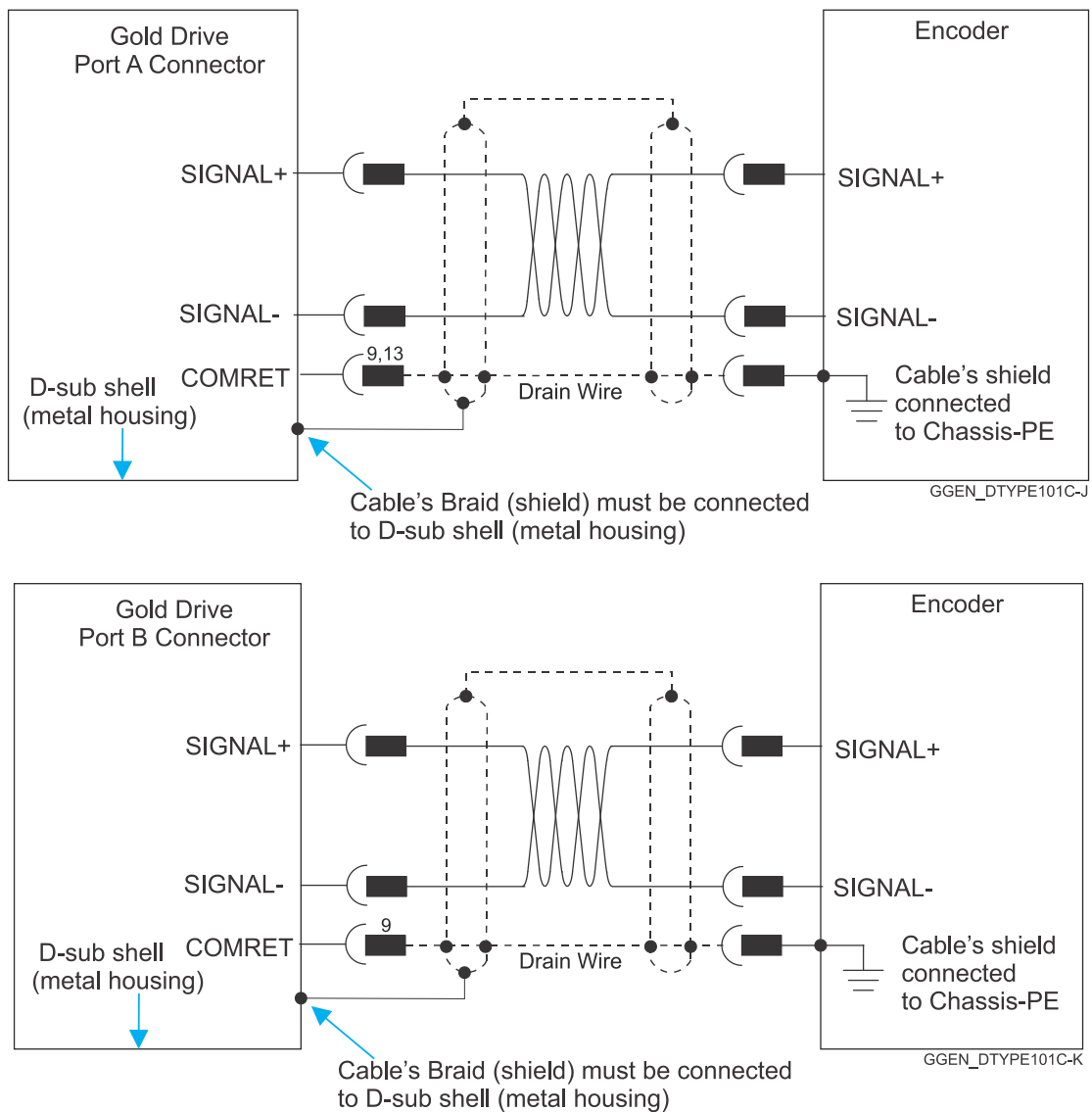
### 6.1.2 Feedback Cable Port A and Port B Connector

1. On the motor side connections, ground the shield to the motor chassis.
2. At least One COMRET (Common Return) must be connected to the PE.

Implement the following steps to connect the COMRET to the PE:

- a. At the drive, connect the feedback drain wire to one of the COMRET terminals in the D-Type feedback connector (Figure 8).
- b. At the motor, connect the feedback cable drain wire to the GND motor chassis terminal of the feedback connector.

The drawings below display two earth connections.



**Figure 8: Feedback Port A and B Cable Assemblies**

### 6.1.3 Feedback Cable Port C Connector

1. At the controller side connections, follow the controller manufacturer's recommendations concerning the shield.
2. The connection of the Drain wire to the Port C is not mandatory.

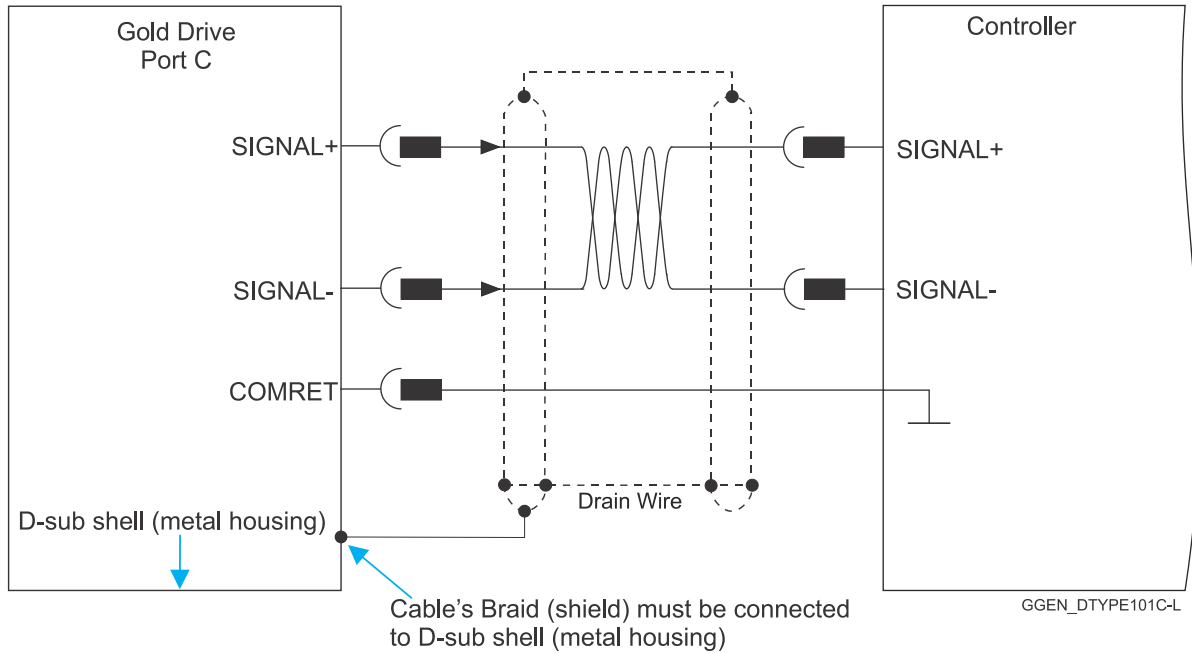


Figure 9: Feedback Port C Cable Assemblies

### 6.1.4 IO Cable Connector

It is recommended to use shielded cable, but is not mandatory.

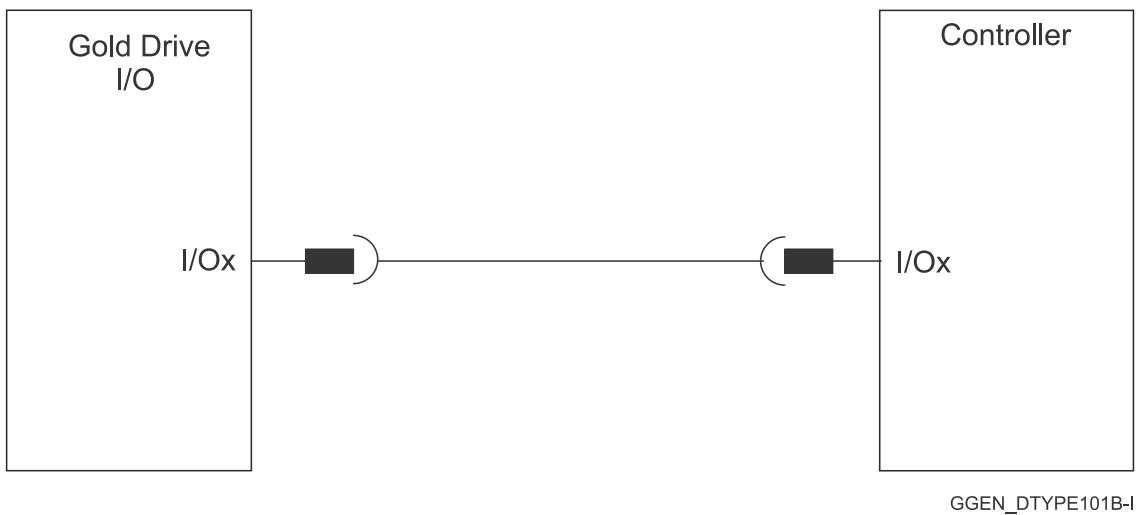


Figure 10: Feedback IO Cable Assemblies



### 6.1.5 STO (Port C) Cable Connector

It is recommended to use shielded cable, but is not mandatory.

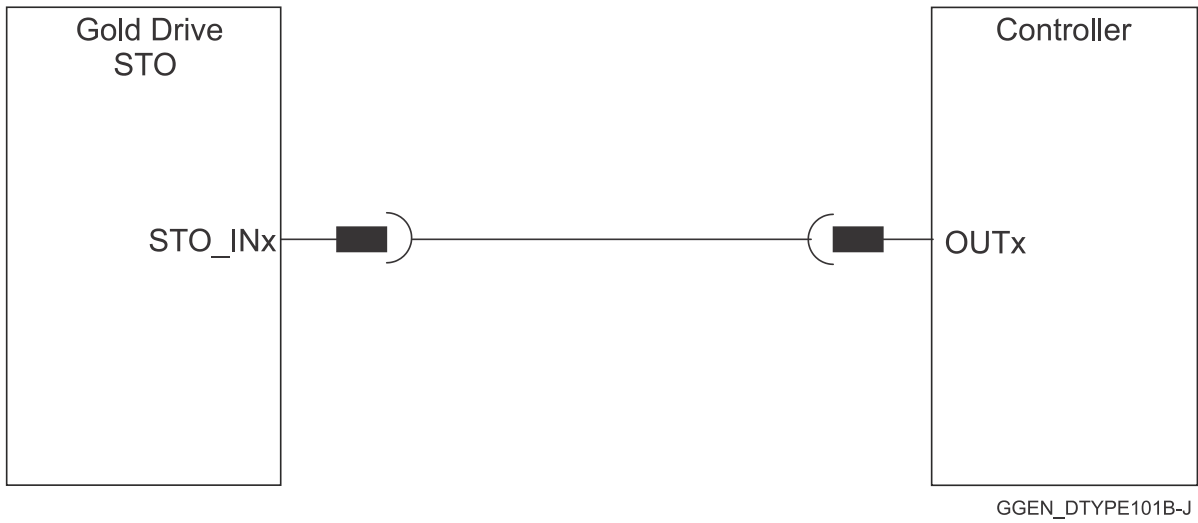


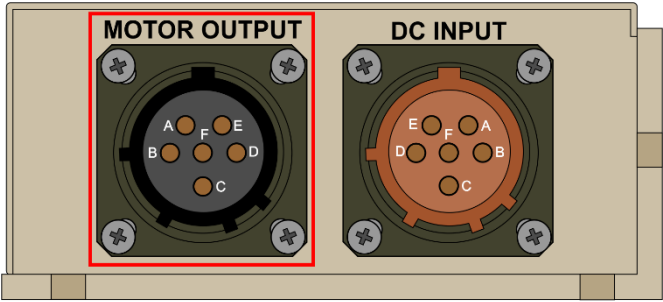
Figure 11: STO Cable Assemblies

## 6.2 Motor Power Connector Pinouts

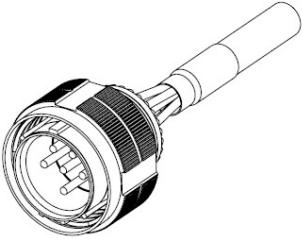
See Chapter 8 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Signal	Function	Cable	
<b>MOTOR OUTPUT CONNECTOR</b>			<b>Brushless Motor</b>	<b>Brushed DC Motor</b>
A	M1	Motor phase	Motor	Motor
B	M2	Motor phase	Motor	Motor
C	M3	Motor phase	Motor	N/C
D	PE	Protective Earth	Motor	Motor
E		Not Connected		
F		Not Connected		



**6-Pin Amphenol Motor Output Female Connector**  
GTIG027C-A



**6-Pin Amphenol Male Connector (D38999/26WE6PN)**

Table 2: Connectors for Motor

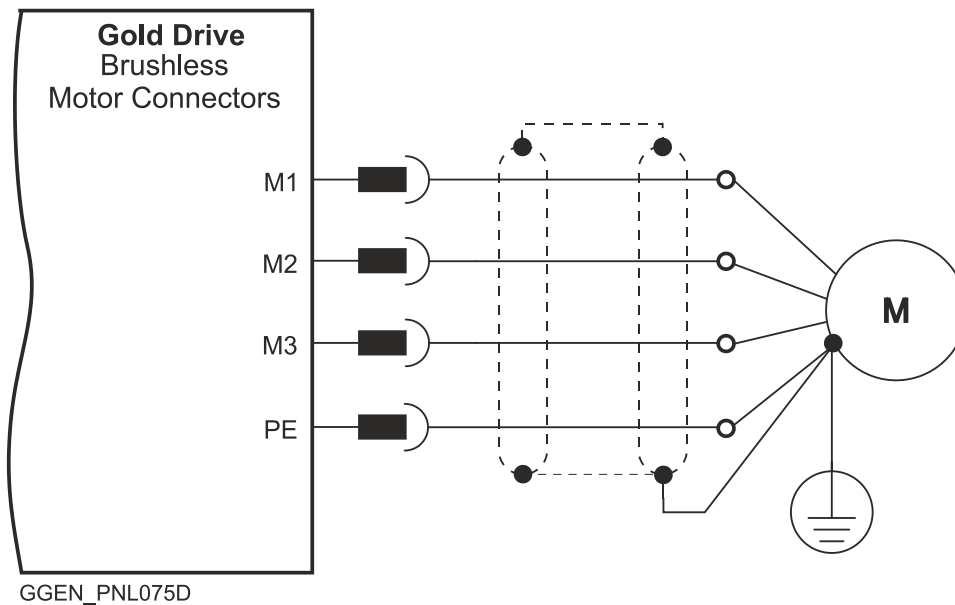


Figure 12: Brushless Motor Power Connection Diagram

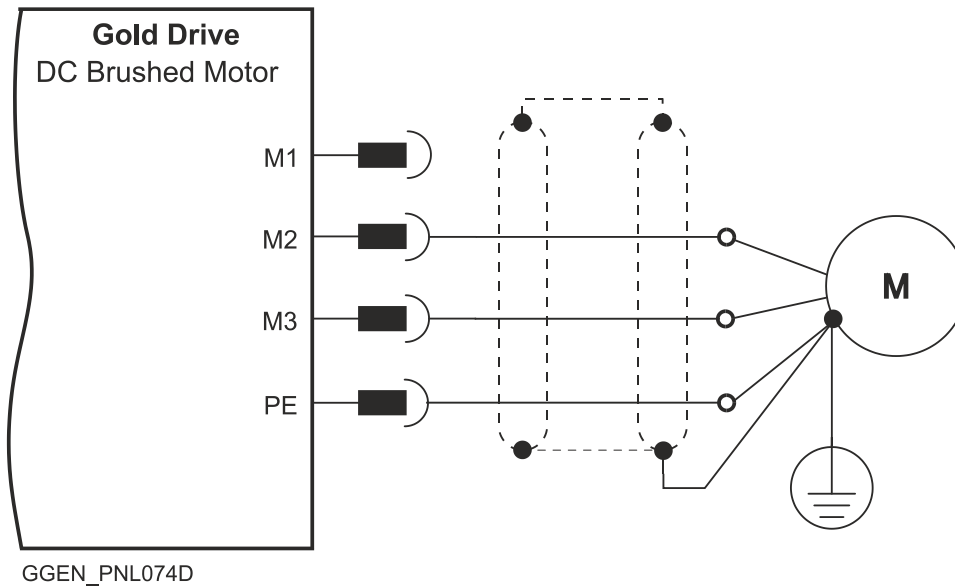


Figure 13: Brushed Motor Power Connection Diagram

### 6.2.1 Motor Power

To power the drive, connect the M1, M2, M3, and PE pins on the Gold Tiger. The phase connection is arbitrary as Elmo Application Studio (EASII) 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.

- For best immunity, it is highly recommended to use a 4-wire shielded (not twisted) cable for the motor connection. The gauge is determined by the actual 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 Protective Earth (PE terminal). Connect the Braid wire to the PE terminal on the motor connector.
- Ensure that the motor chassis is properly grounded.

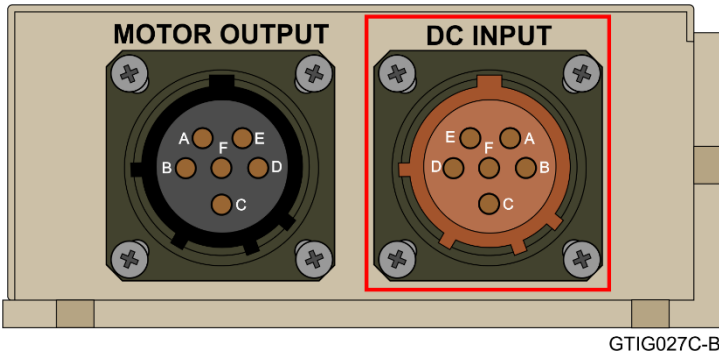
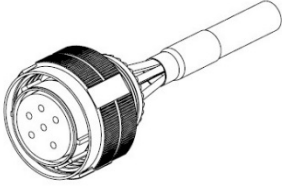
### 6.3 Main Power

The Gold Tiger receives power from main and control supplies and delivers power to the motor.

See Chapter 8 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Signal	Function	Cable
<b>DC INPUT CONNECTOR</b>			
A	VP+	DC Positive Power input	DC Power
B	VN-	DC Negative Power input	DC Power
C	PE	Protective Earth	DC Power
D		Not Connected	
E		Not Connected	
F		Not Connected	

 <p style="text-align: center;">GTIG027C-B</p> <p style="text-align: center;"><b>6-Pin Amphenol DC Input Male Connector</b></p>	 <p style="text-align: center;"><b>6-Pin Amphenol Female Connector (D38999/26WE6SA)</b></p>
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**Table 3: Connectors for Main Power**

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

The following sections contain topology recommendations for implementing three-phase and a single-phase supply chains.

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

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

However, as well as operating from a non-isolated/direct-to-mains DC power supply, the Gold Tiger can also operate from an isolated power supply or batteries.





When rectifying an AC voltage source, the AC voltage level must be limited to the following:

VDC Drive	To not exceed Max VDC	AC Voltage Level
400	390	270
800	747	528
900	840	594

### 6.3.1 Direct-to-Mains Power Source

This section relates to the configuration of the power supply and drive, which are connected directly to the mains.

