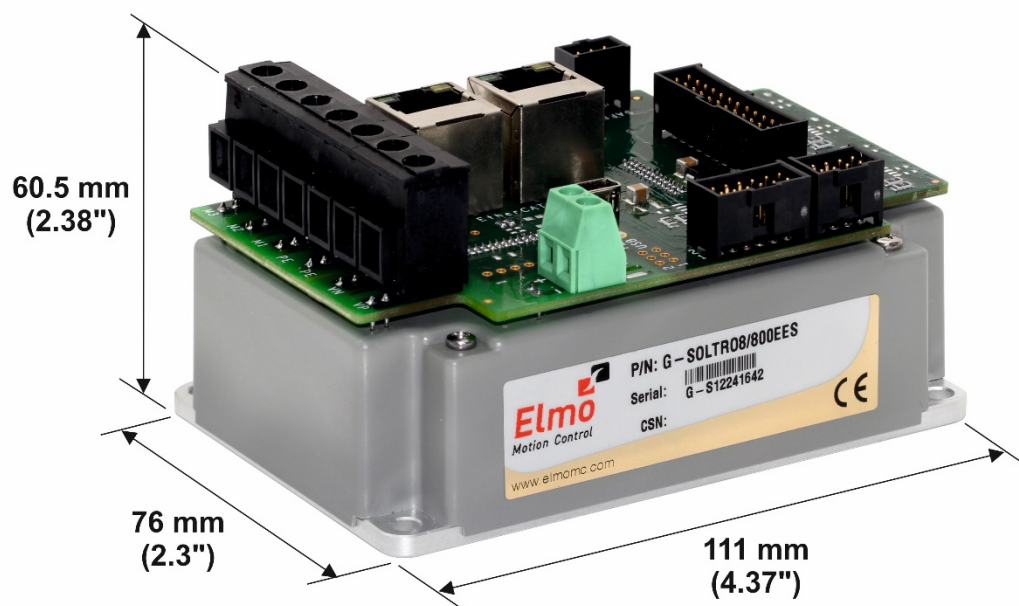


Gold Solo Trombone Digital Servo Drive Installation Guide



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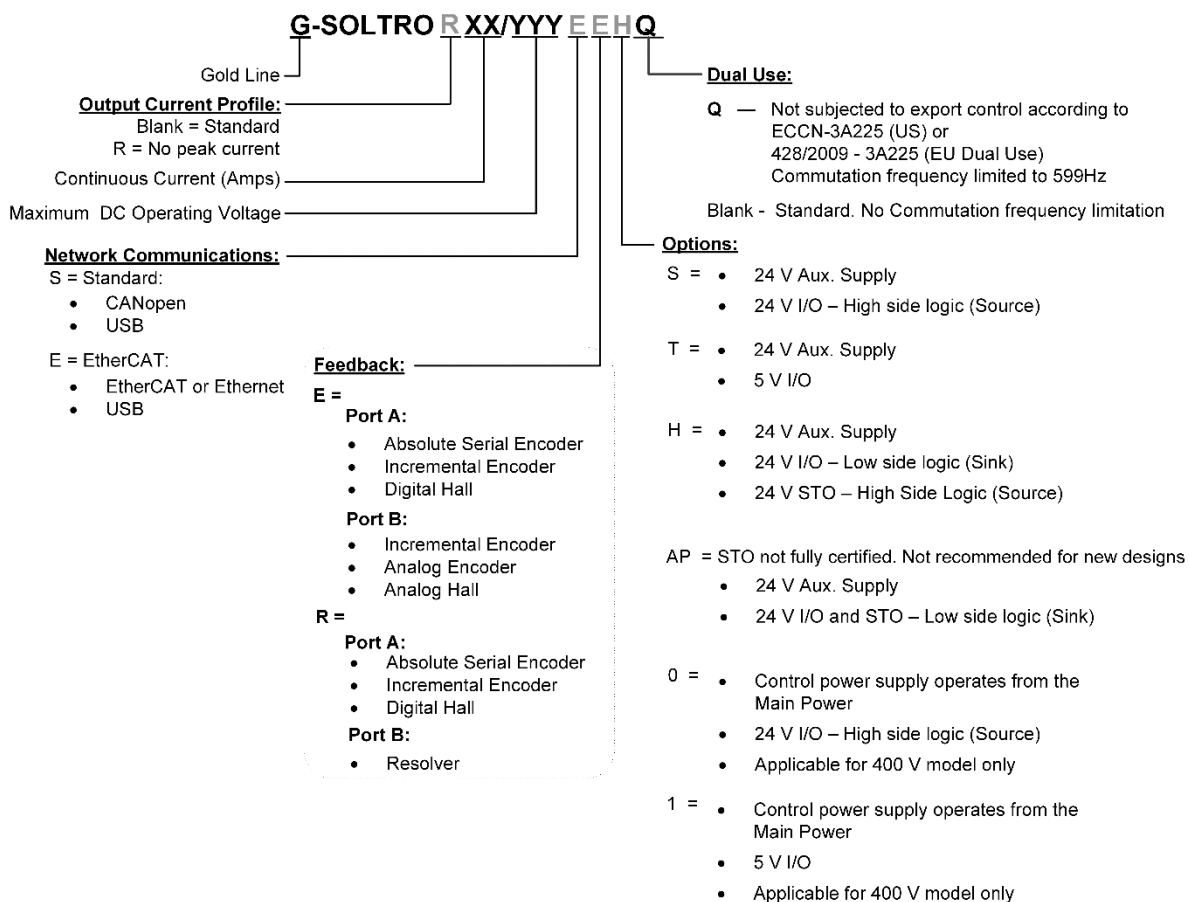
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Catalog Number



Cable Kit

Catalog number: CBL-GDCWHIKIT02 (can be ordered separately)

For further details, see the documentation for this cable kit ([MAN-CBLKIT-GOLD.pdf](#)).



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Chapter 1: This Installation Guide

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

Chapter 2: Safety Information

In order to achieve the optimum, safe operation of the Gold Solo Trombone, 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 Solo Trombone 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 Solo Trombone 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 Solo Trombone 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 Solo Trombone to an approved isolated auxiliary power supply, connect it through a line that is separated from hazardous live voltages using reinforced or double insulation in accordance with approved safety standards.
- Before switching on the Gold Solo Trombone, 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 Solo Trombone 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 Solo Trombone 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 Solo Trombone series of digital servo drives are highly resilient and operate from a DC Power Voltage Input source. They are designed to deliver the highest density of power and intelligence. The Gold Solo Trombone 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 Solo Trombone 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 drive is easily set up and tuned using Elmo Application Studio (EASII) software tools. This Windows-based application enables users to quickly and simply configure the servo drive for optimal use with their motor. The Gold Solo Trombone, as part of the Gold Line, is fully programmable with Elmo's motion control language.

Power to the drives is provided by a DC power source (not included with the Gold Solo Trombone).

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 H, S, T or AP-model Gold Solo Trombone 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 **18–30 VDC**.

Whenever backup functionality is not required, Gold Solo Trombone models that have the 0 or 1 suffix 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 Solo Trombone to operate with only the main power supply VP+ and VN-, with no need for a 24 VDC auxiliary power supply for the logic.

The Gold Solo Trombone is a stand-alone version of the Gold Trombone module (PCB-mounted). Another pluggable version, the Gold DC Trombone is also available.

3.1.1. Accessories

Cable Kit, catalog number: CBL-GDCWHIKIT02 (can be ordered separately)

For further details, see the documentation for this cable kit ([MAN-CBLKIT-GOLD.pdf](#)).



Chapter 4: Technical Information

4.1. Physical Specifications

Feature	Units	All Types
Weight	g (oz)	362 g (12.8 oz)
Dimension	mm (in)	111 x 76 x 60 (4.37" x 3" x 2.36")
Mounting method		Panel / Wall Mounted

4.2. Technical Data

Feature	Units	12/400	16/400	R17/400	R22/400	8/800	12/800	R11/800	R16/800
Minimum supply voltage	VDC	H, S, T, or AP suffix in P/N*: 50 0 or 1 suffix in P/N: 100				H, S, T, or AP suffix in P/N*: 95+			
Nominal supply voltage	VDC	325				560 for 400 VAC 680 for 480 VAC			
Maximum supply voltage	VDC	400				780			
Maximum continuous power output	kW	4	5	5.5	7	5	7.5	7	10
Efficiency at rated power (at nominal conditions)	%	> 98							
Auxiliary supply voltage option	VDC	18 V to 30 V Only for Control Supply A, H, S, or T suffix Model							
Auxiliary power supply	VA	7							
Continuous current limit (I _c) Amplitude sinusoidal/DC trapezoidal commutation	A	12	16	17	22	8	12	11	16
Sinusoidal continuous RMS current limit (I _c)	A	8.5	11.3	12	15.5	5.7	8.5	7.8	11.3
Peak current limit	A	2 x I _c		No peak		2 x I _c		No peak	

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



Note on current ratings:

The current ratings of the Gold Solo Trombone 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.

4.2.1. Auxiliary Supply

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

4.2.2. Product Features

Main Feature	Details	Presence and No.
STO	TTL, <i>or</i>	✓
	PLC Source, <i>or</i>	✓
	PLC Sink (is not fully certified, and not recommended for new designs)	✓
Digital Input Option	TTL, <i>or</i>	6
	PLC Source, <i>or</i>	6
	PLC Sink	6
Digital Output Option	TTL, <i>or</i>	4
	PLC Source, <i>or</i>	4
	PLC Sink	4
Analog Input	Differential ±10V	1
Feedback	Standard Port A, B, & C	✓
Communication Option	USB	✓
	EtherCAT, <i>or</i>	✓
	CAN	✓



4.2.3. Environmental Conditions

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

4.2.3.1. Gold Line

Feature	Details
Operating ambient temperature according to IEC60068-2-2	0 °C to 40 °C (32 °F to 104 °F)
Storage temperature	-20 °C to +85 °C (-4 °F to +185 °F)
Maximum non-condensing humidity according to IEC60068-2-78	95%
Maximum Operating Altitude	2,000 m (6562 feet) It should be noted that servo drives capable of higher operating altitudes are available on request.
Mechanical Shock according to IEC60068-2-27	15g / 11ms Half Sine
Vibration according to IEC60068-2-6	5 Hz ≤ f ≤ 10 Hz: ±10mm 10 Hz ≤ f ≤ 57 Hz: 4G 57 Hz ≤ f ≤ 500 Hz: 5G



4.2.4. Gold Line Standards and Certificates

The following table describes the Main Standards of the Gold Solo Trombone servo drive. For further details refer to the MAN-G-Panel Mounted Drives 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 4.2.3.1 Gold Line above.	
STO IEC 61800-5-2:2007 SIL 3	Adjustable speed electrical power drive systems – Safety requirements – Functional
EN ISO 13849-1:2008 PL e, Cat 3	Safety of machinery — Safety-related parts of control systems.
Approved IEC/EN 61800-5-1	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
Recognized UL 508C	Power Conversion Equipment
In compliance with UL 840	Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment
Conformity with CE 2006/95/EC	Low-voltage directive 2006/95/EC
Recognized CSA C22.2 NO. 14-13	Industrial Control Equipment

4.2.4.1. 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 5: Installation



Warning: The Gold Solo Trombone must be:

- installed in a suitable environment and properly connected to its voltage supplies and the motor.
- mounted and confined within a metal enclosure.

5.1. Unpacking the Drive Components

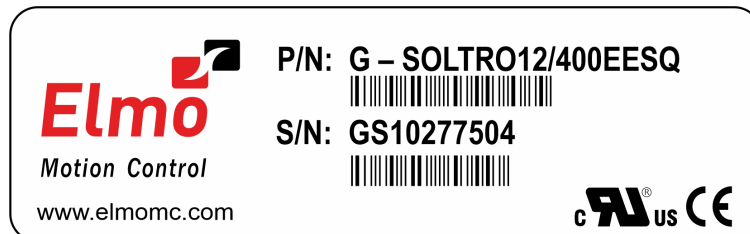
Before you begin working with the Gold Solo Trombone, verify that you have all of its components, as follows:

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

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

To unpack the Gold Solo Trombone:

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



4. Verify that the Gold Solo Trombone 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. Connectors Types

The Gold Solo Trombone has the following 11 connectors.

No. Pins	Type	Function
7	8 mm Phoenix high current	Main Power and Motor Connector
2	5.08 mm Phoenix high current	24 V Auxiliary Supply
12	2.54 mm Pitch	Feedback port A
8	2.54 mm Pitch	Feedback port B
24	2.54 mm Pitch	Port C and I/O
3	2.54 mm Pitch	STO (Safety Torque Off)
8	RJ-45	EtherCAT in
8	RJ-45	EtherCAT out
4	USB Device Type Mini B	USB Communication
4	2.54 mm Pitch	CAN
4	2.54 mm Pitch	CAN

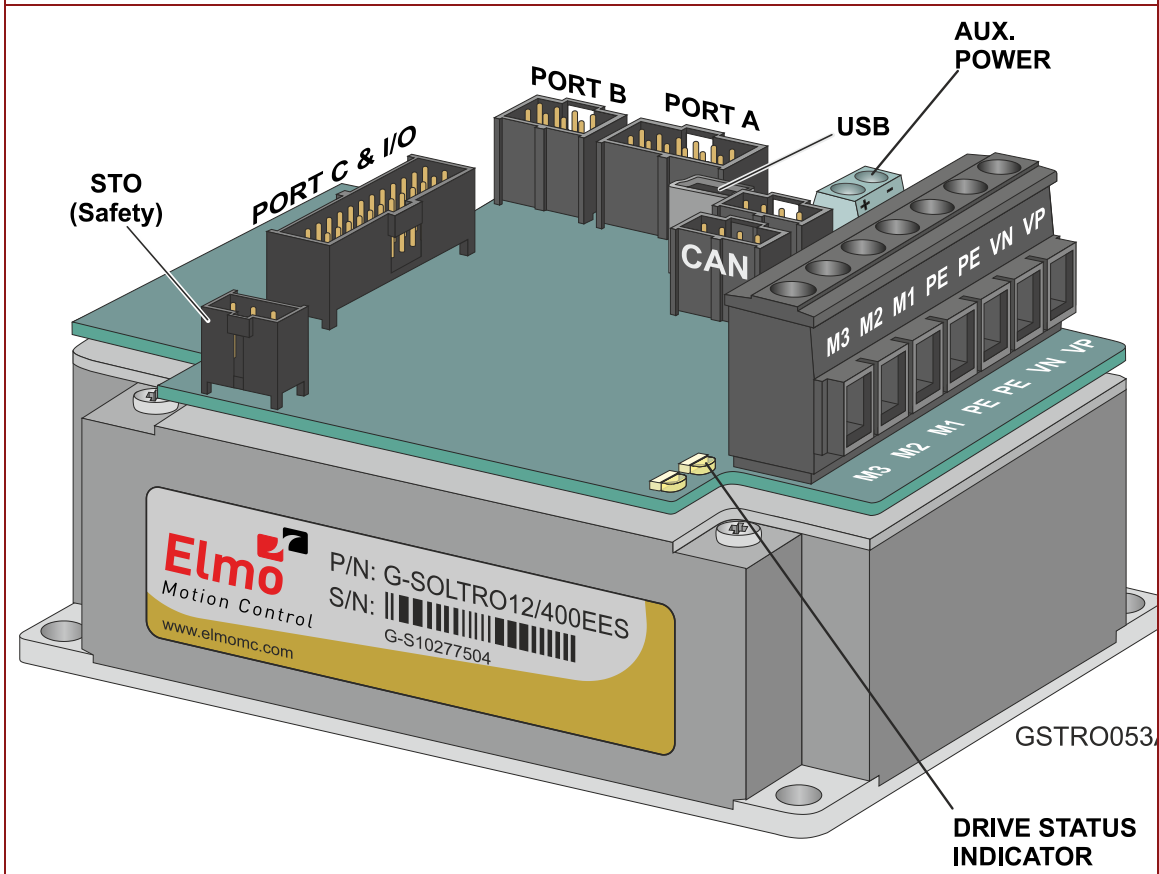
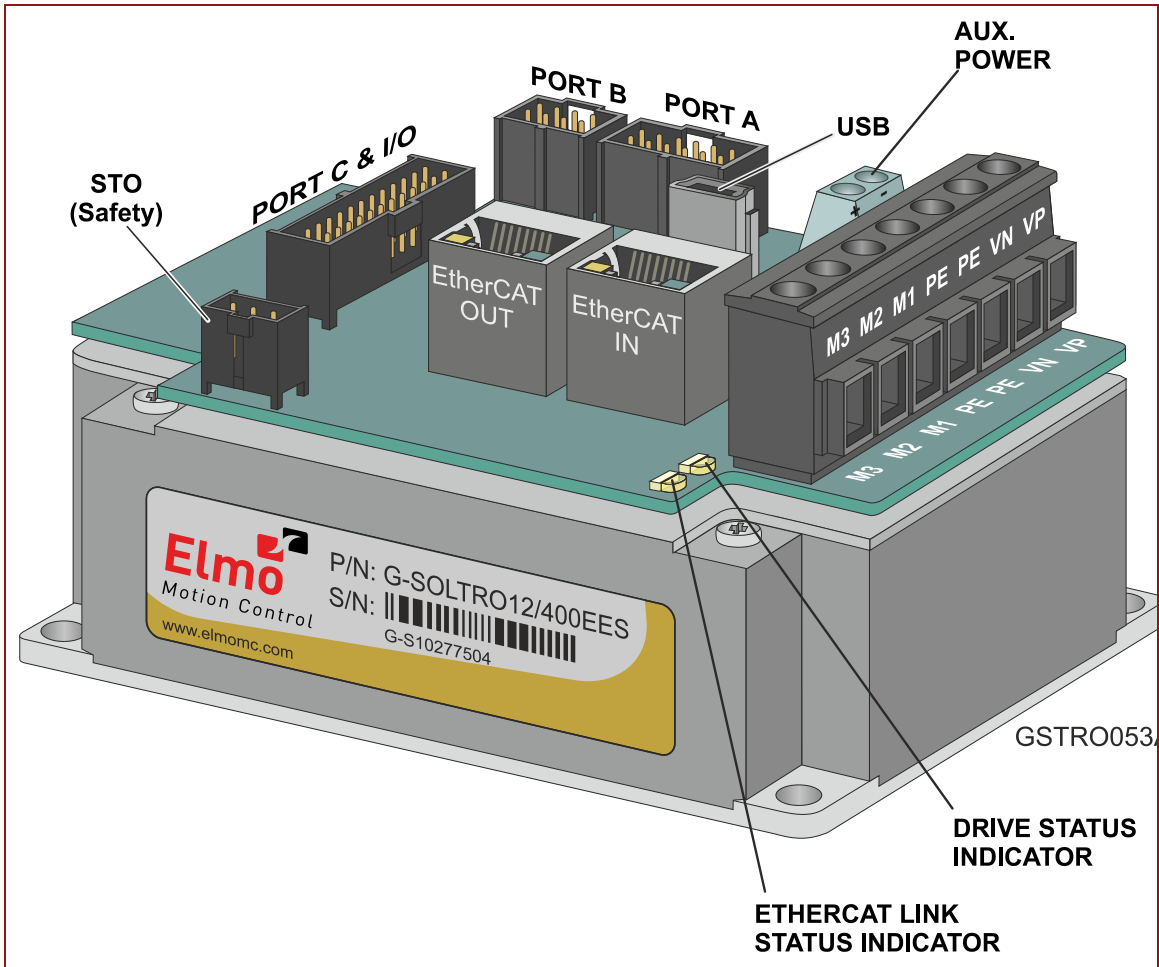