**To connect the non-isolated DC power supply:**

1. For best noise immunity, a shielded (not twisted) cable is recommended (not mandatory) for the DC input cable.
2. A 3-wire shielded cable should be used:
  - a. Connect the main input cable to the VP+ and VN- terminals of the main input connector.
  - b. For safety requirements, the green/yellow-wire must be connected to the earth connection (PE terminal). Connect the Earth Connection wire to the PE terminal on the main DC connector.
  - c. For better EMI performance, the shield should be connected to Earth Connection (PE).
3. The gauge of the cable strands is determined by the actual current of the drive.



**Caution For all the following Topologies:**

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

#### 6.3.1.1 Three-Phase Direct-to-Mains Connection Topology

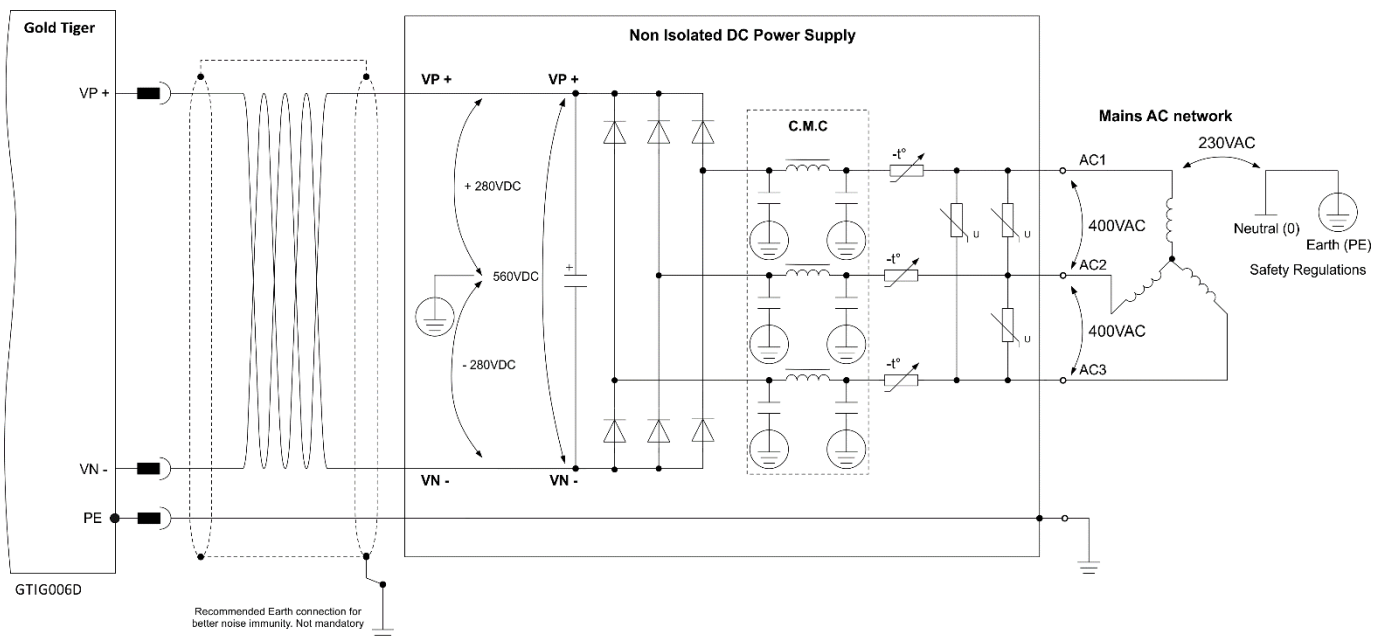


Figure 14: Non-Isolated Three-Phase Connection Topology



### 6.3.1.2 Single-Phase Direct-to-Mains Connection Topology

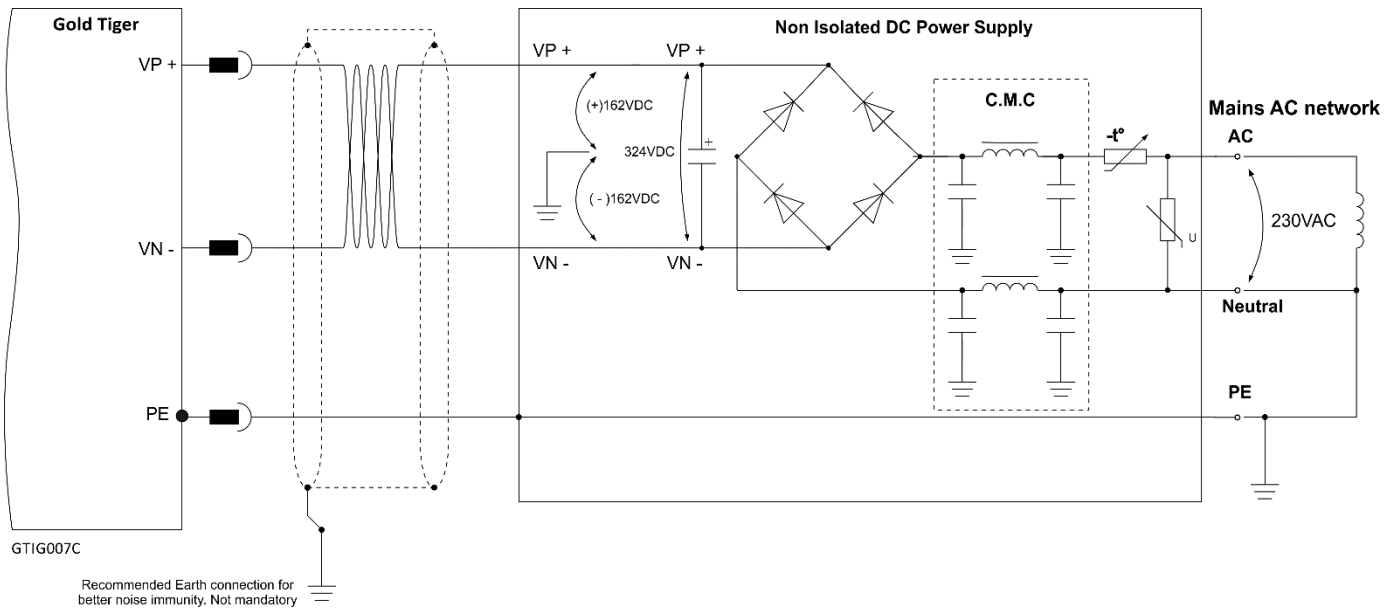


Figure 15: Non-Isolated Single-Phase Connection Topology

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

### 6.3.1.2.a Multiple Connections Topology

In a multi-axis application it is likely that a single power supply can feed several drives in parallel. The power supply is connected directly to the mains AC line and it feeds more than one drive.

This topology is efficient and cost saving, by reducing the number of power supplies and the amount of wiring. Most importantly it utilizes an energy sharing environment among all the drives that share the same DC bus network.

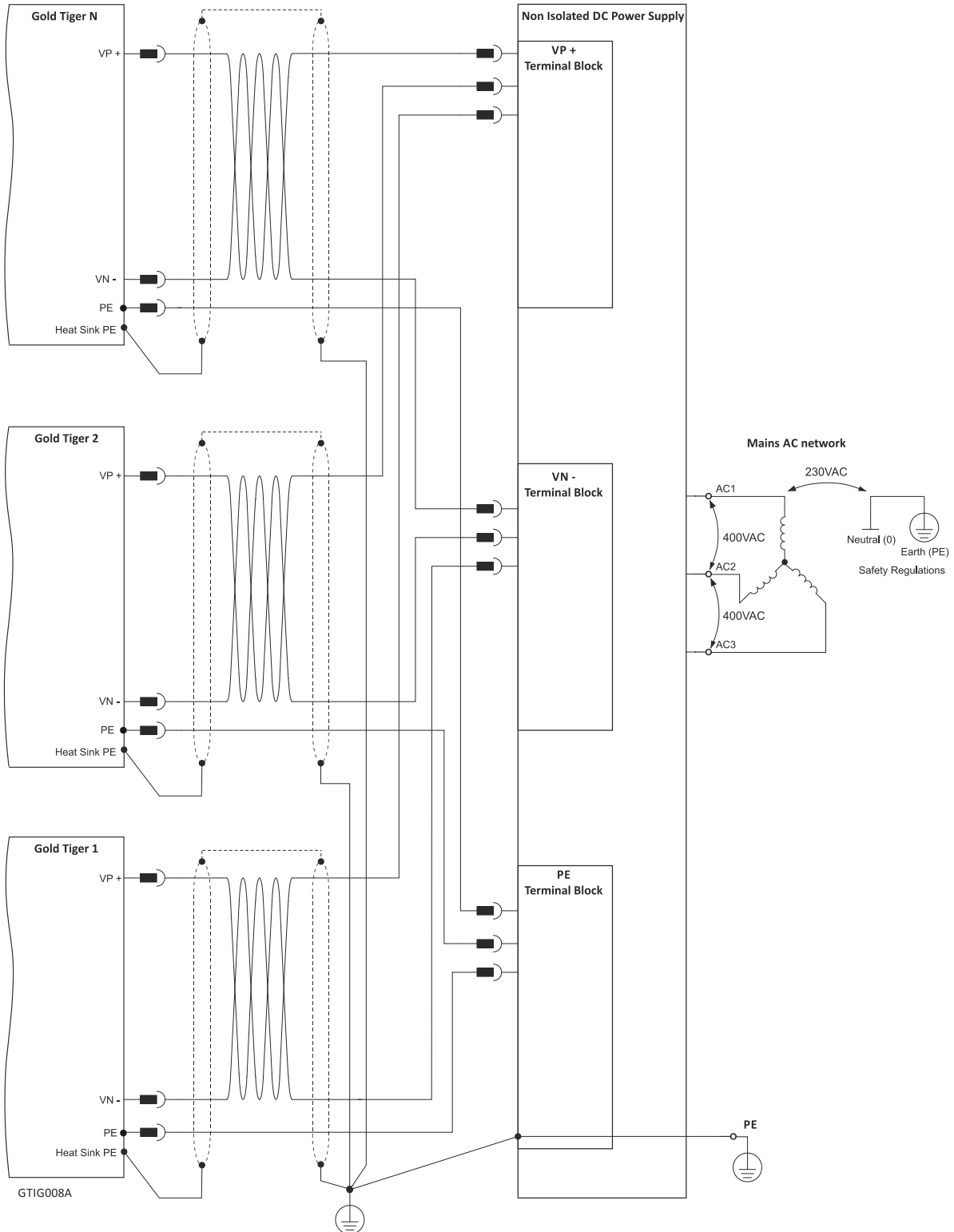


Figure 16: Non-Isolated Three-Phase Multiple Connection Topology



### 6.3.2 Battery Power Supply

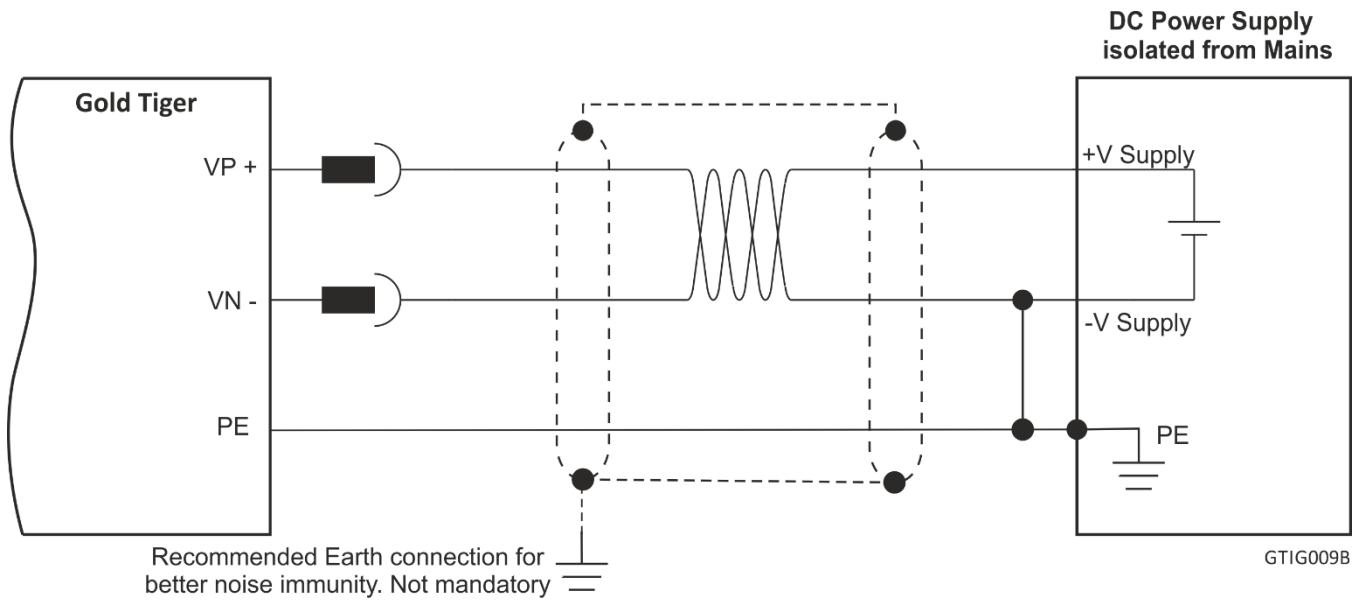


Figure 17: Battery Connection Topology



**Caution:** When using batteries, it is recommended to connect the negative pole to the PE.

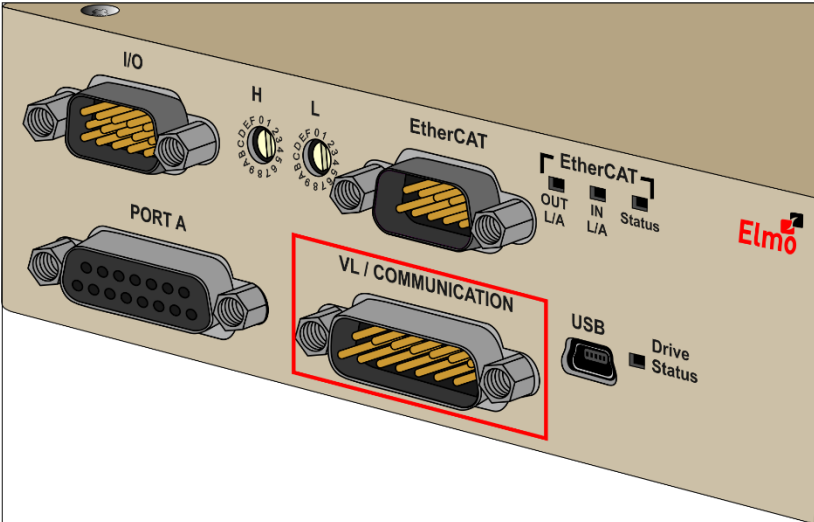
When doing so, the charger of the battery **must** be isolated from the mains by an isolation transformer.

## 6.4 Control Power

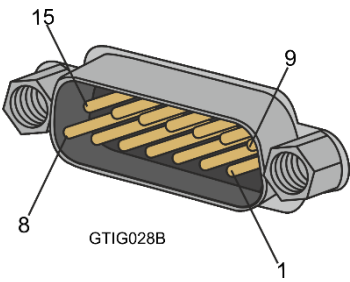
Optional Backup Supply in A, H, S, or T option drives.

See Chapter 8 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Signal	Function	Cable
<b>A, H, S, or T option type</b>			
14	VL+	+24 V Control Supply Input Positive	DC Power
6	VL-	24 V RET Control Supply Input Return	DC Power
8	VL Shield	Drain wire cable	

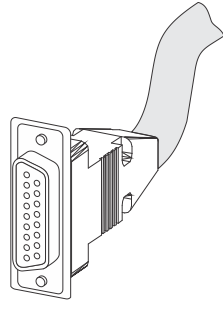


GTIG021B-D



GTIG028B

**15-Pin D-Type Male Connector**



GEAGHV022A

**15-Pin D-Type Female Connector**

**Table 4: Control Power Connector**

In drives that have a 0 or 1 Option (only for 400 V model) in the catalog number, a smart control-supply algorithm enables the Gold Tiger to operate with the main power supply only, *with no need for an control supply voltage to supply the drive's logic section.*

**Note** that in such a model there is no backup ability at all.

If backup functionality is required to store control parameters in the event of a mains power outage, then an A, H, S, or T options Gold Tiger should be used, with an external 24 VDC isolated supply connected to it.

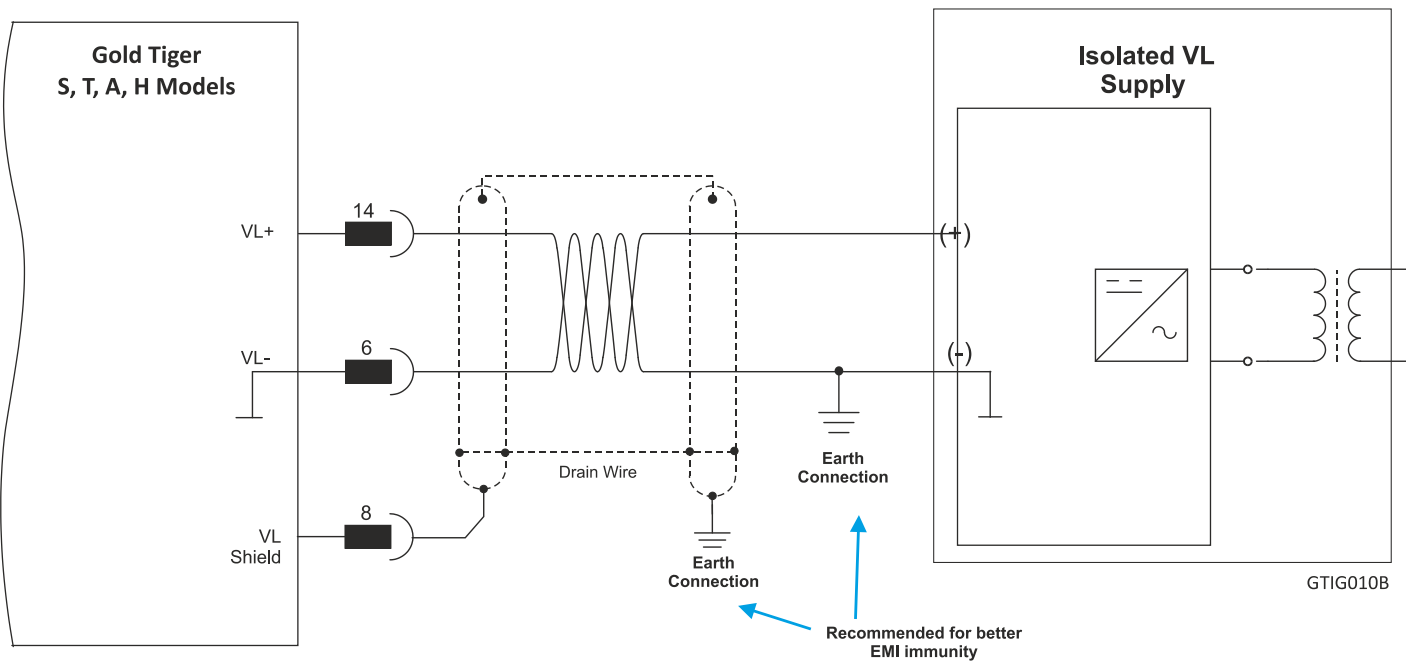
Note that the A, H, S, or T options Gold Tiger always requires an external 24 VDC power supply, regardless of whether or not backup functionality is required.