Table 1: Connector Types



5.2.1. Mating Connector Types

Mating Pin Connector	Function	Manufacturing P/N (Molex)
12 Pin	Port A	90142-0012
8 Pin	Port B	90142-0008
24 Pin	Port C & I/O	90142-0024
3 Pin	STO	90156-0143
4 Pin	CAN	90156-0144



5.3. Mounting the Gold Solo Trombone

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

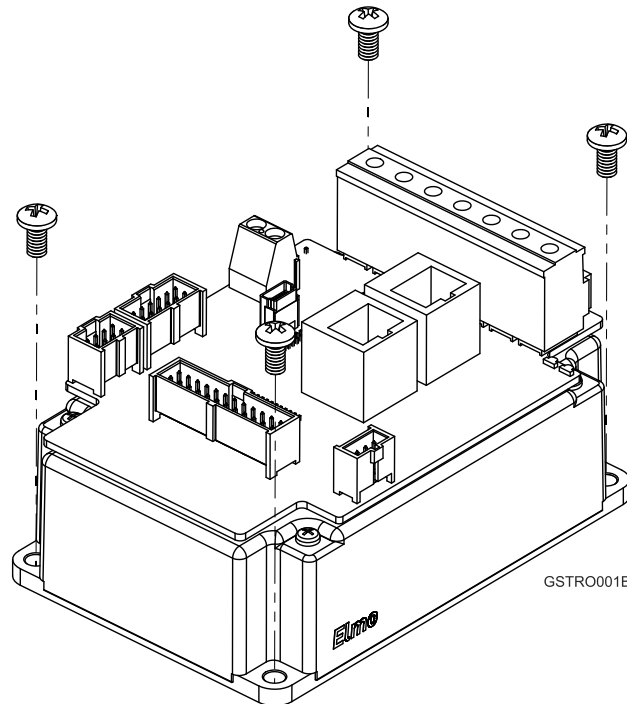


Figure 1: Mounting the Gold Solo Trombone



5.4. Connection Diagrams

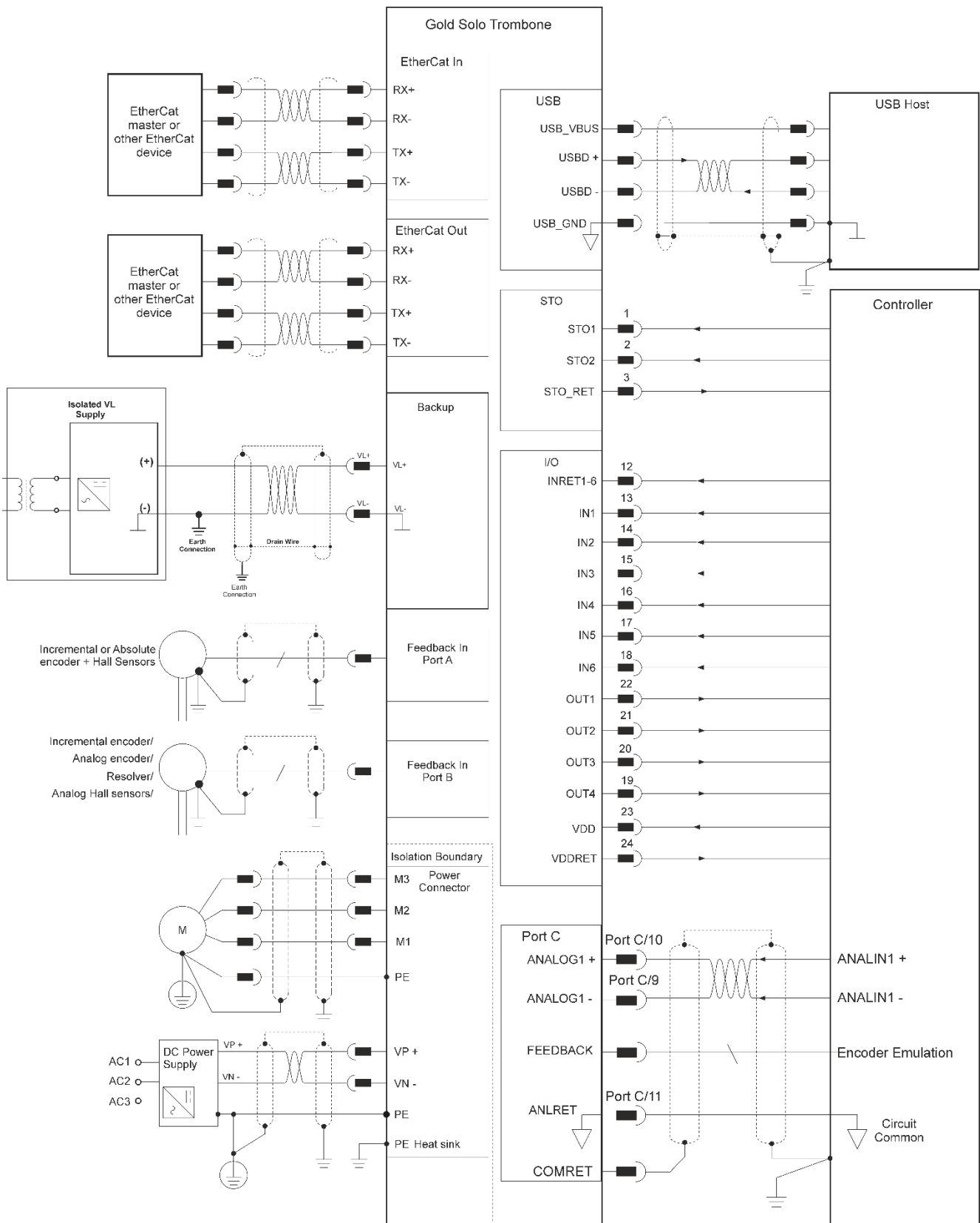
There are two connection diagrams for EtherCAT and two for CAN that show the two different ways of connecting the power supply:

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



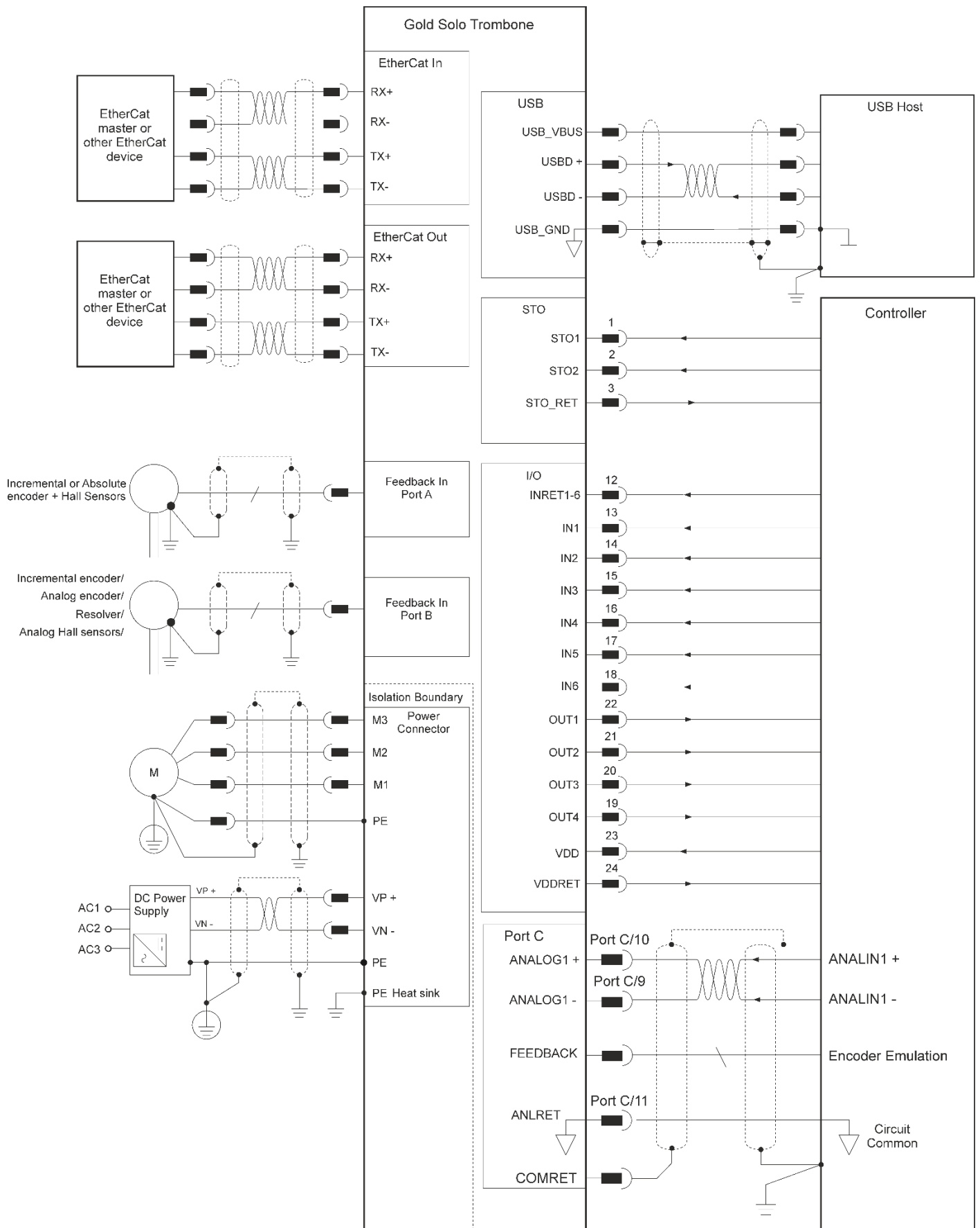
5.4.1. Connection Diagrams for EtherCAT Version

The following describes the connection diagrams for the EtherCAT version.



GSTRO007D

Figure 2: Gold Solo Trombone **EtherCAT** Connection Diagram – **with Backup Functionality**
(H, S, T, or AP Model Drive)



GSTRO031D

Figure 3: Gold Solo Trombone EtherCAT Connection Diagram – 400 V without Backup Functionality (0 or 1 Model Drive)



5.4.2. Connection Diagrams for CAN Version

The following describes the connection diagrams for the CAN version.

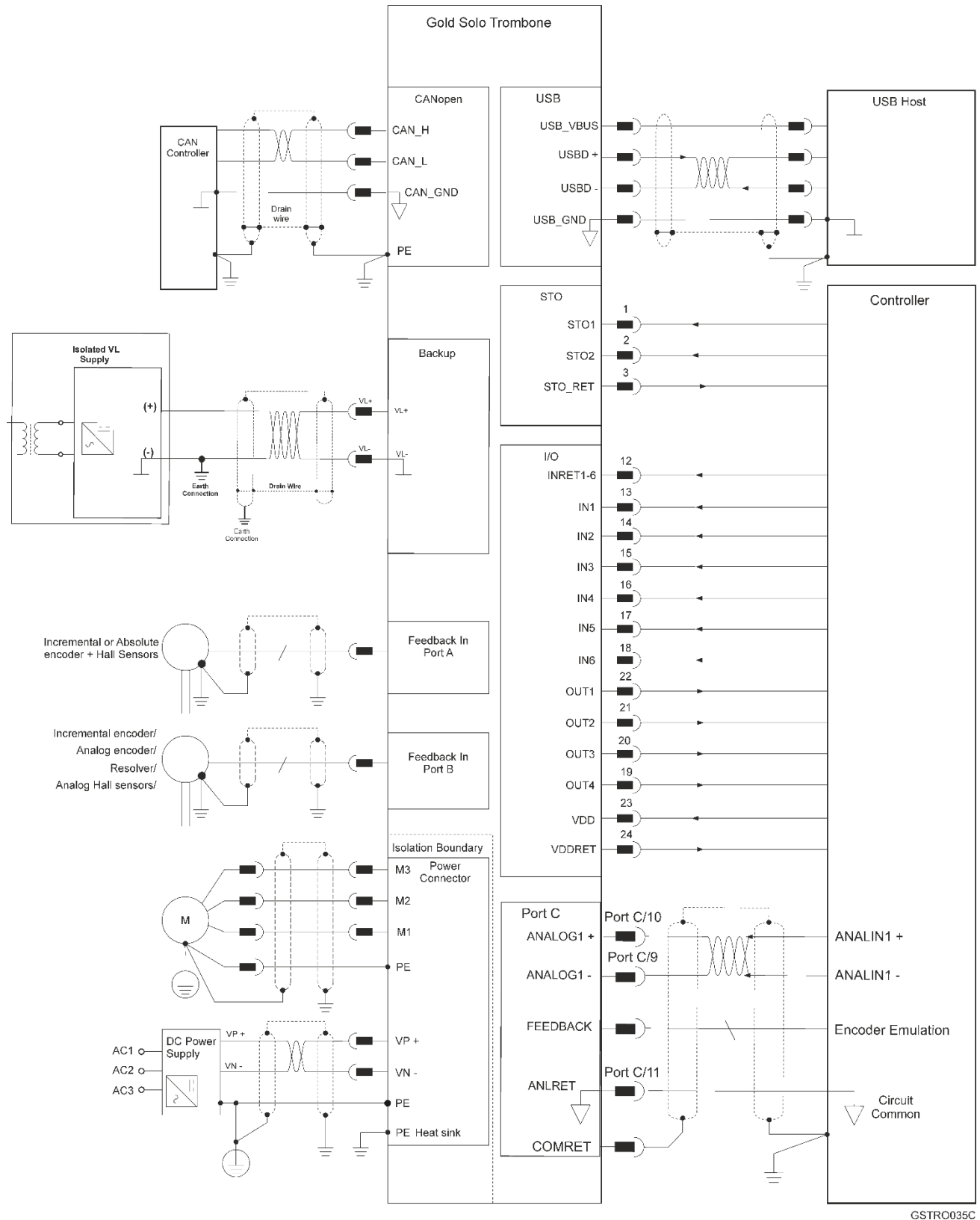


Figure 4: Gold Solo Trombone CAN Connection Diagram – with Backup Functionality
(H, S, T, or AP Model Drive)