Connect the control 24 VDC power supply as described below.

**To connect the 24 VDC backup supply:**

1. Use a 24 AWG twisted pair shielded cable. The shield should have copper braid.
2. The source of the 24VDC backup supply must be isolated with an isolation transformer.
3. For safety and EMI reasons, connect the return of the 24 VDC backup supply to the closest ground (PE).
4. Connect the cable shield to the closest ground (PE) near the power source.
5. Connect the drain wire to the VL Shield connection.
6. Before applying power, first verify that the polarity of the connection is correct.



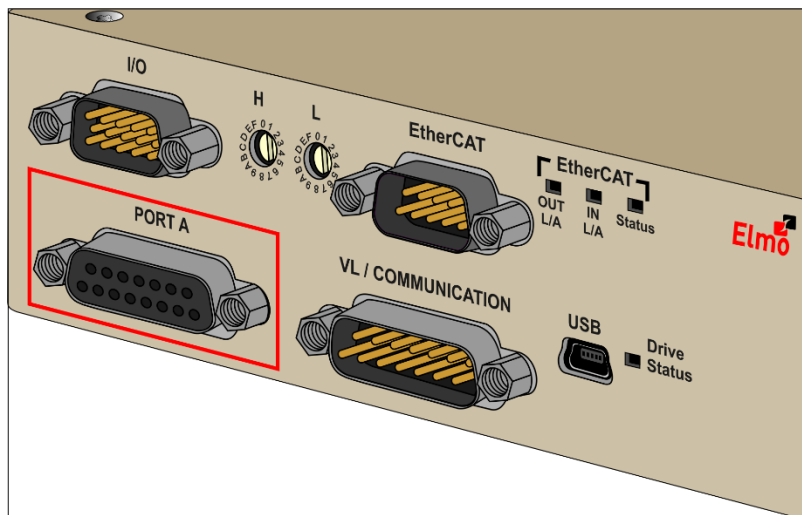
**Figure 18: Control 24 VDC Backup Supply Connection Diagram**

## 6.5 Port A

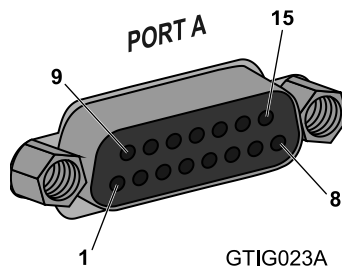
See Section 10.3 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Incremental Encoder			Absolute Serial Encoder	
Pin on Port A	Signal	Function	Signal	Function
12,4	+5V	Encoder +5V supply	+5V	Encoder +5V supply
3,9,11,13	COMRET	Common return	COMRET	Common Return
6	PortA_ENC_A+	Channel A+	ABS_CLK+	Abs encoder clock +
5	PortA_ENC_A-	Channel A-	ABS_CLK-	Abs encoder clock -
15	PortA_ENC_B+	Channel B+	ABS_DATA+	Abs encoder data +
14	PortA_ENC_B-	Channel B-	ABS_DATA-	Abs encoder data -
8	PortA_ENC_INDEX+	Index+	Reserved	Reserved
7	PortA_ENC_INDEX-	Index-	Reserved	Reserved
2	HA	Hall sensor A	HA	Hall sensor A
10	HB	Hall sensor B	HB	Hall sensor B
1	HC	Hall sensor C	HC	Hall sensor C

### Pin Positions

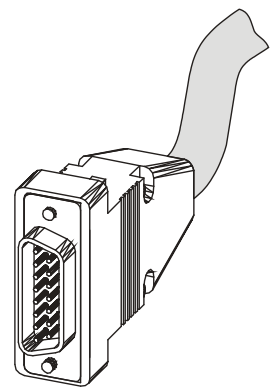


GTIG021B-C



GTIG023A

15-Pin D-Type Female Connector



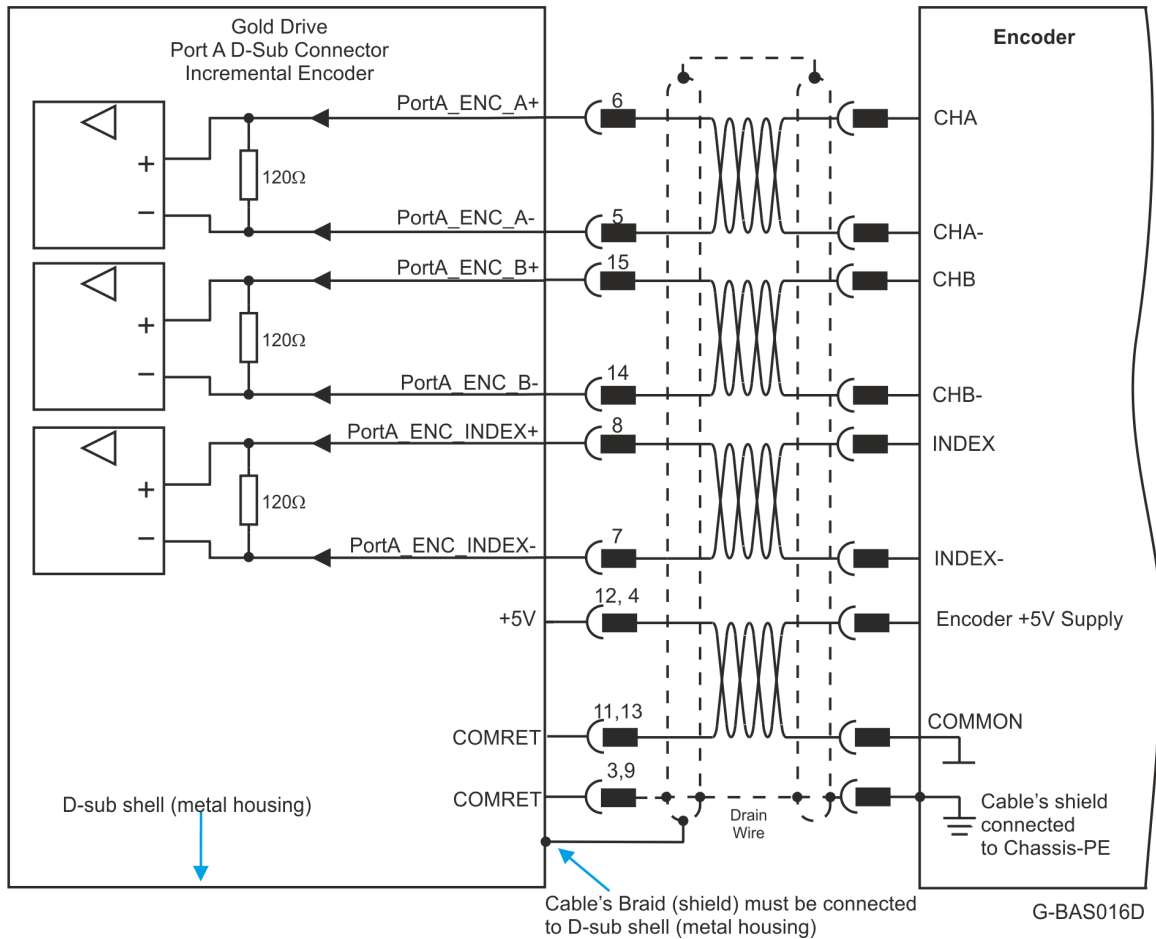
15-Pin D-Type Male Connector

Table 5: Port A Pin Assignments



### 6.5.1 Incremental Encoder

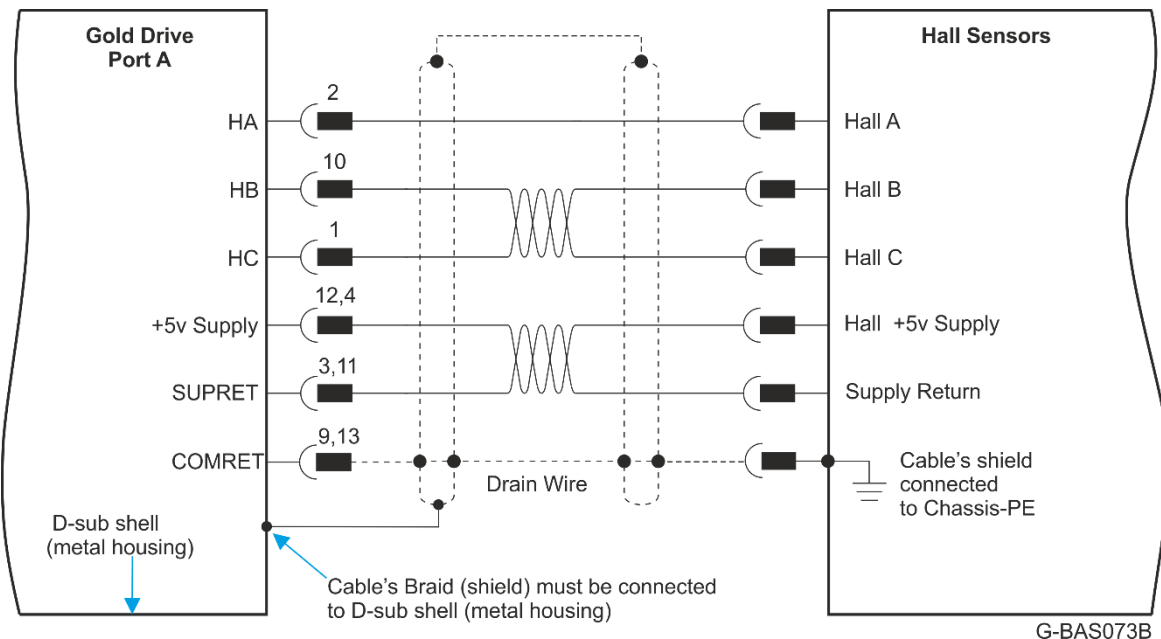
The following figure describes the connections at Port A for the Incremental encoder.



**Figure 19: Port A D-Type Incremental Encoder Input – Recommended Connection Diagram**

### 6.5.2 Hall Sensor

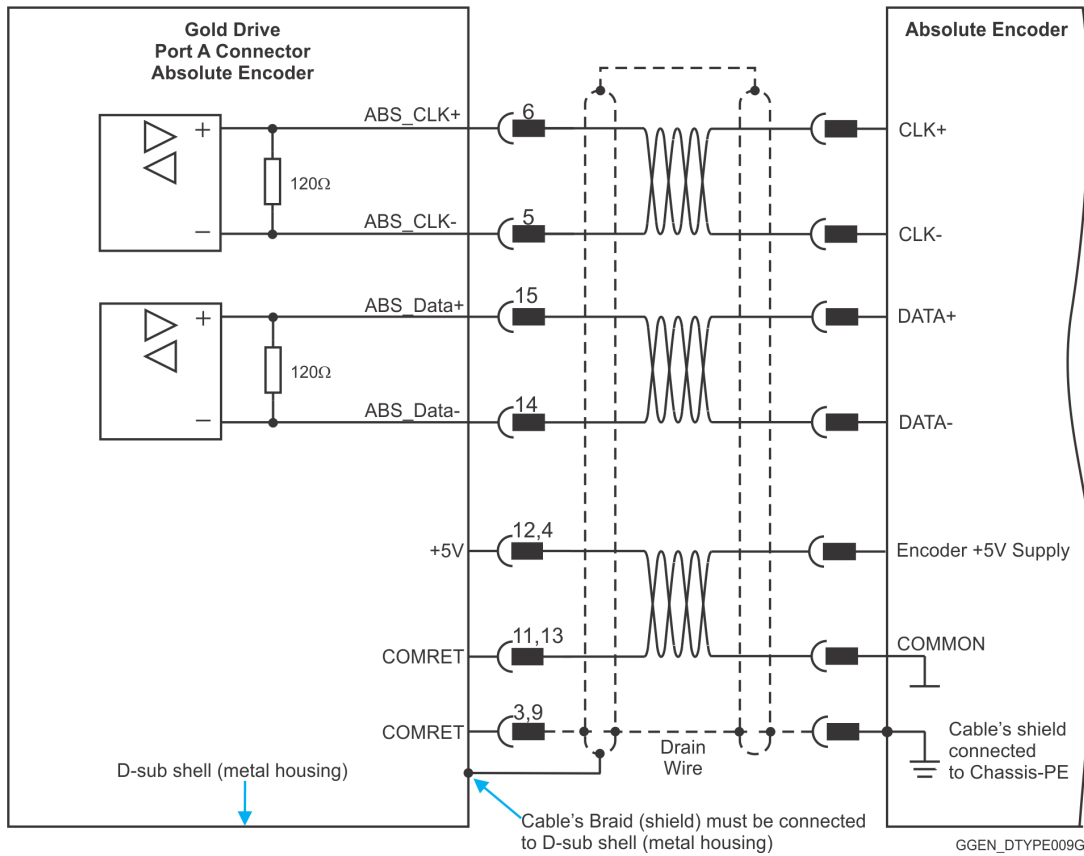
The following figure describes the connections at Port A for the Hall Sensor.



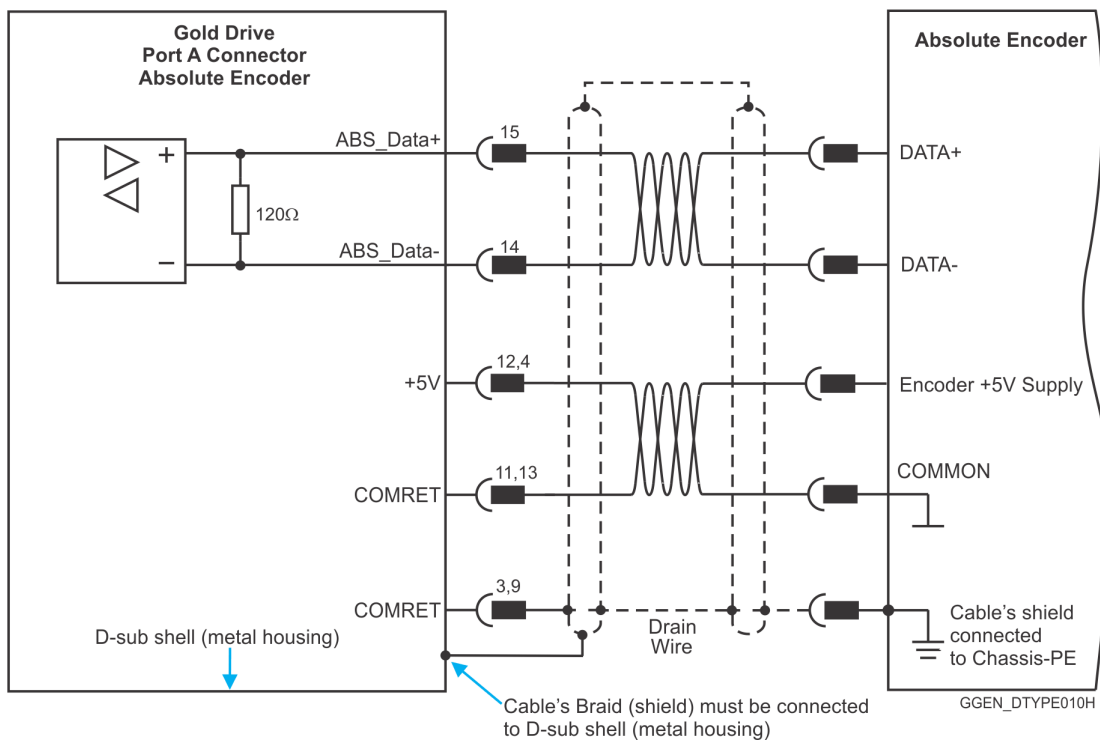
**Figure 20: Hall Sensor Connection Diagram**

### 6.5.3 Absolute Serial Type Encoder

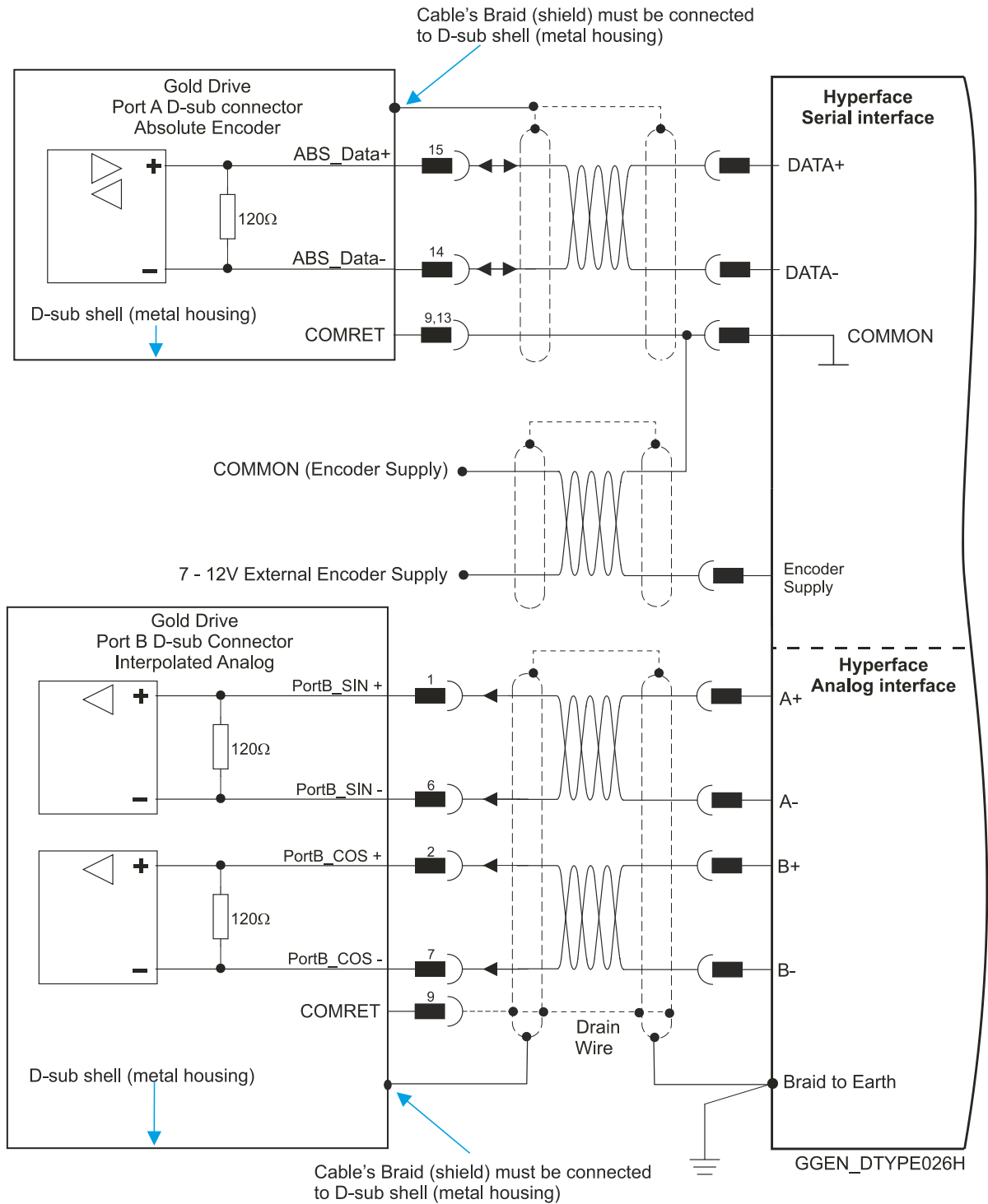
The following figures describe the connections at Port A for the Absolute Serial type encoders.