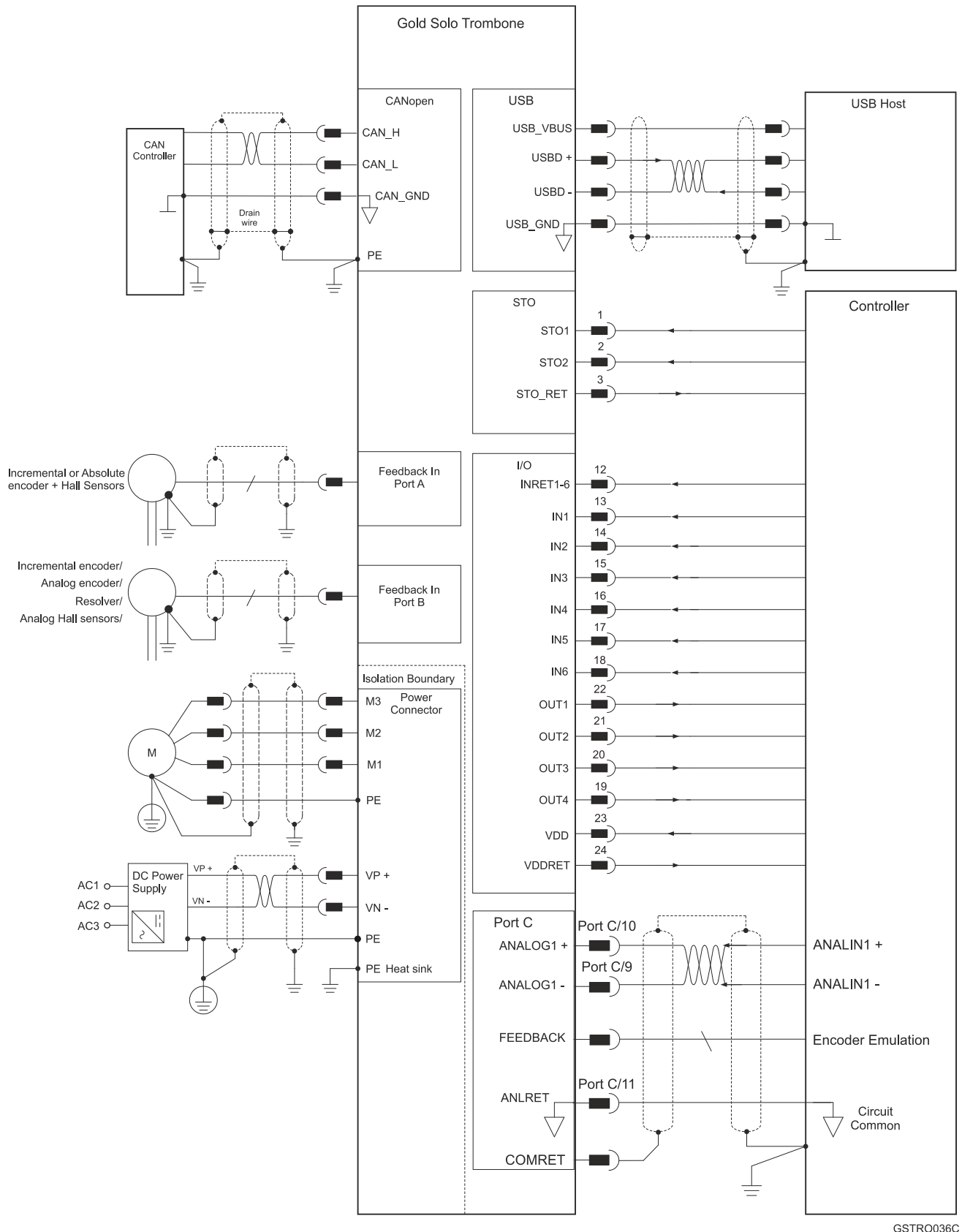




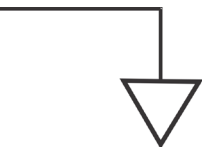
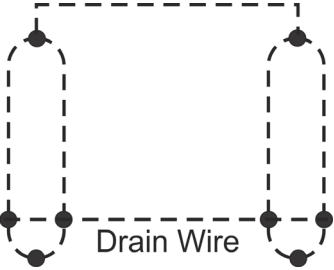
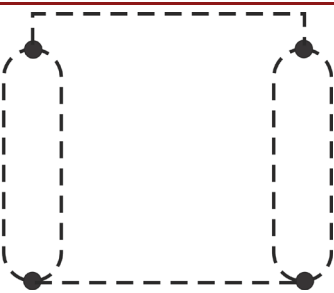
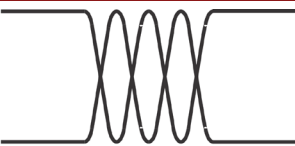
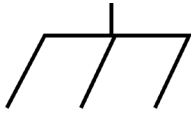
Figure 5: Gold Solo Trombone CAN Connection Diagram – 400 V without Backup Functionality (0 or 1 Model Drive)



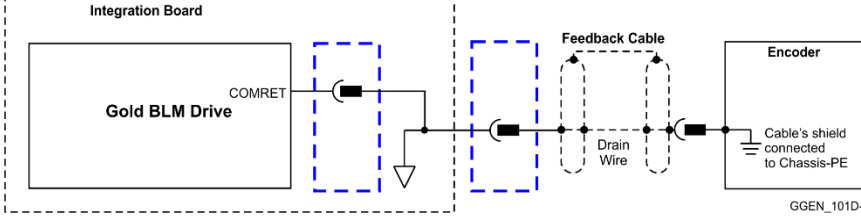
Chapter 6: Wiring

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



Wiring Symbol	Description
 <p>Integration Board</p> <p>Gold BLM Drive</p> <p>COMRET</p> <p>Feedback Cable</p> <p>Encoder</p> <p>Cable's shield connected to Chassis-PE</p> <p>Drain Wire</p> <p>GGEN_101D-R</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.

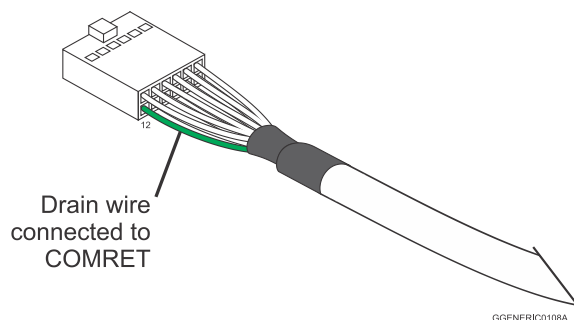


Figure 6: Feedback and Molex Control Cable Assemblies

Note: Please pay attention to the location of PIN 1 in the above connector diagram.

It should be noted that in all Elmo manuals the pinouts are shown differently to Molex's technical sheets. Molex shows pin 1 at the bottom-left when looking at the face of the cable-side connector, tab down (Figure 7).

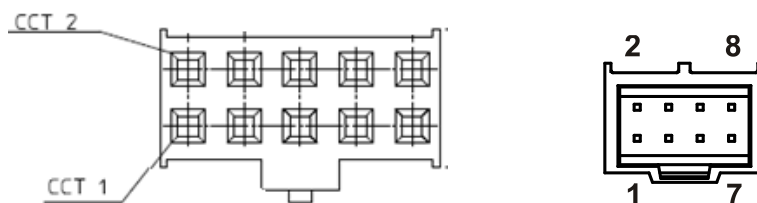


Figure 7: Molex vs Elmo Technical Diagram Examples Showing Pinout Numbers

5. However, Elmo specifies pin 1 as the bottom-left of drive-side connector. The result is that Elmo's pin designations are mirrored relative to the pinouts as labeled by Molex.
6. Where there is only one COMRET pin (Common Return) in the connector, which **MUST** be connected to the DRAIN WIRE and also to COMRET signal of the cable, it is necessary to connect the drain wire and COMRET signal to the same pin.



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 Shrouded feedback connector (Figure 8).
- b. At the motor, connect the feedback cable drain wire to the GND motor chassis terminal of the feedback connector (Figure 8).

The drawing displays two earth connections.

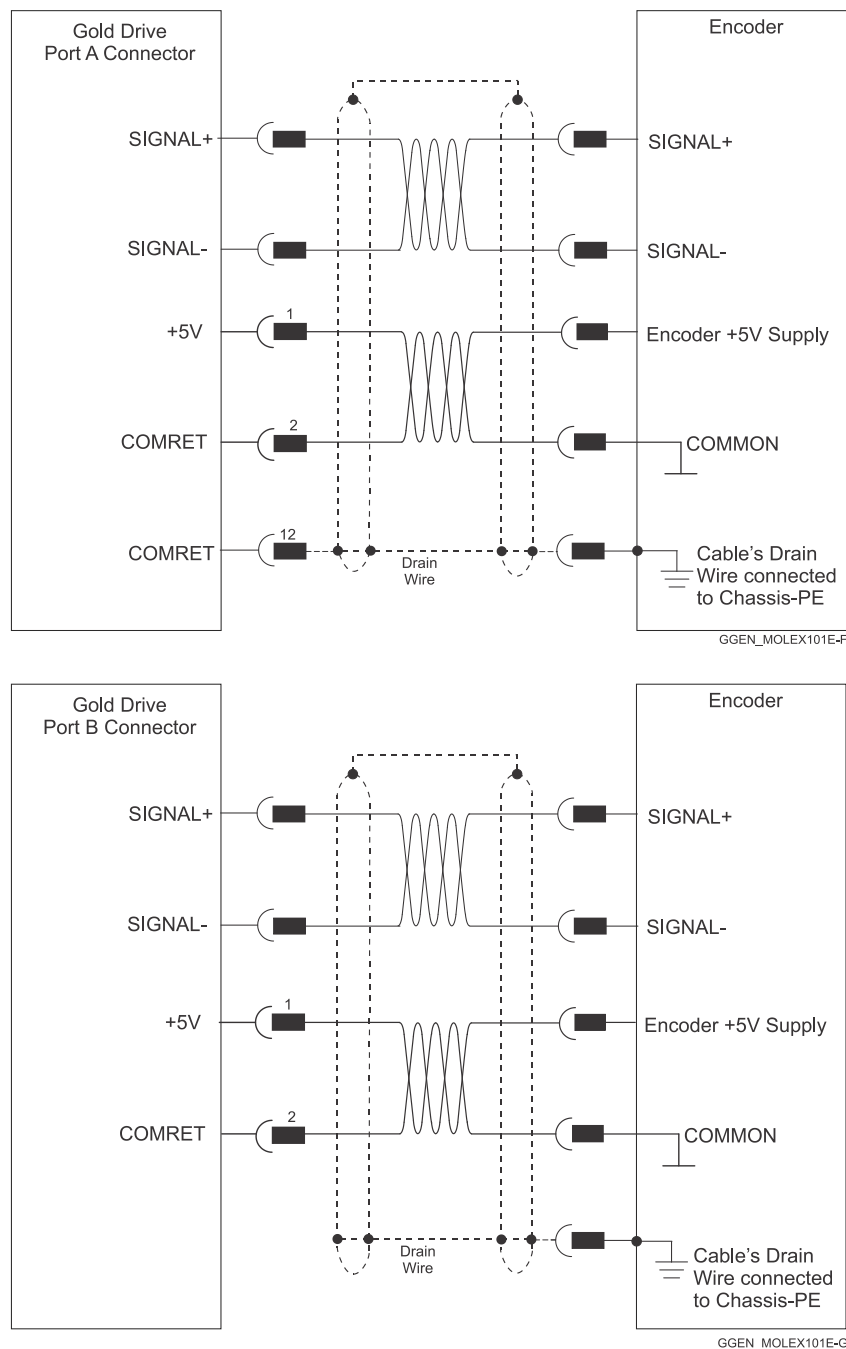


Figure 8: Feedback Port A and B Cable Assemblies



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.