**Figure 21: Absolute Serial Encoder – Recommended D-Type Connection Diagram for EnDAT, Biss, and SSI**



**Figure 22: Absolute Serial Encoder – Recommended D-Type Connection Diagram for Sensors Supporting Data Line Only (NRZ types, e.g., Panasonic / Mitutoyo / Sanyo Danki / Tamagawa)**



**Figure 23: Absolute Serial Encoder – Recommended D-Type Connection Diagram for Stegmann Hiperface**

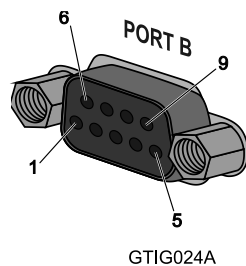
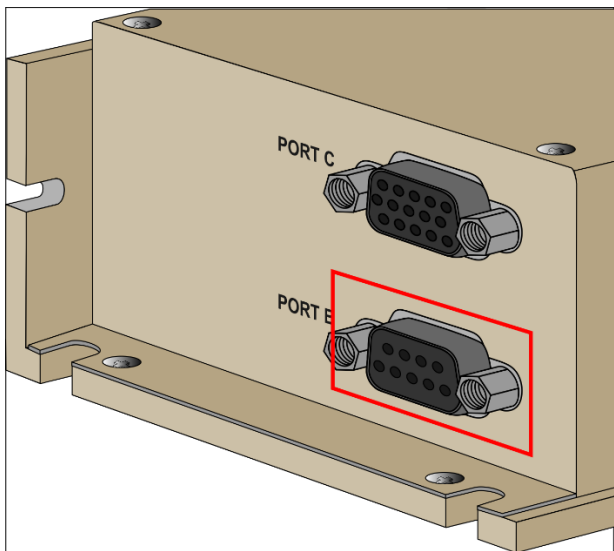
**Note:** When the Hiperface protocol is used, the RS-232 connection is not available.

## 6.6 Port B

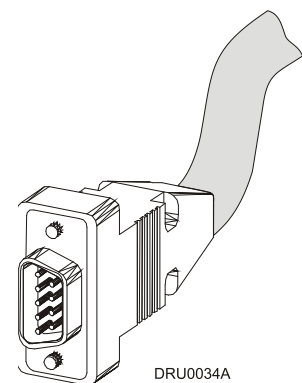
See Section 10.4 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Incremental or Interpolated Analog Encoder			Resolver	
G-TIGXXX/YYYYEX			G-TIGXXX/YYYYRX	
Pin on Port B	Signal	Function	Signal	Function
4	+5V	Encoder +5V supply	NC	
5,9	COMRET	Common Return	COMRET	Common Return
1	PortB_ENC_A+/SIN+	Incremental Encoder A+ / Sine+	SIN+	Sine+
6	PortB_ENC_A-/SIN-	Channel A- / Sine-	SIN-	Sine-
2	PortB_ENC_B+/COS+	Channel B+ / Cosine+	COS+	Cosine+
7	PortB_ENC_B-/COS-	Channel B- / Cosine-	COS-	Cosine-
3	PortB_ENC_INDEX+	Index+	RESOLVER_OUT+	Vref f=1/TS, 50 mA Max.
8	PortB_ENC_INDEX-	Index -	RESOLVER_OUT-	Vref complement f= 1/TS, 50 mA Max.

### Pin Positions



**9-Pin D-Type Female Connector**

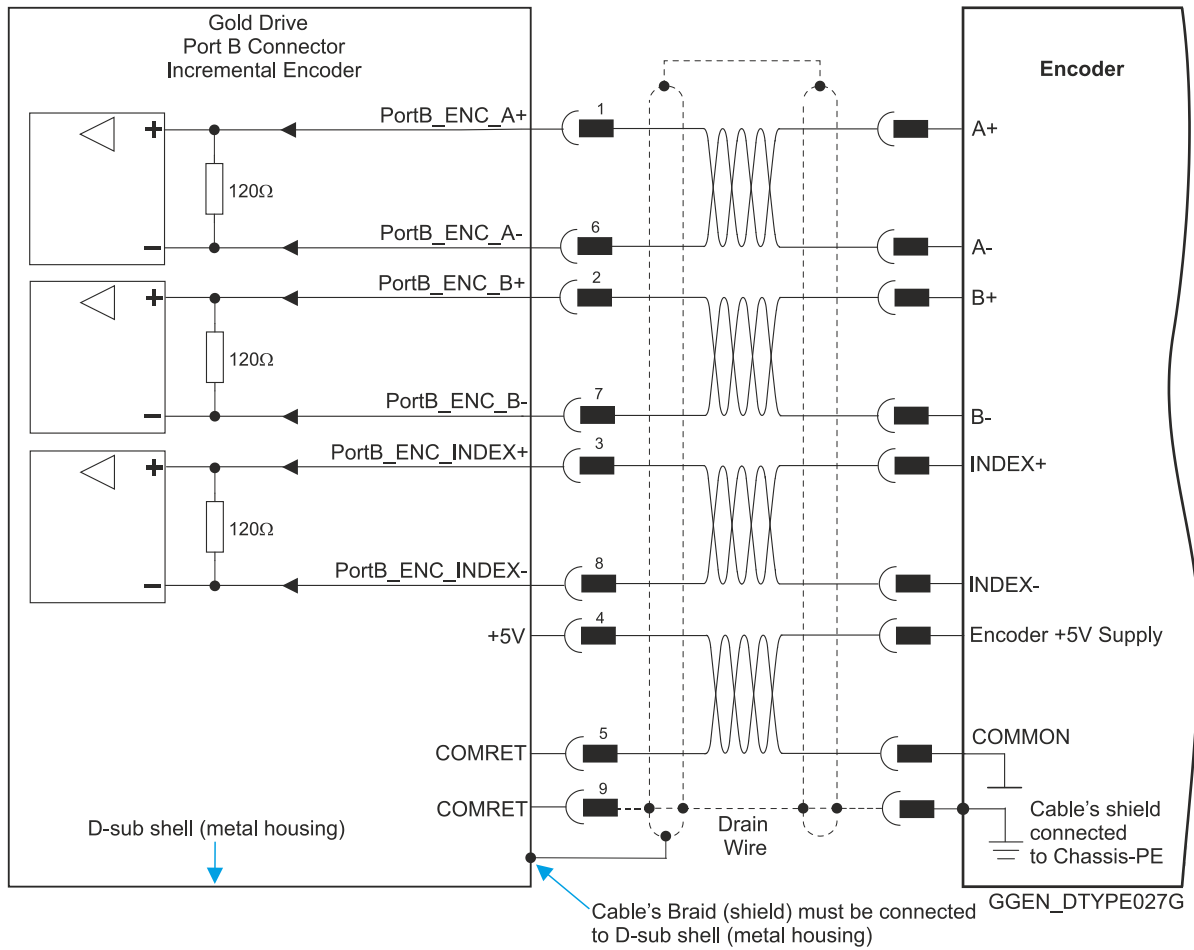


**9-Pin D-Type Male Connector**

**Table 6: Port B Pin Assignments**

### 6.6.1 Incremental Encoder

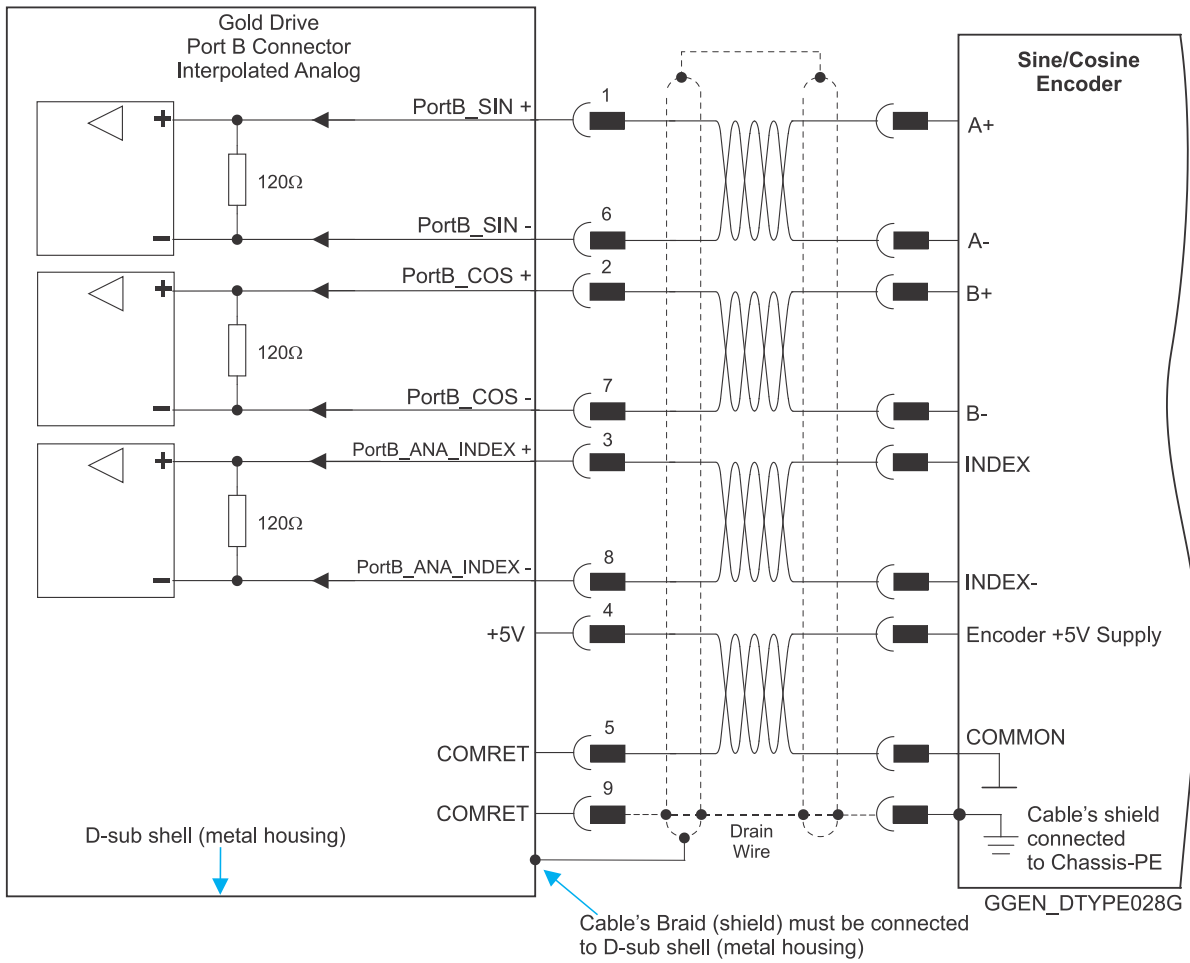
The following figure describes the connections at Port B for the Incremental encoder.



**Figure 24: Port B Incremental Encoder Input – Recommended D-Type Connection Diagram**

## 6.6.2 Interpolated Analog Encoder

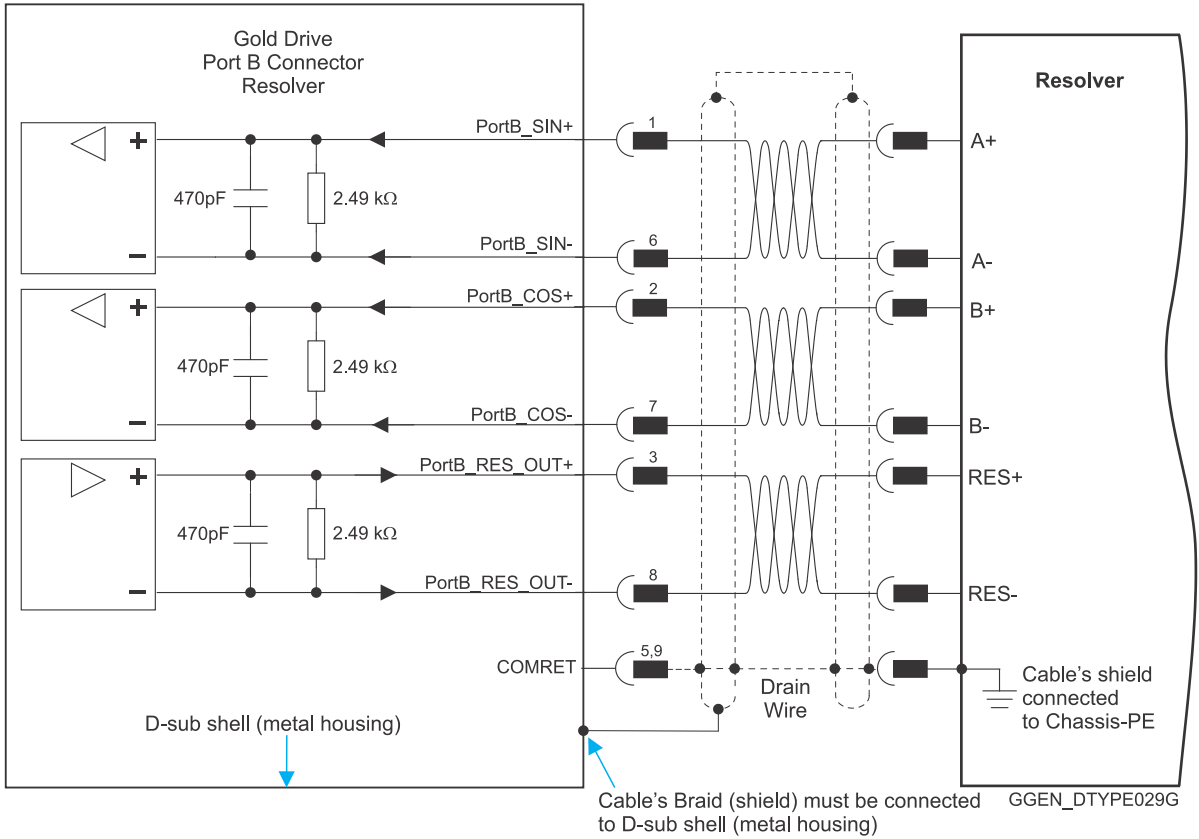
The following figure describes the connections at Port B for the Interpolated Analog encoder.



**Figure 25: Port B - Interpolated Analog Encoder D-Type Connection Diagram**

### 6.6.3 Resolver

The following figure describes the connections at Port B for the Resolver encoder.



**Figure 26: Port B – Resolver D-Type Connection Diagram**



## 6.7 Port C, Analog Input, and STO

The Port C connector includes the following functions:

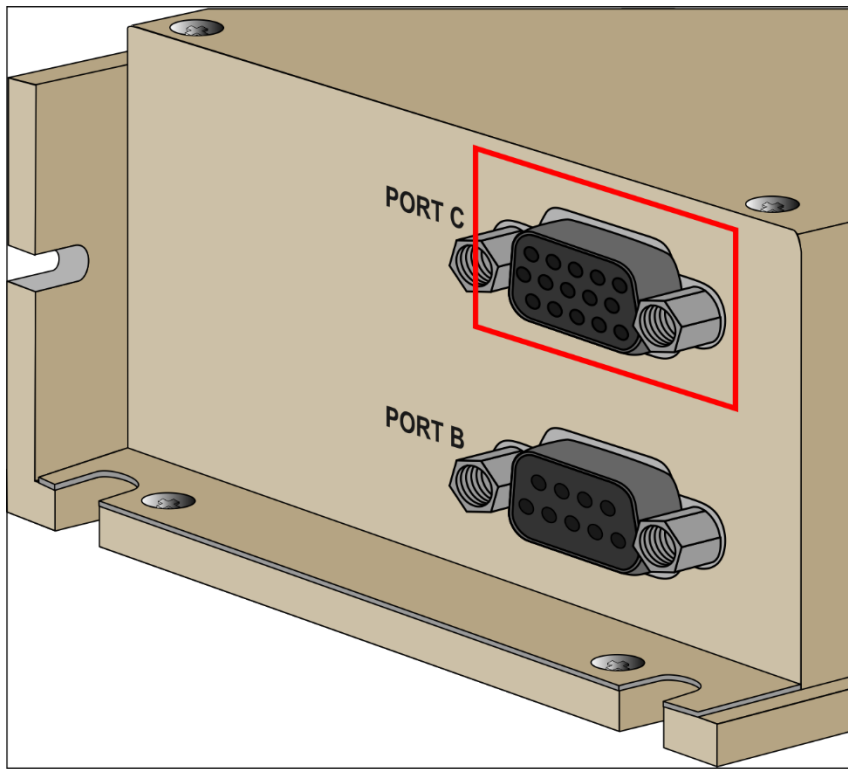
- **Port C:** Refer to Sections 10.5 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details
- **STO:** See Chapter 9 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.
- **Analog input:** See Section 11.2 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin on Port C	Signal	Function
1	PortC_ENCO_A+	Buffered Channel A+ output/Pulse+/PWM+
2	PortC_ENCO_A-	Buffered Channel A- output / Pulse- / PWM-
3	PortC_ENCO_B+	Buffered Channel B+ output / Dir+
4	PortC_ENCO_B-	Buffered Channel B- output / Dir-
5	PortC_ENCO_Index+	Buffered Channel INDEX+ output
6	STO1	STO 1 input (default 24 V)
7, 12	STO_RET	STO signal return
8	Reserved	Reserved
9	COMRET	Common return
10	PortC_ENCO_Index-	Buffered Channel INDEX- output
11	STO2	STO 2 input (default 24 V)
13	ANLRET	Analog ground
14	ANALOG1-	Analog input 1-
15	ANALOG1+	Analog input 1+

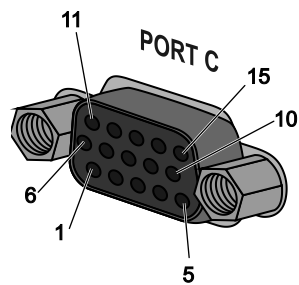




### Pin Positions

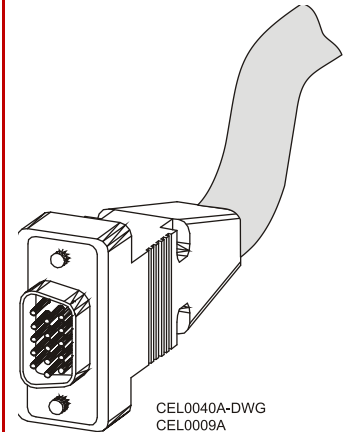


GTIG022B-A



GTIG025A

**15-Pin High Density D-Type Female Connector**

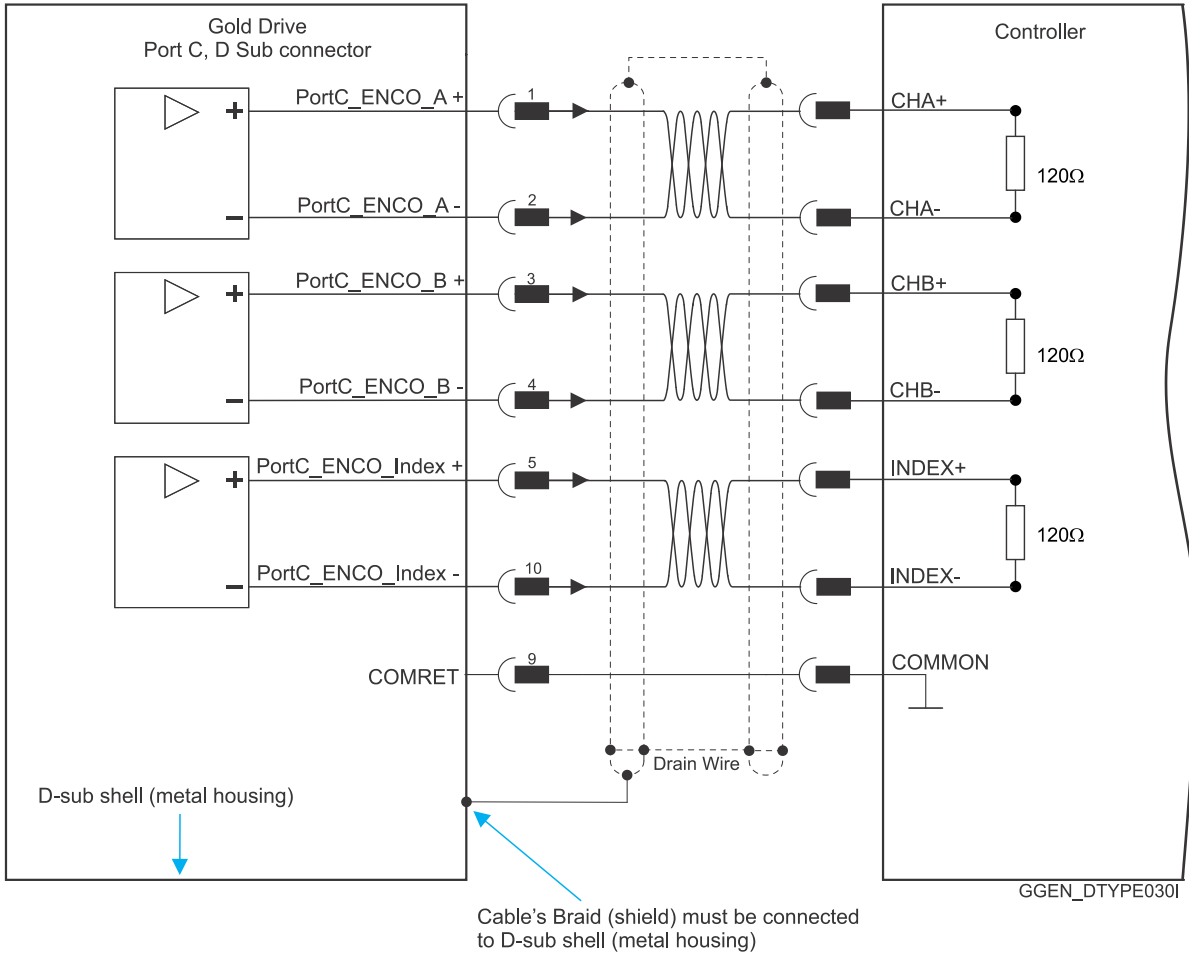


**15-Pin High Density D-Type Male Connector**

**Table 7: Port C Feedback Out, STO, and Analog Input**

### 6.7.1 Port C

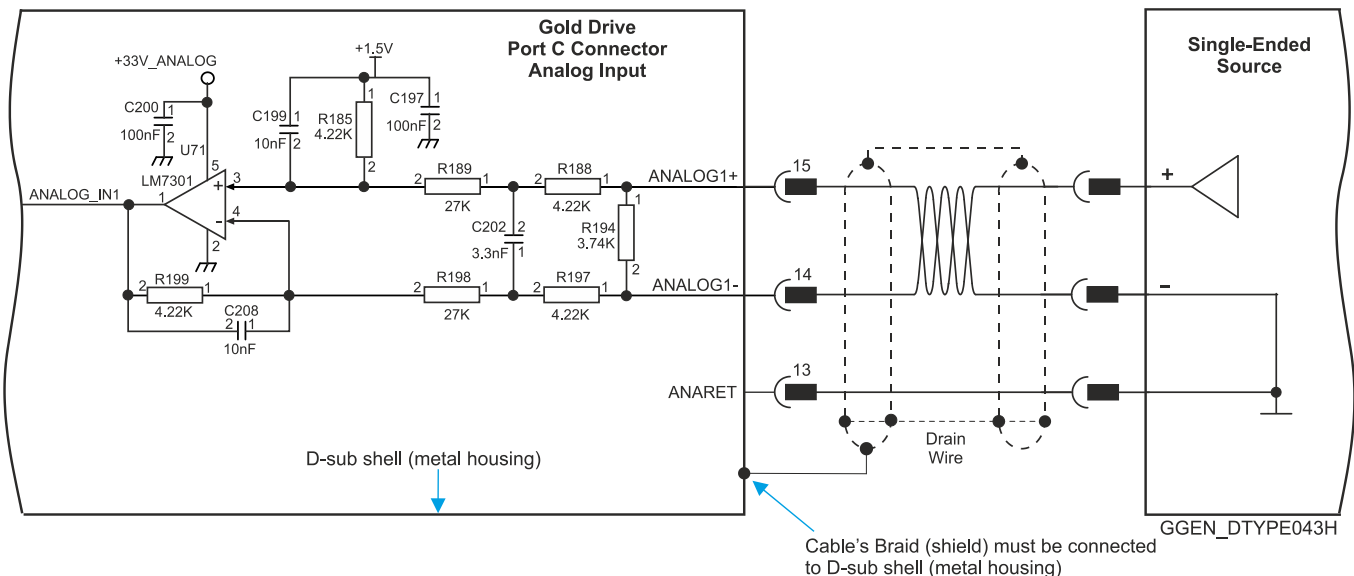
The following figure describes the connections at Port C for the Emulated Encoder Differential.



**Figure 27: Emulated Encoder Differential Output – Recommended D-Type Connection Diagram**

### 6.7.2 Analog Input

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



**Figure 28: Differential Analog D-Type Input**



### 6.7.3 STO

The following circuits describe the STO wiring options.

#### 6.7.3.1 Source Mode PLC Voltage Level

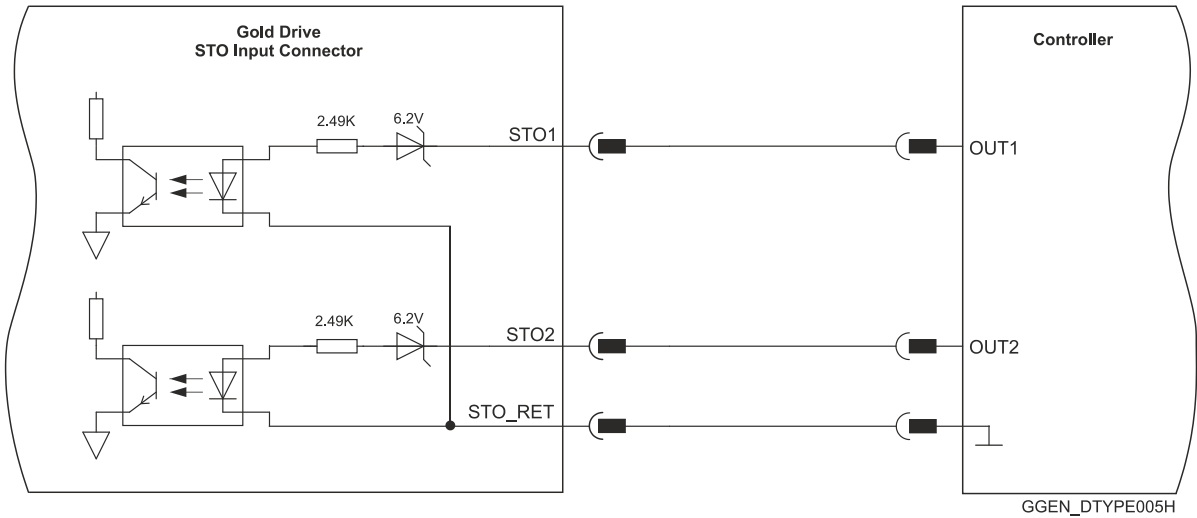


Figure 29: STO D-Type Input Connection – PLC Source Option

#### 6.7.3.2 TTL Mode TTL Voltage Level

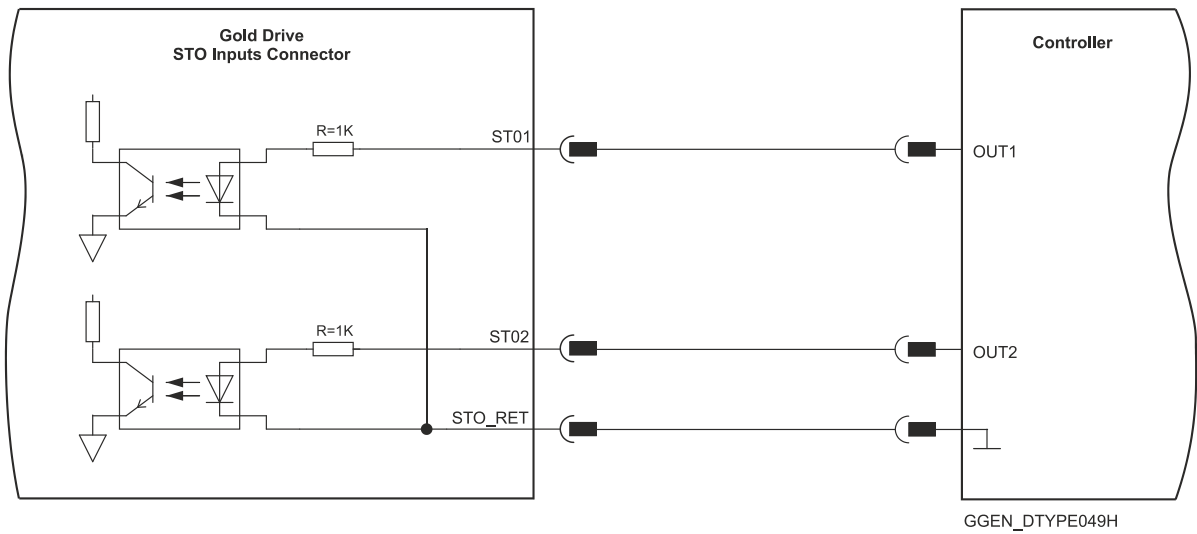


Figure 30: STO Input Connection – TTL Option



### 6.7.3.3 SINK Mode – PLC Voltage Level

Refer to the diagrams below for the PLC Sink option connections which is not fully certified for STO.  
**This option is not recommended for new designs.**

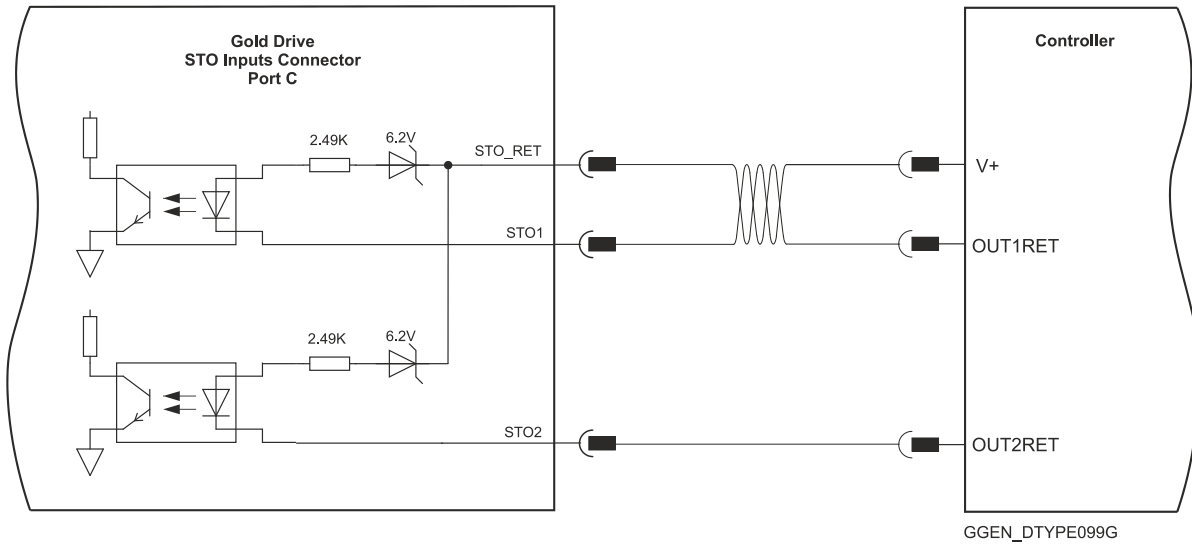


Figure 31: STO Input Connection – Sink Option



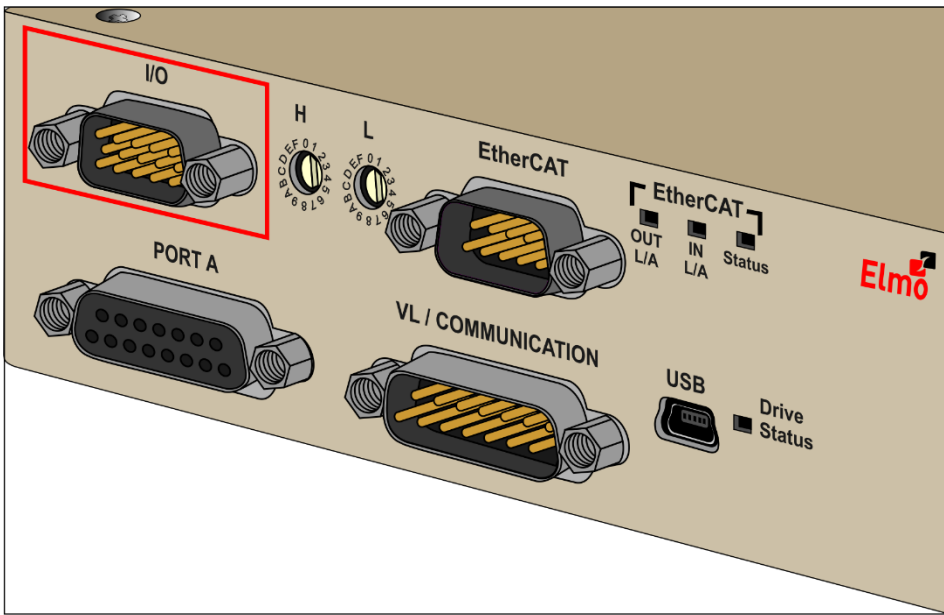
## 6.8 Digital Inputs and Outputs

Refer to Chapter 11 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

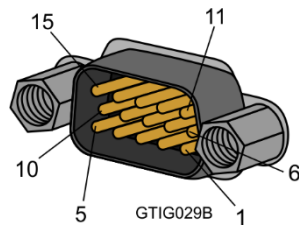
Pin on I/O	Signal	Function
1	IN1	Programmable digital input 1
2	IN2	Programmable digital input 2
7	IN3	Programmable digital input 3
8	IN4	Programmable digital input 4
11	IN5	Programmable digital input 5
12	IN6	Programmable digital input 6
6	INRET1-6	Programmable inputs 1 - 6 return for Source version Programmable positive inputs 1 - 6 for Sink version
3	OUT1	Programmable output 1
4	OUT2	Programmable output 2
5	OUT3	Programmable output 3
13	OUT4	Programmable output 4
10, 15	VDD	Supply for out 1-4
9, 14	VDDRET	Supply return for out 1-4