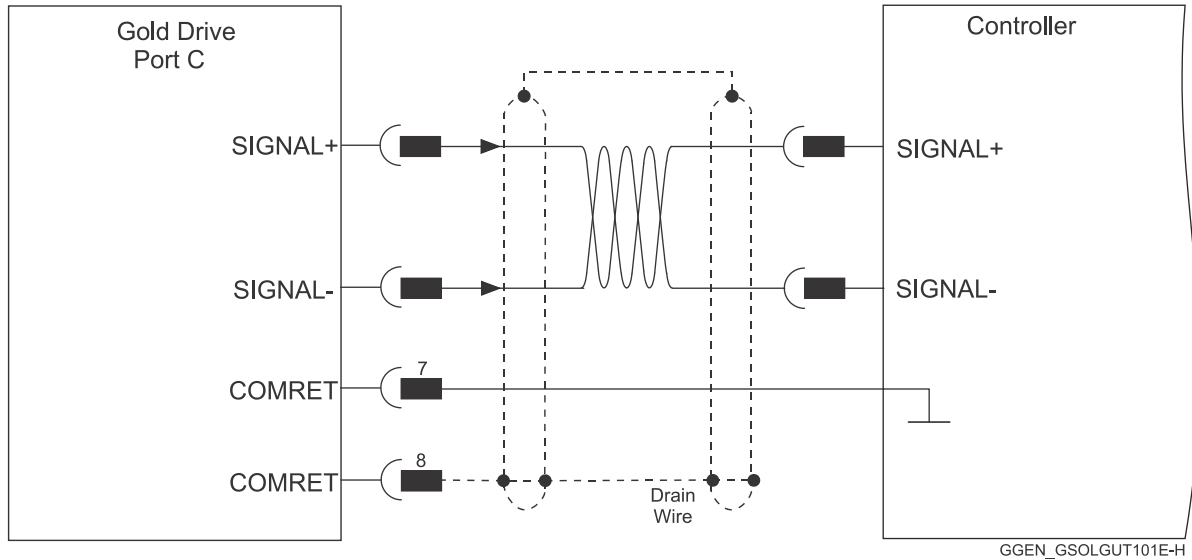


Figure 9: Feedback Port C Cable Assemblies

6.1.4. IO Cable Connector

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

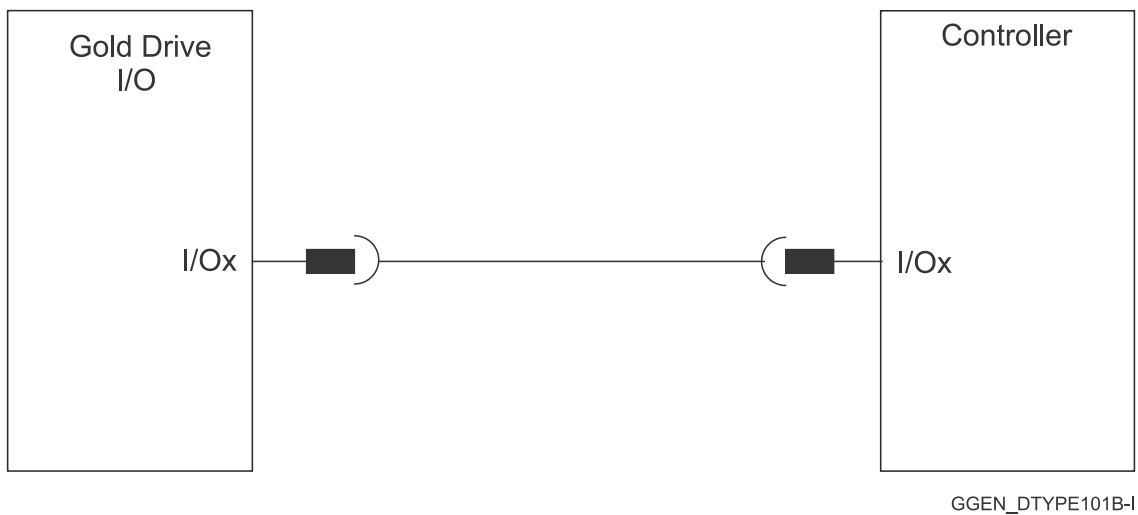


Figure 10: Feedback IO Cable Assemblies



6.1.5. STO (Port C) Cable Connector

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

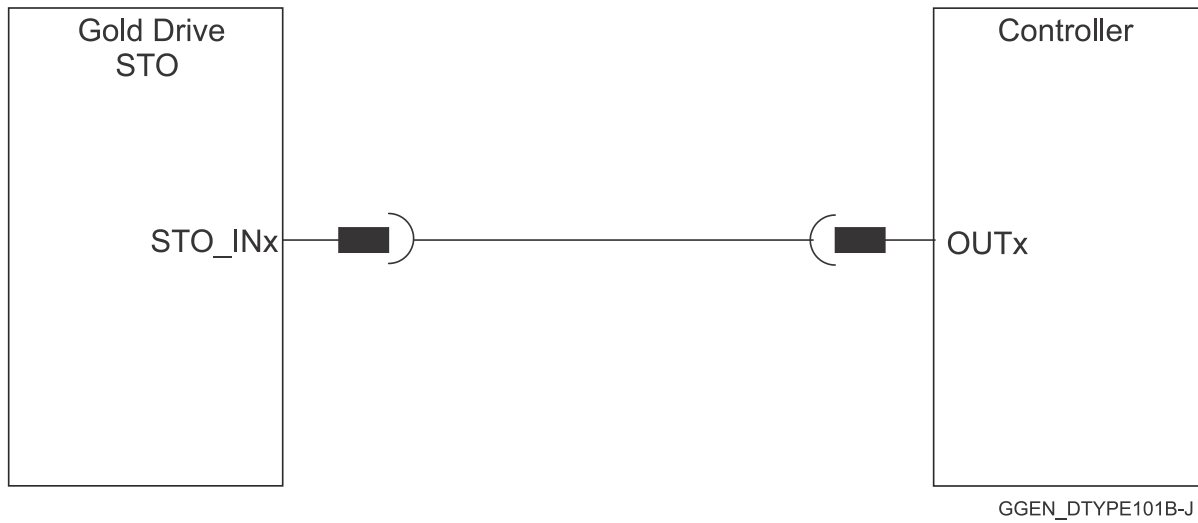


Figure 11: STO Cable Assemblies



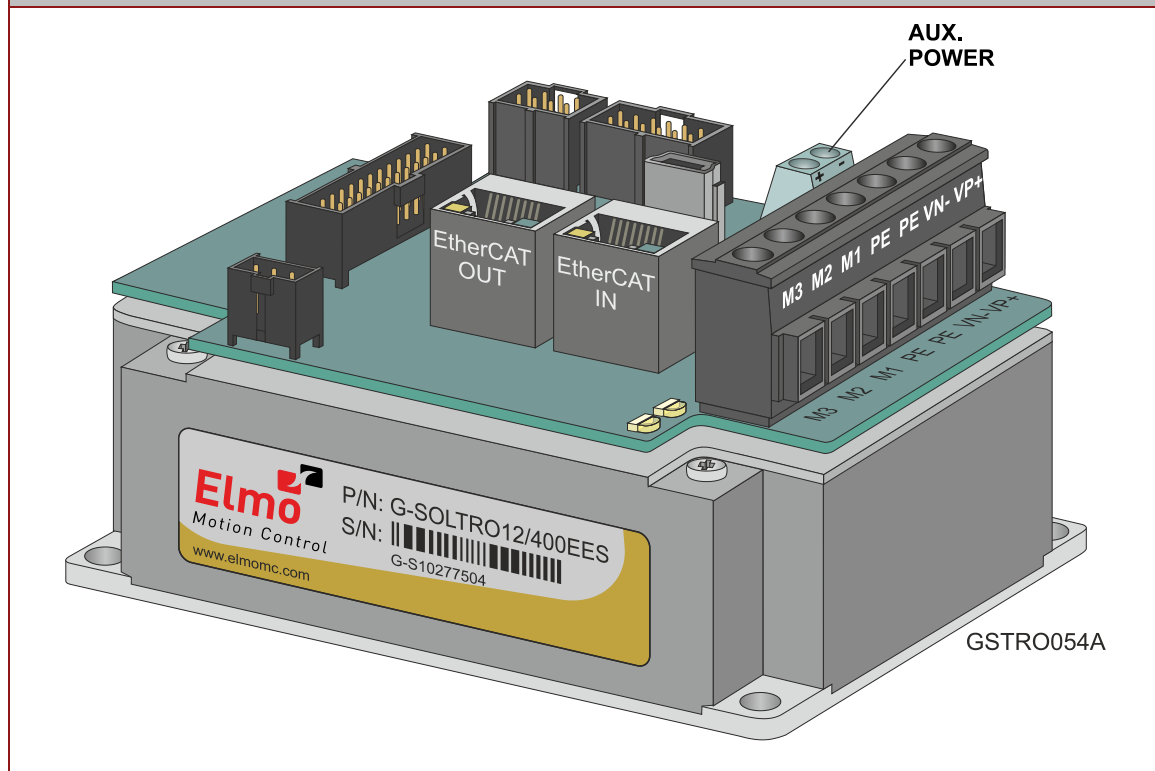
6.2. Main Power and Motor Power Pinouts

See Section 6.3 for full details on Main Power.

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

Pin	Function	Cable	
		Brushless Motor	Brushed DC Motor
M3	Motor phase	Motor	Motor
M2	Motor phase	Motor	Motor
M1	Motor phase	Motor	N/C
PE	Earth Connection	Motor	Motor
PE	Earth Connection	DC Power	
VN-	DC Negative Power input	DC Power	
VP+	DC Positive Power input	DC Power	

Pin Positions



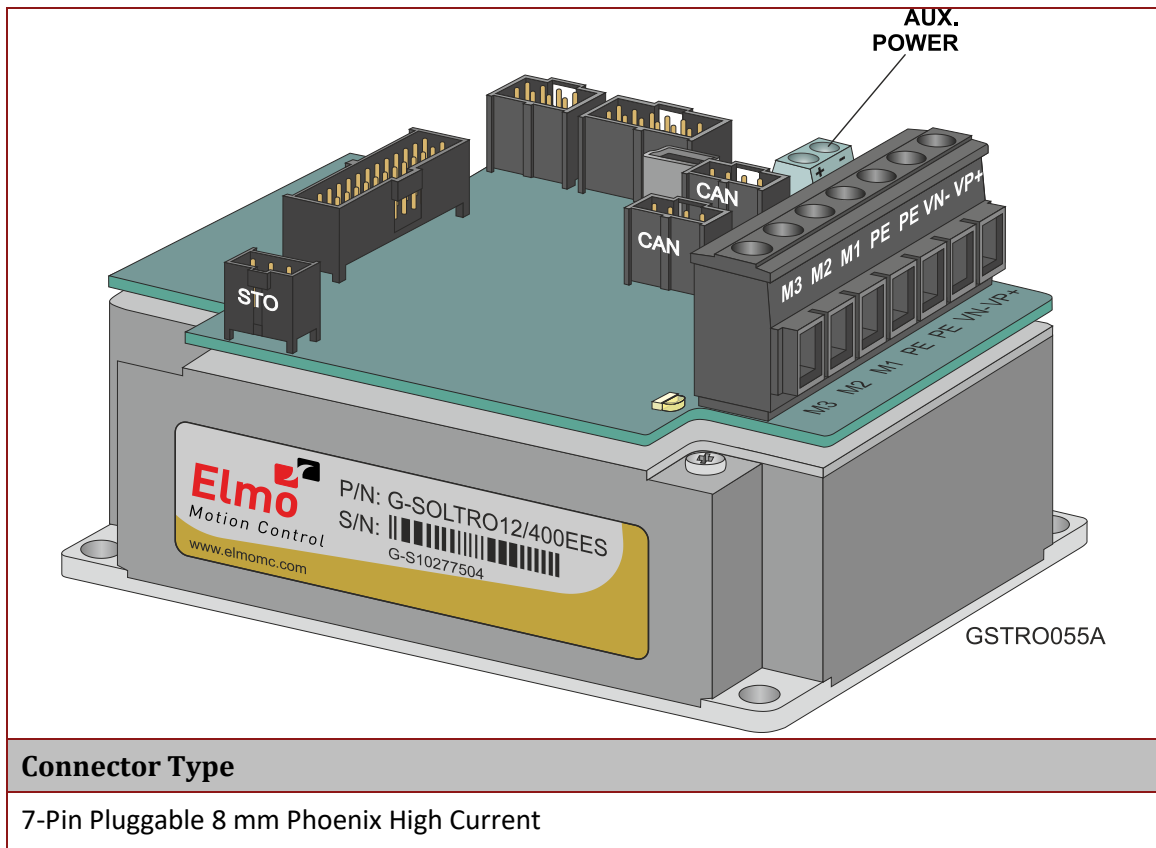


Table 2: Connectors for Main Power and Motor Power



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

- 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 Earth Connection (PE terminal).
- Ensure that the motor chassis is properly grounded.