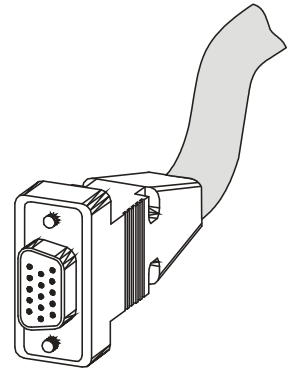
### Pin Positions



GTIG021B-A



**15-Pin High Density D-Type Male Connector**



**15-Pin High Density D-Type Female Connector**

**Table 8: I/O Connector Pin Assignments**



### 6.8.1 Digital Input and Output TTL Mode

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

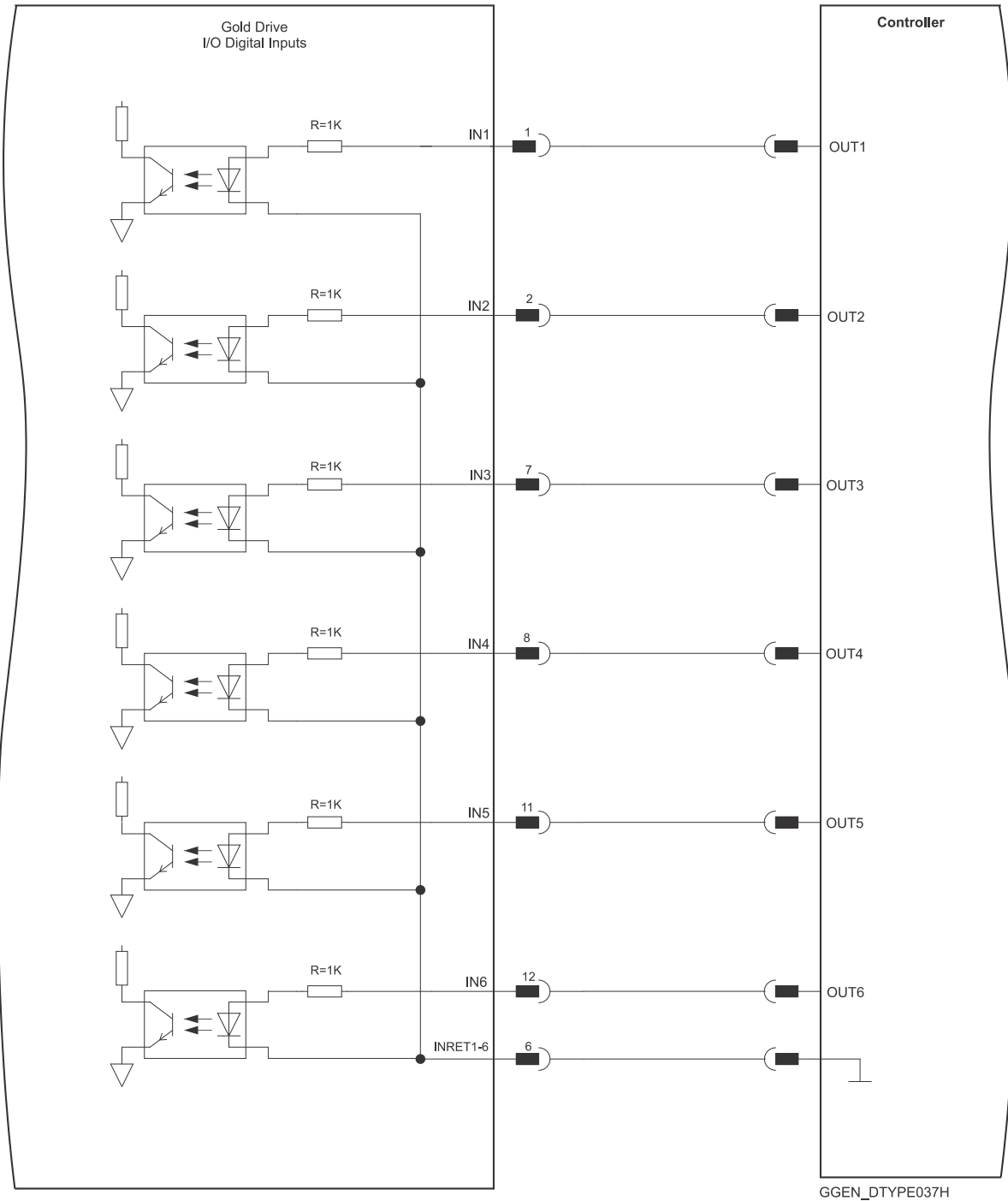


Figure 32: Digital Input TTL Mode D-Type Connection Diagram

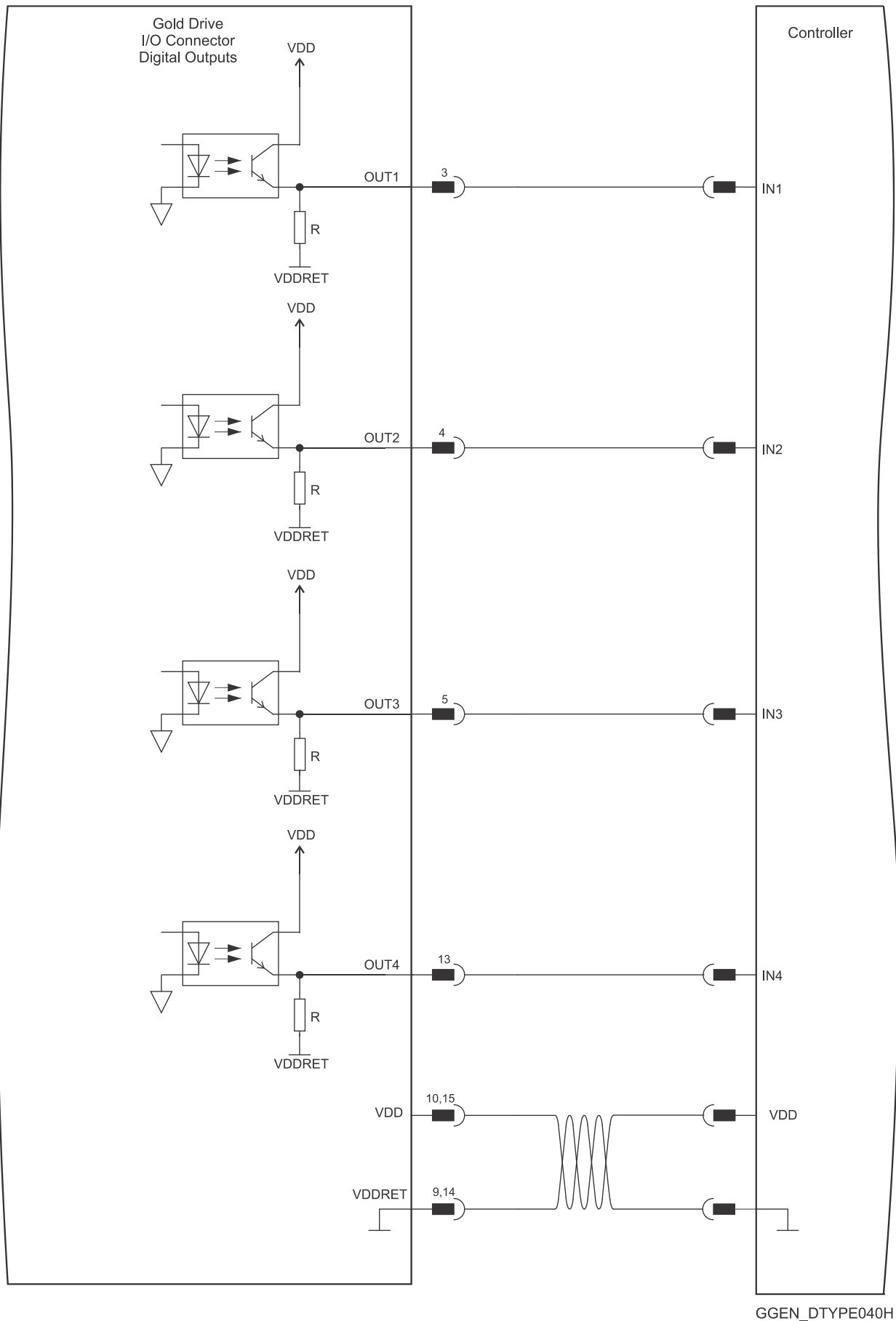


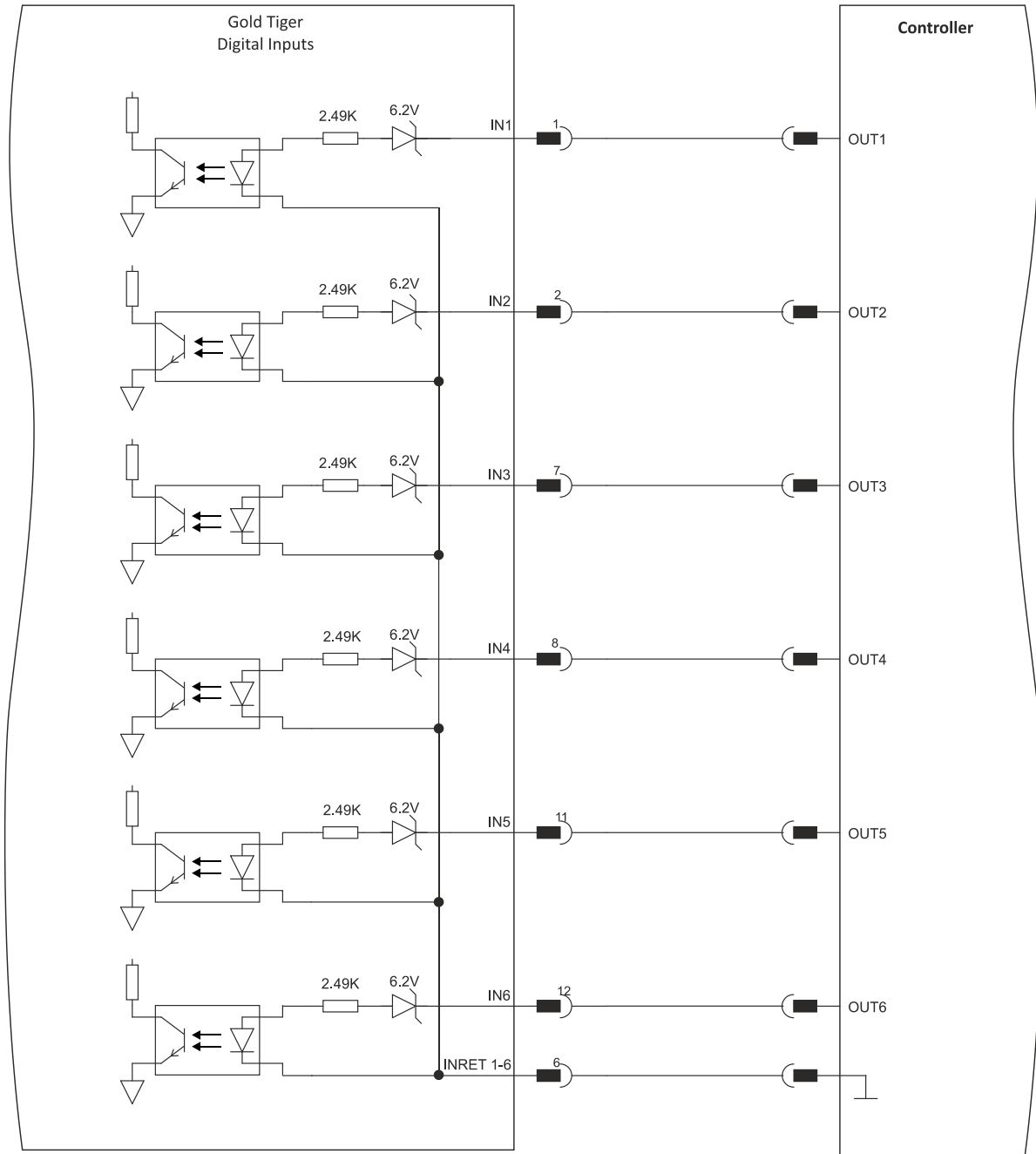
Figure 33: Digital Output D-Type Connection Diagram – TTL Option





### 6.8.2 Digital Input and Output PLC Source Mode

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



GTIG013A

Figure 34: Digital Input D-Type Connection Diagram – Source PLC Option

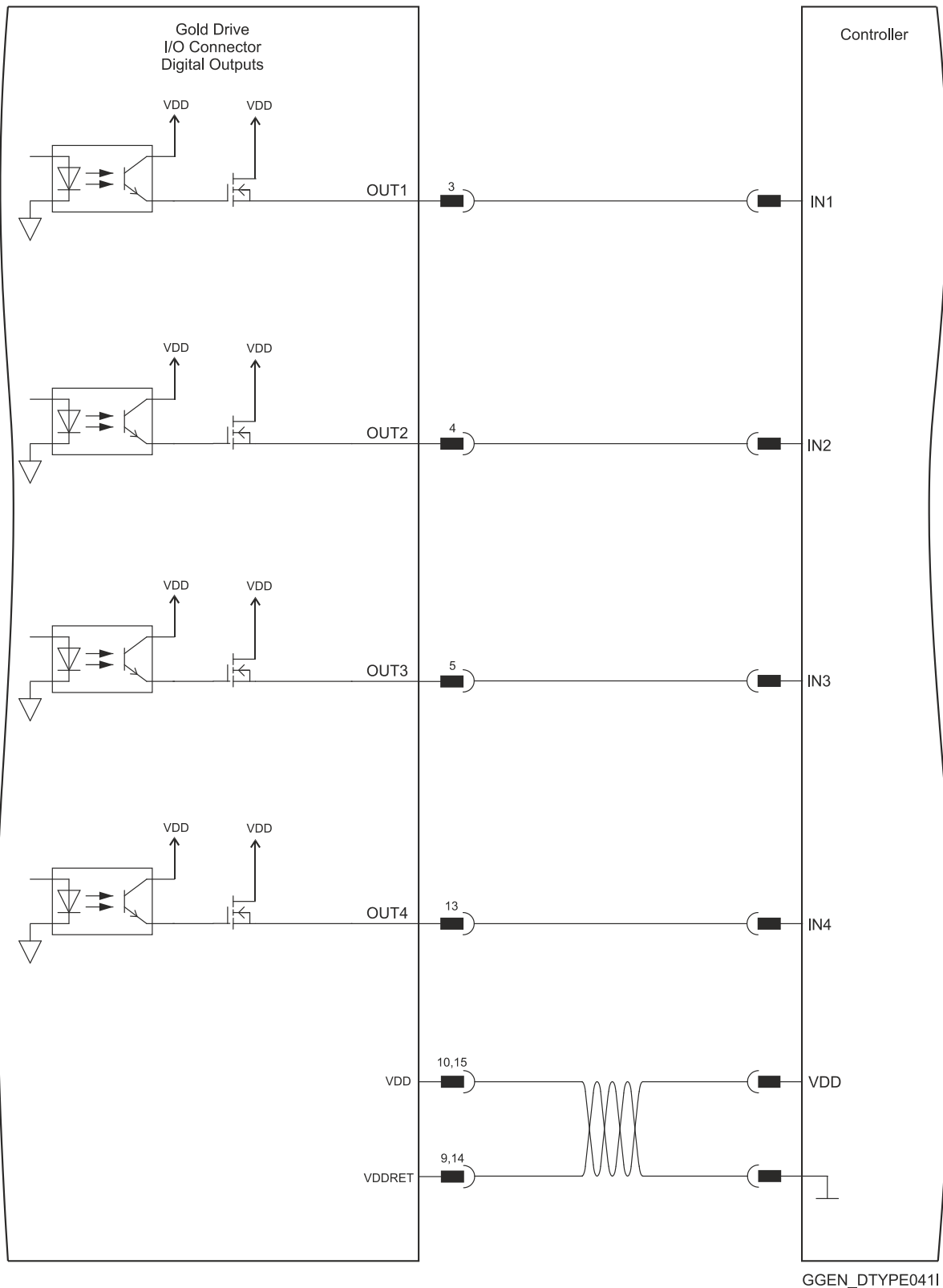


Figure 35: Digital Output D-Type Connection Diagram – Source PLC Option



### 6.8.3 Digital Input and Output Sink Mode

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

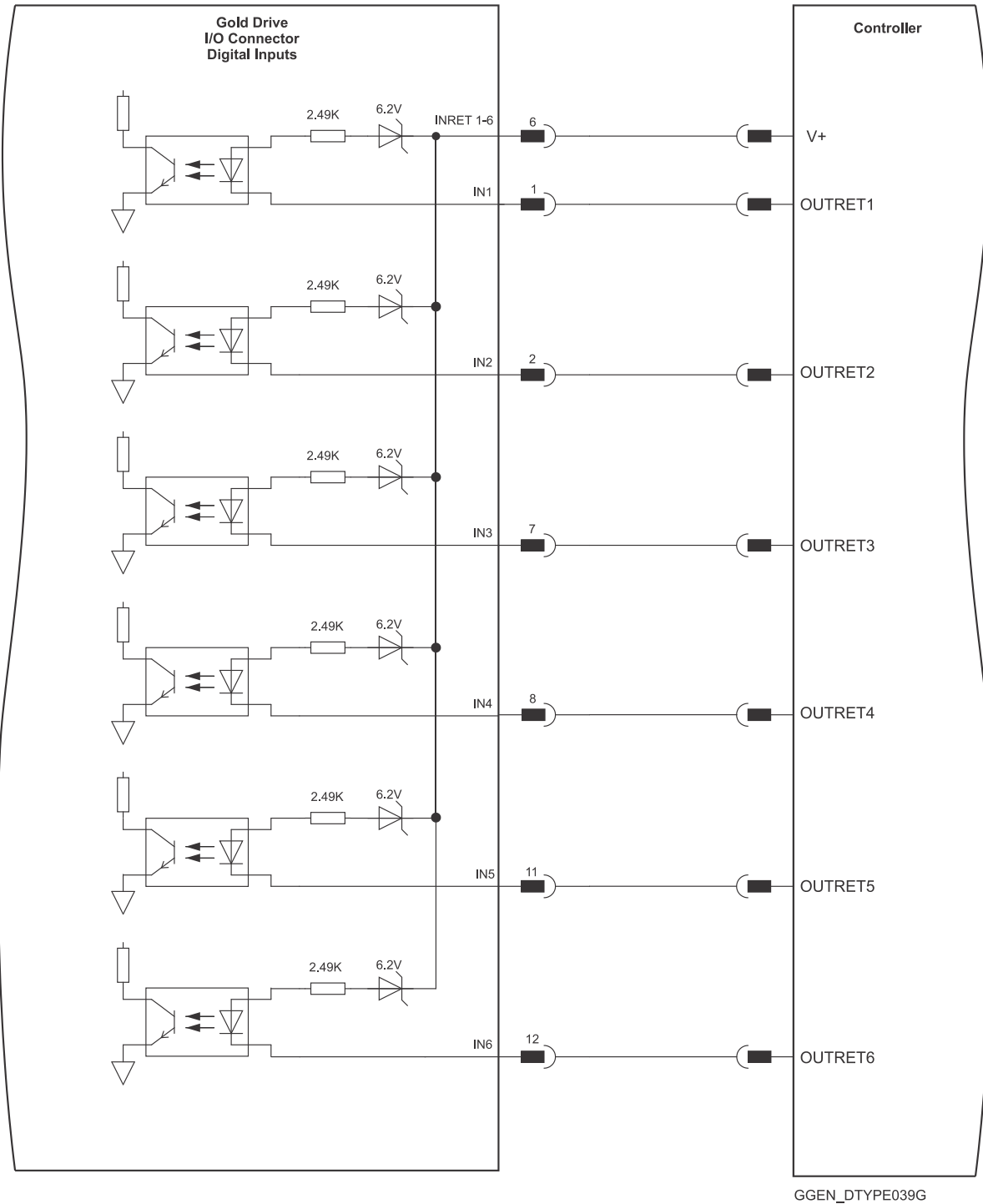


Figure 36: Digital Input Sink Mode – PLC Voltage Level D-Type Connection Diagram

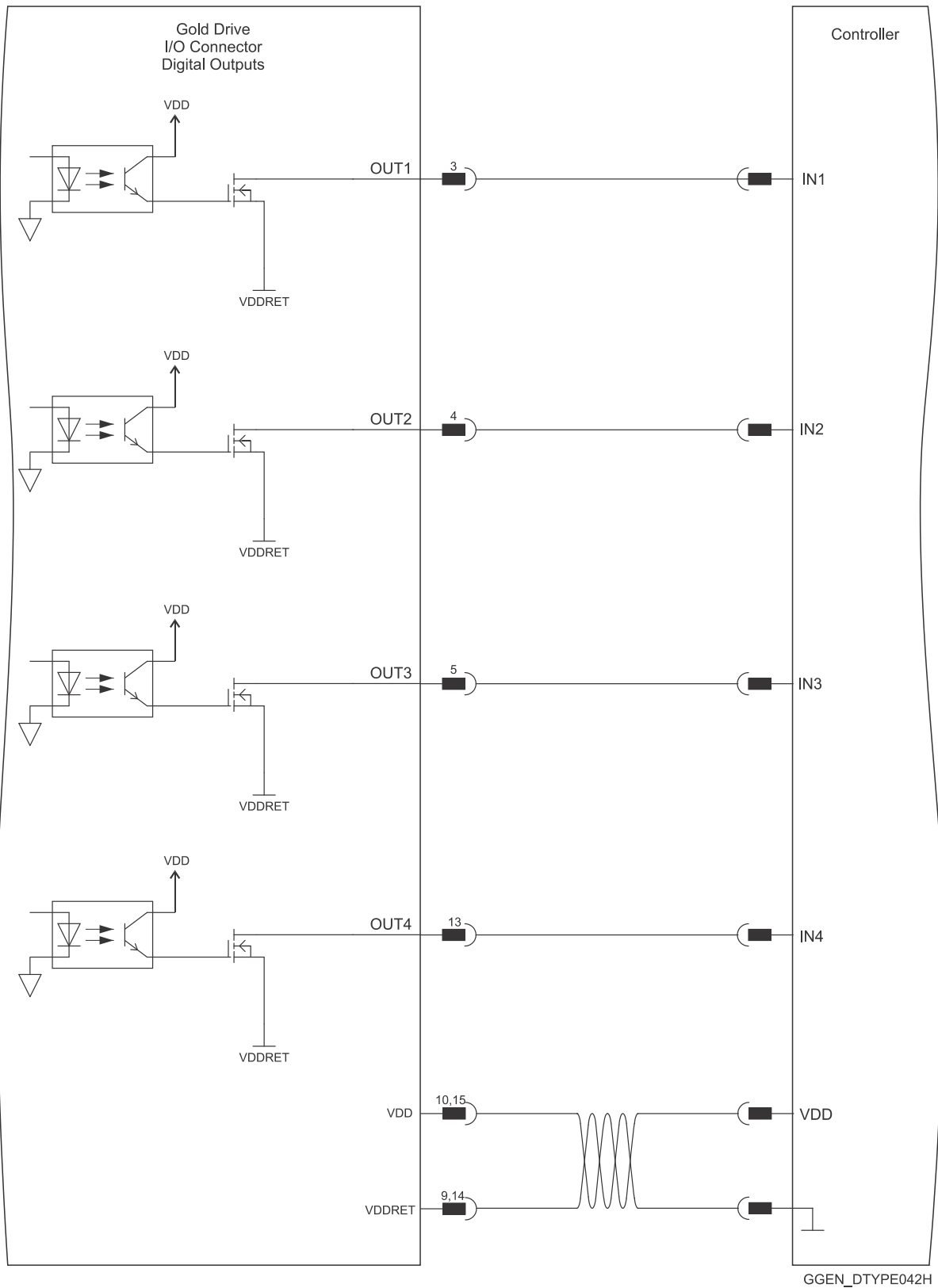


Figure 37: Digital Output as Sink Configuration D-Type Connection Diagram

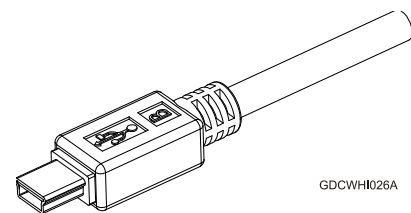
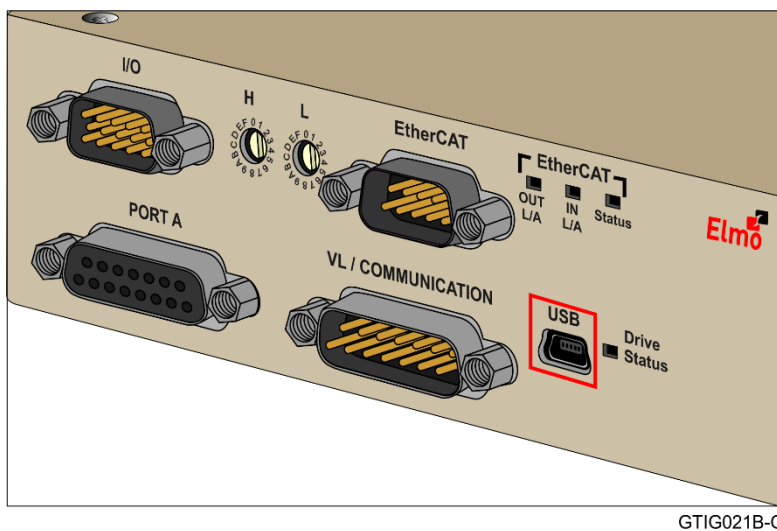
## 6.9 USB 2.0

See Section 12.1 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

**Note:** The USB connection can be either from the mini USB connector or from the VL/Communication D-Type connector.  
**DO NOT** connect the USB communication from the mini USB and the VL/Communication D-Type connector simultaneously.

Pin on USB	Signal	Function
1	USB VBUS	USB VBUS 5V
2	USBD-	USB _N line
3	USBD+	USB _P line
5	USB COMRET	USB communication return

### Pin Positions

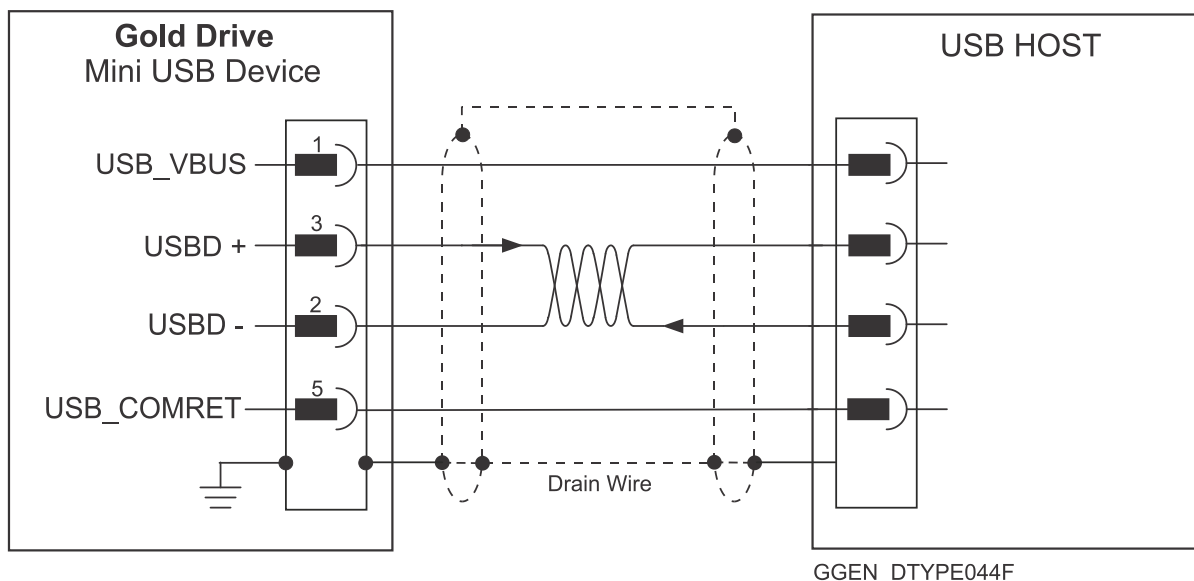


USB Device Mini B Plug

GTIG021B-G

GDCWH026A

Table 9: USB 2.0 Pin Assignments



GGEN\_DTYPE044F

Figure 38: USB Mini B Connection Diagram



### 6.9.1 VL/Communication Connector

See Section 5.2 for full details.

**Note:**

The USB connection can be either from the mini USB connector or from the VL/Communication D-Type connector.

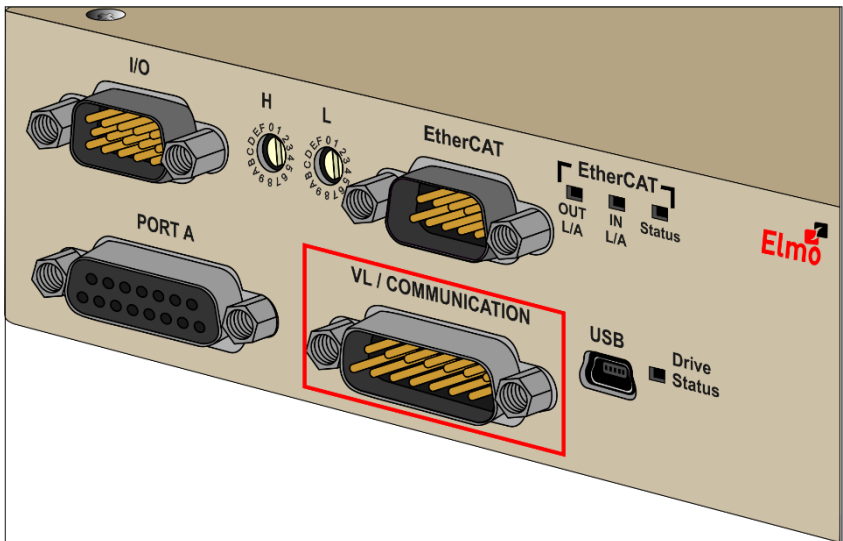
**DO NOT** connect the USB communication from the mini USB and the VL/Communication D-Type connector simultaneously.

Optional Backup Supply in S, T, A, or H option drives.

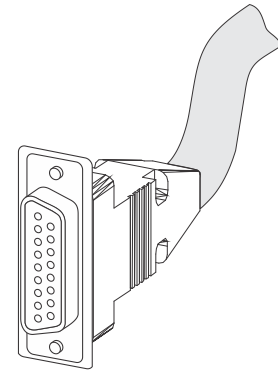
Pin	Signal	Function
2	USB_VBUS	USB VBUS 5V
1	USBD-	USB _N line
9	USBD+	USB _P line
10	USB_COMRET	USB Common Return
3	COMRET	Common Return (connected to the drain wire of cable)
11	COMRET	Common Return
4	RS-232_RX/RS-422_RX+	RS-232 Receive/RS-422 Receive+
5	RS-422_TX-	RS-422 Transmit-
13	RS-422_TX+	RS-422 Transmit+
12	RS-232_TX/RS-422_RX-	RS-232 Transmit/RS-422 Receive-
15	Not in use	
7	Not in use	
<b>S, T, A, or H option type(optional backup supply)</b>		
14	+24 V Control Supply Input Positive	DC Power
6	24 V Control Supply Input Return	DC Power
8	VL Shield	Drain wire cable



**Pin Positions**

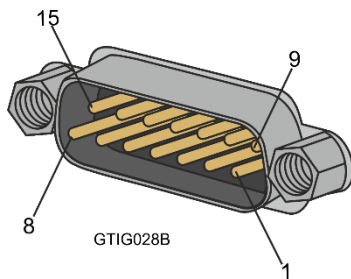


GTIG021B-D



GEAGHV022A

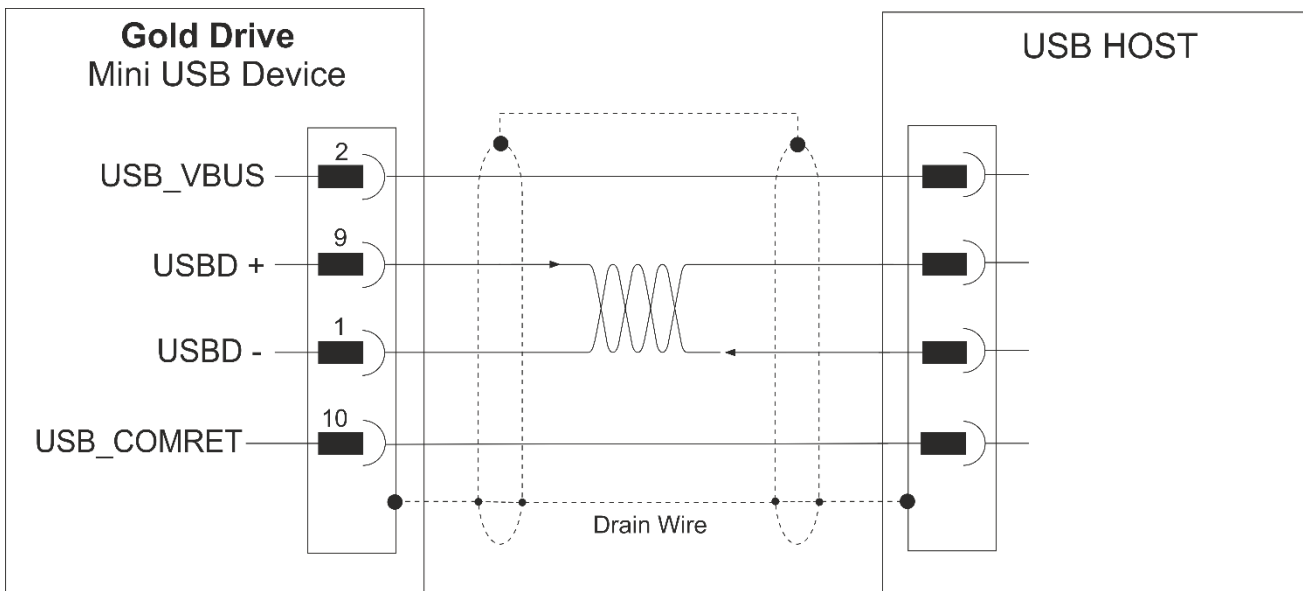
**15-pin D-Type Female Connector**



GTIG028B

**15-Pin D-Type Male Connector**

**6.9.1.1 USB 2.0 VL/Communication Connector**



GTIG030A

**Figure 39: USB 15-Pin D-Type Connection Diagram**

6.9.1.2 RS-232

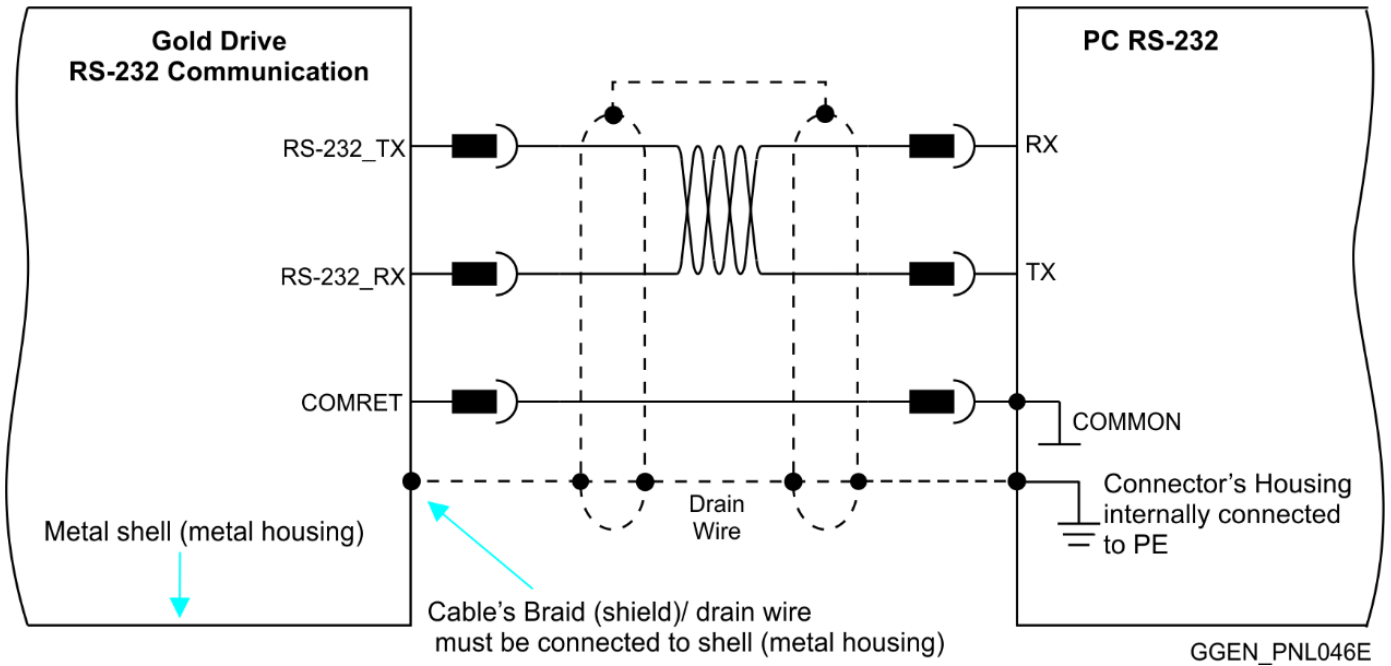


Figure 40: RS-232 D-Type Connection Diagram Example

6.9.1.3 RS-422 (Differential RS-232)

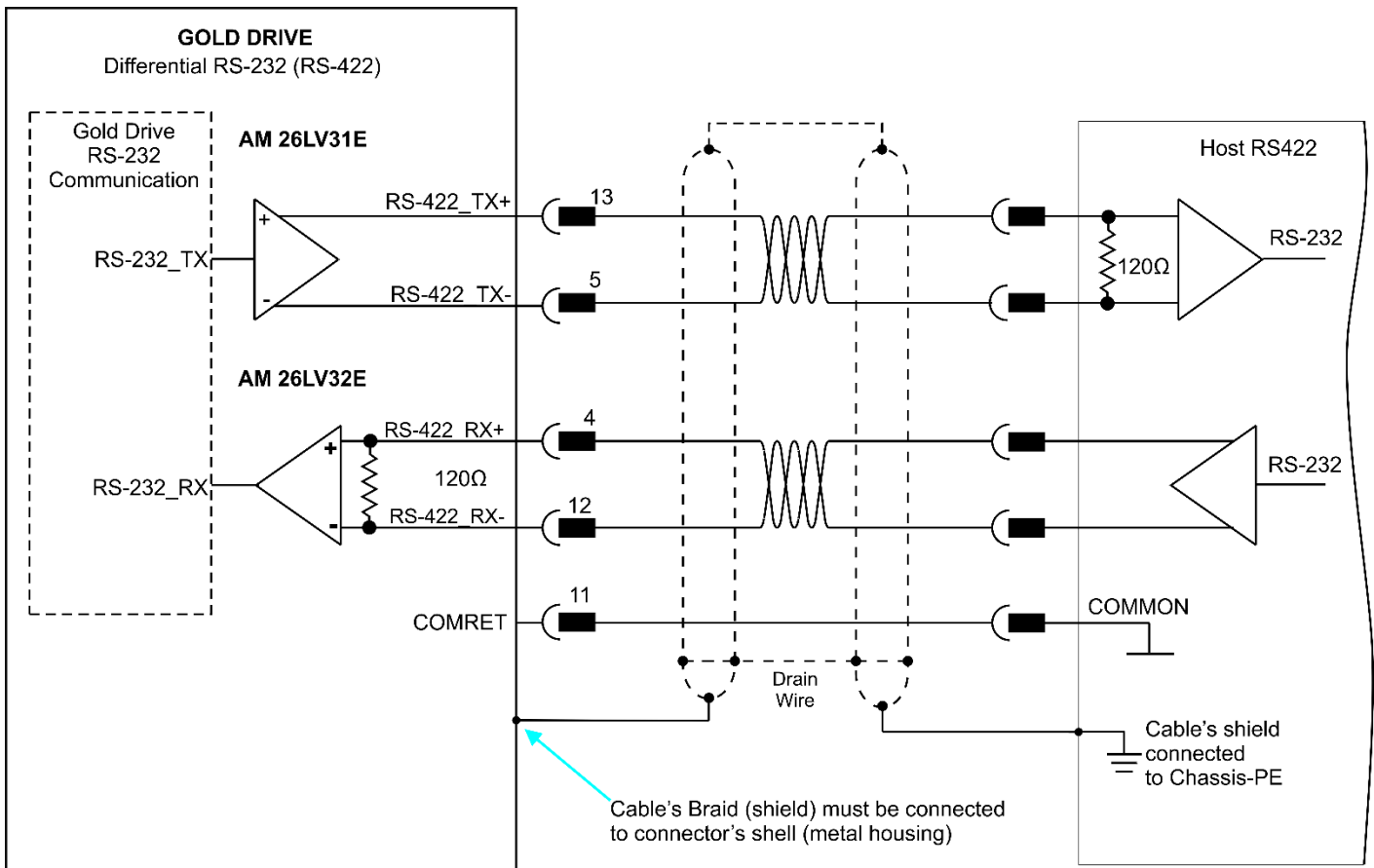


Figure 41: Differential RS-232 D-Type Communication Example

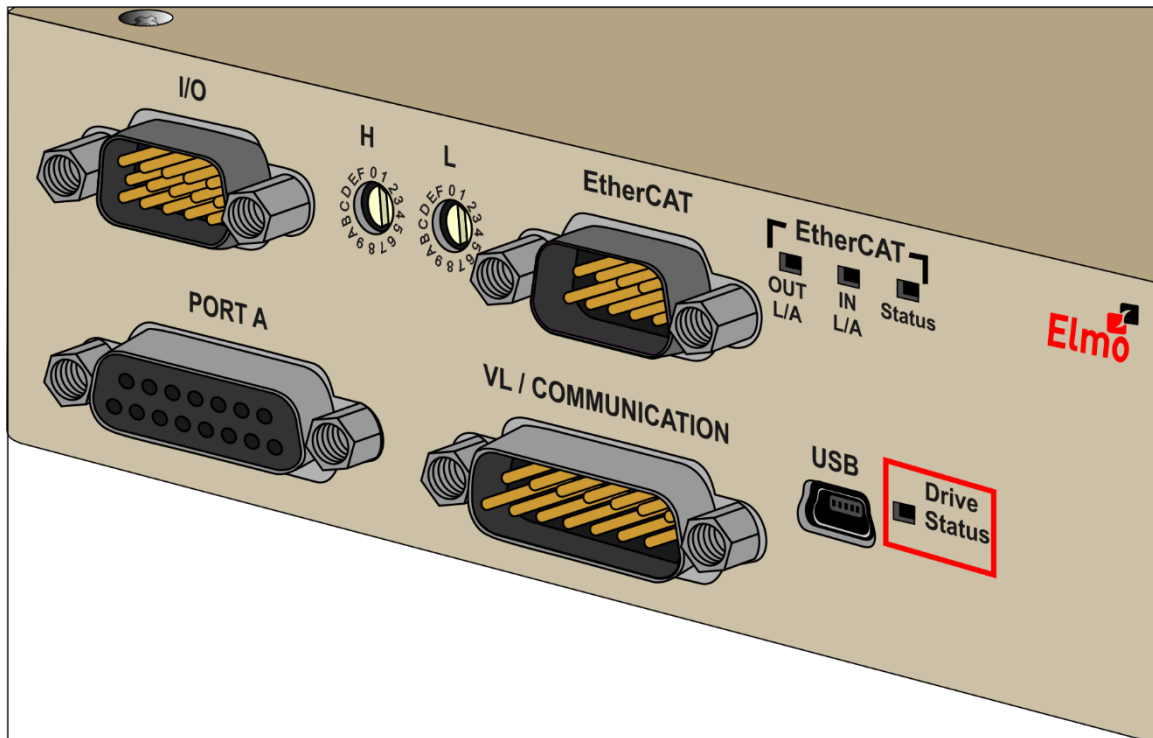


## 6.10 Drive Status Indicator

The Gold Tiger is equipped with a Drive Status light-emitting diode (LED) indicator.

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

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



GTIG021B-H

Figure 42: Gold Tiger Drive Status Indicator

For details of the **Drive Status**, refer to Chapter 7 in the MAN-G-Panel Mounted Drives Hardware manual.



## 6.11 EtherCAT Communications Version

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

Fieldbus Type	Product Number
EtherCAT	G-TIG XX/YYYEXX
EtherCAT with Switches	G-TIG XX/YYYFXX
EtherCAT + Differential RS-232 (RS-422)	G-TIG XX/YYYGXX

### 6.11.1 EtherCAT/Ethernet Pinouts

Refer to section 12.2 in the MAN-G-Panel Mounted Drives Hardware manual for more details.

Pin	Signal	Function
1	EtherCAT_IN_TX+/Ethernet_TX+	EtherCAT in transmit+/Ethernet transmit+
2	EtherCAT_IN_RX+/Ethernet_RX+	EtherCAT in receive+/Ethernet receive+
3	EtherCAT_OUT_TX+	EtherCAT out transmit+
4	EtherCAT_OUT_RX+	EtherCAT out receive+
5	EtherCAT Shield	Drain wire cable
6	EtherCAT_IN_TX-/Ethernet_TX-	EtherCAT in transmit-/Ethernet transmit-
7	EtherCAT_IN_RX-/Ethernet_RX-	EtherCAT in receive-/Ethernet receive-
8	EtherCAT_OUT_TX-	EtherCAT out transmit-
9	EtherCAT_OUT_RX-	EtherCAT out receive-

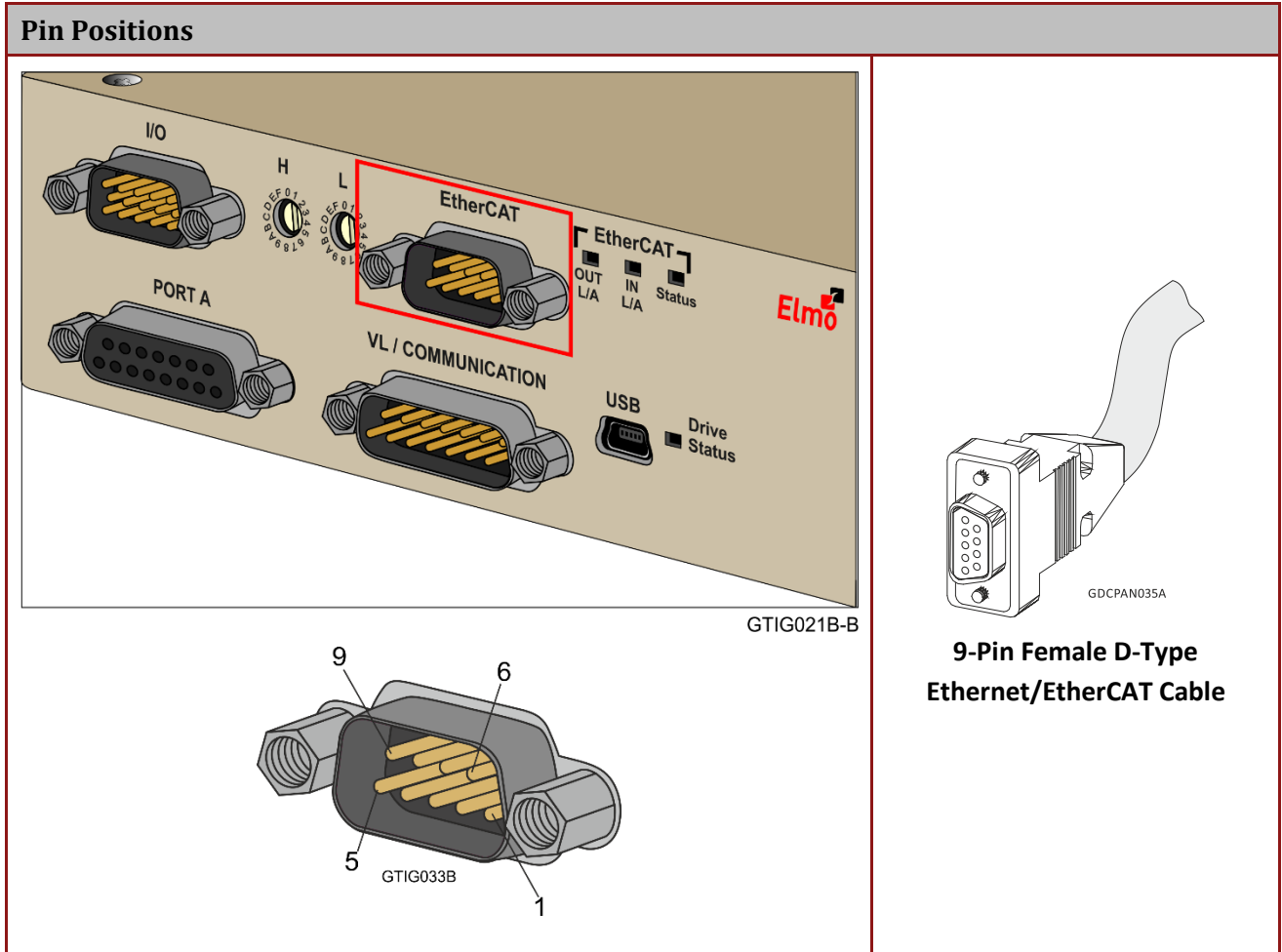
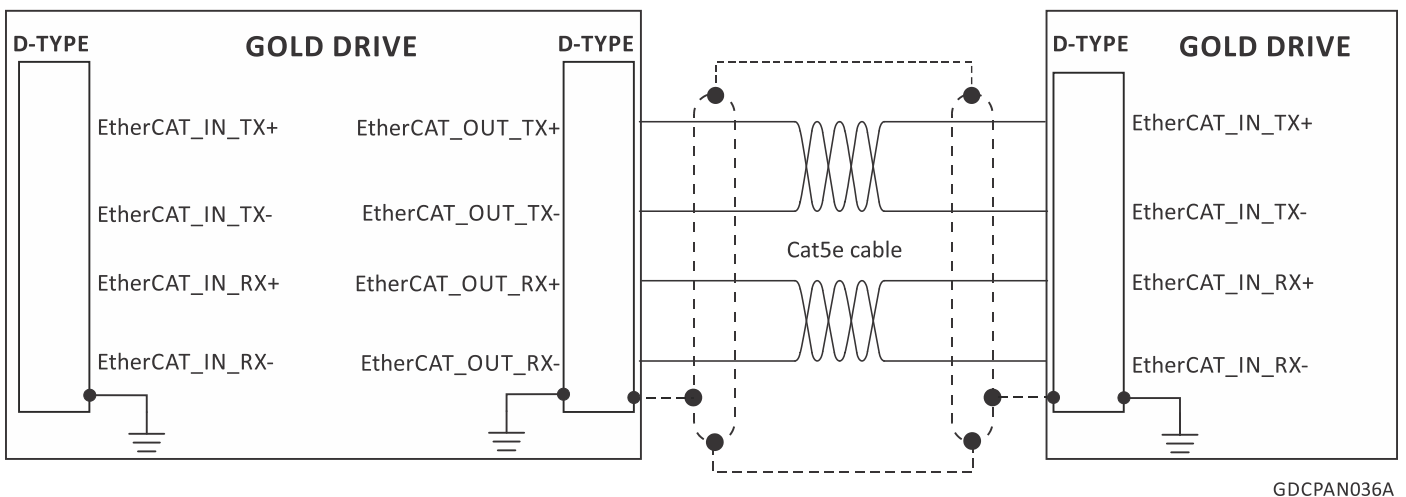


Table 10: EtherCAT In/Out Connector Pin Assignments

### 6.11.2 EtherCAT Wiring

Figure 43 describes the wiring diagram for the EtherCAT connections.



GDCPAN036A

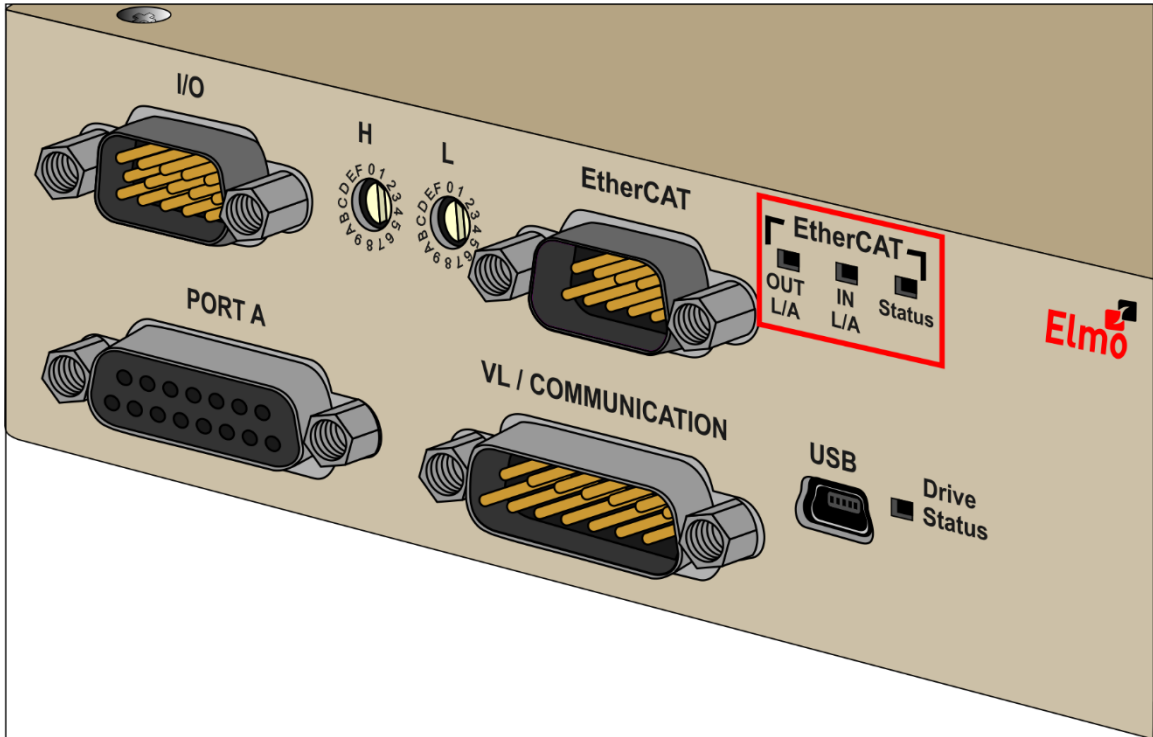
Figure 43: EtherCAT Connections

### 6.11.3 EtherCAT Status and Link Indicators

The **EtherCAT status indicator** is a red/green dual LED. It combines run indication (when it is green) and error indication (when it is red) of the EtherCAT device.

The Gold Tiger can serve as an EtherCAT slave device. For this purpose it has a D-Type connector, which is designated as EtherCAT In and EtherCAT Out.

The green LEDs are the **Link/Activity indicators** called EtherCAT IN L/A and EtherCAT OUT L/A respectively. They show the state of the applicable physical link and the activity on that link. For full details, see Section 6.8.2.2 in the MAN-G-Drive Hardware manual.



GTIG021B-F

Figure 44: Ethernet Connector LEDs

## 6.12 CAN Communications Version

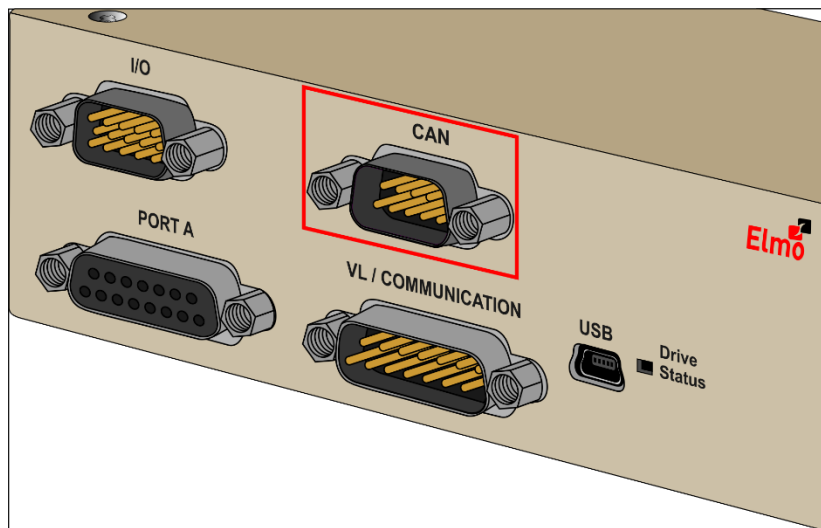
Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Gold Tiger supports the following CAN fieldbus type industrial network protocol:

Fieldbus Type	Product Number
CAN	G-TIG XX/YYYSXX
CAN + Differential RS-232 (RS-422)	G-TIG XX/YYTXX

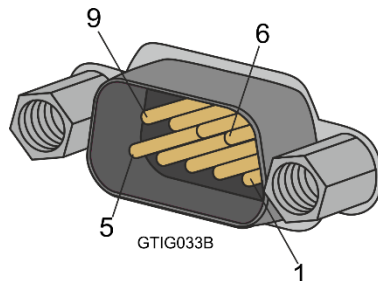
See Section 12.4 in the MAN-G-Panel Mounted Drives Hardware manual for the electrical diagram.

Pin	Signal	Function
1, 3	CAN_H	CAN_H bus line (dominant high)
6, 8	CAN_L	CAN_L bus line (dominant low)
7, 9	CAN_RET	CAN Return
5	CAN_SHLD	Drain wire cable

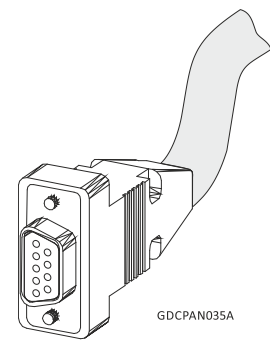
### Pin Positions



GTIG035A-A



GTIG033B



GDCPAN035A

**9-Pin Female D-Type CAN Cable**

**Table 11: CAN In/Out Connectors Pin Assignments**





## 6.13 Powering Up

After the Gold Tiger 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.

## 6.14 Initializing the System

After the Gold Tiger 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*.



## Chapter 7: Gold Tiger Dimensions

This chapter provides detailed technical information regarding the Gold Tiger.

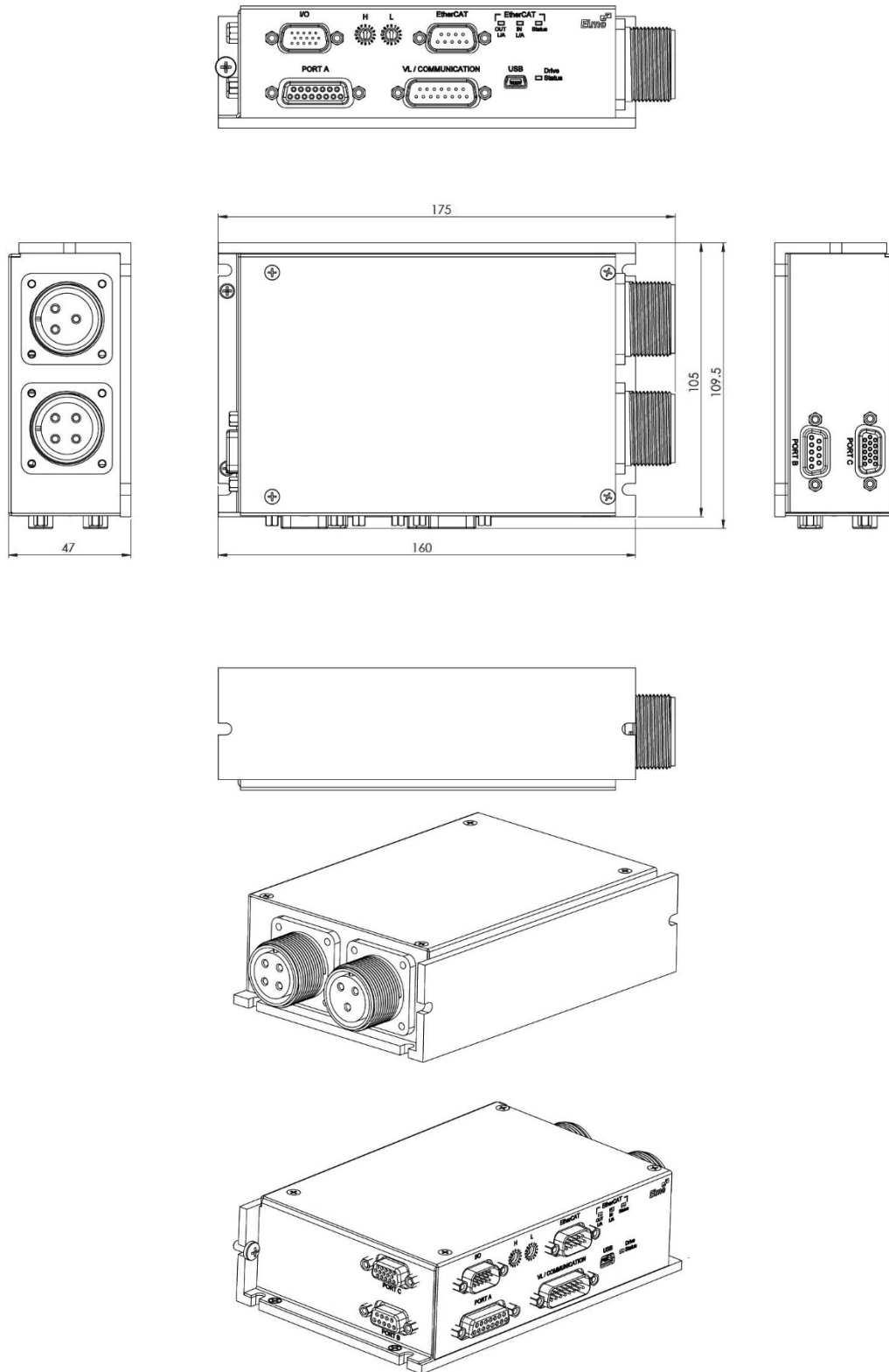


Figure 46: Gold Tiger Dimensions with Standard L-Shape Heat-Sink