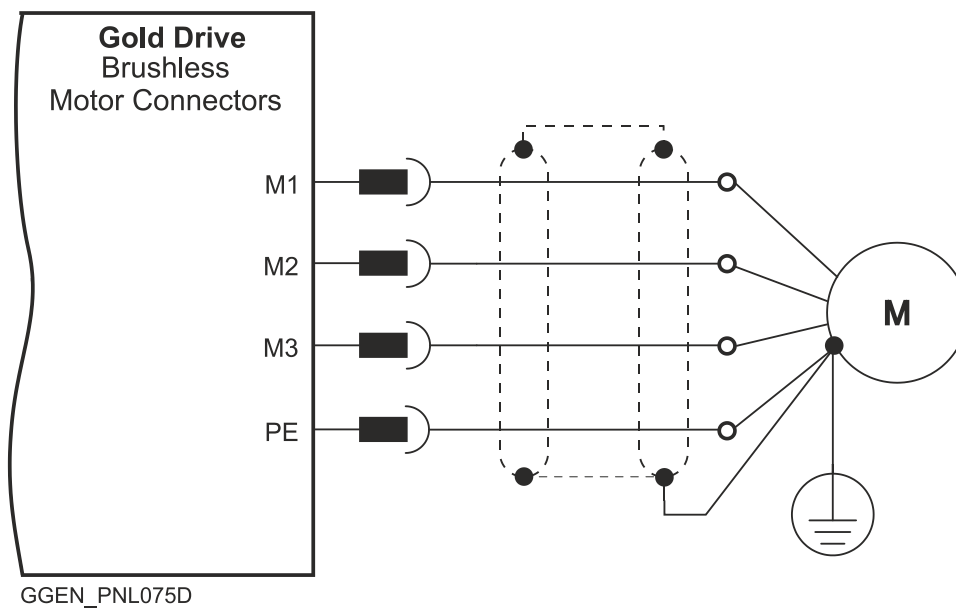


Figure 12: Brushless Motor Power Connection Diagram

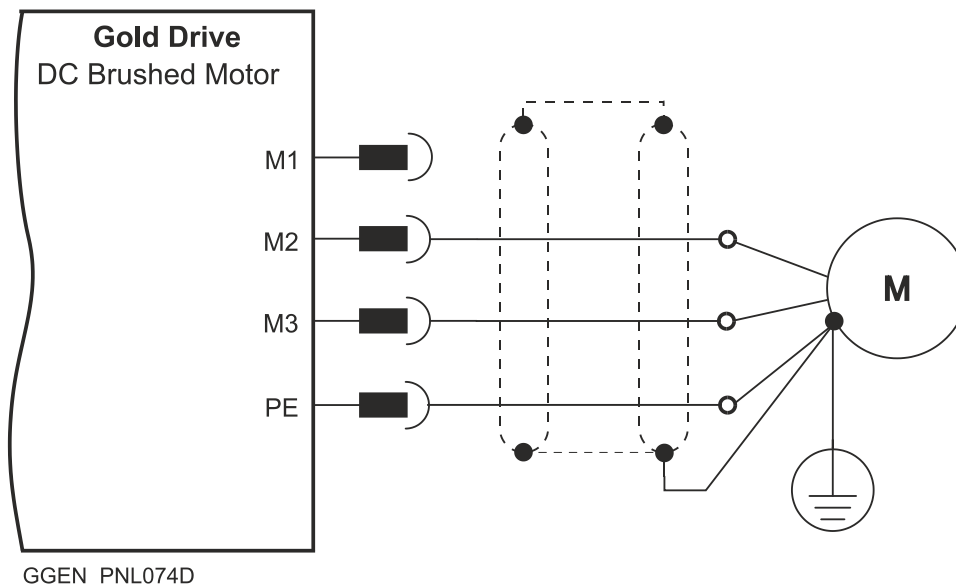


Figure 13: Brushed Motor Power Connection Diagram



6.3. Main Power

The Gold Solo Trombone receives power from main and auxiliary 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	Function	Cable
PE	Earth Connection	DC Power
VN-	DC Negative Power input	DC Power
VP+	DC Positive Power input	DC Power

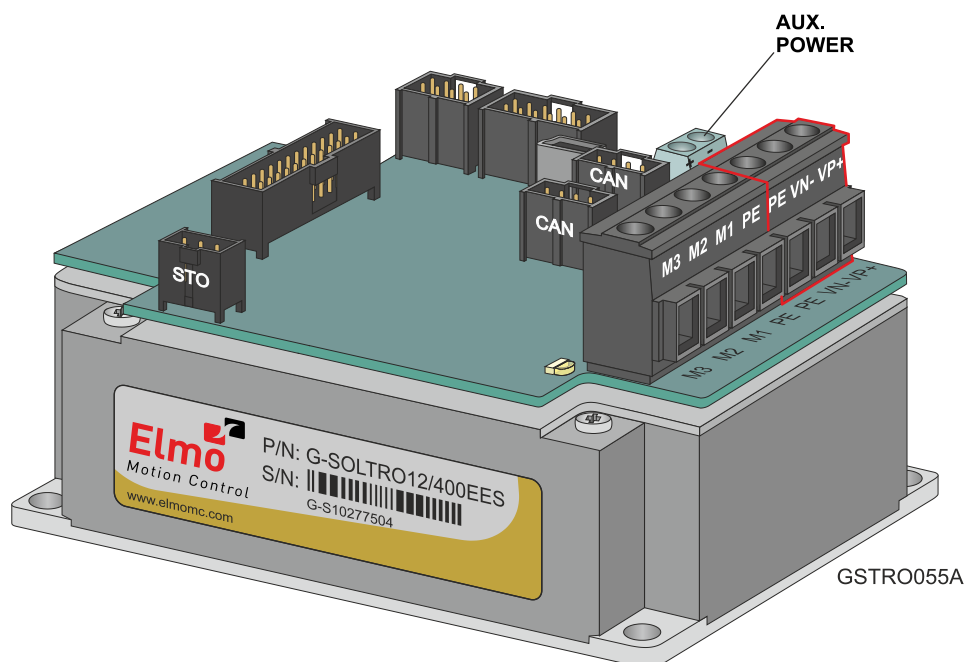
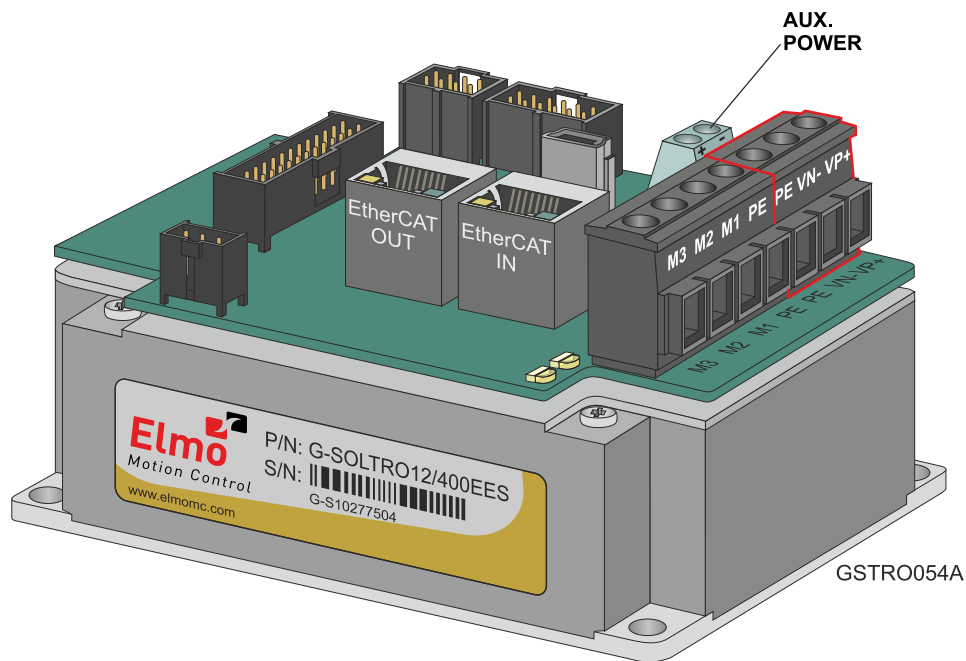


Table 3: Connectors for Main Power



The DC power for the Gold Solo Trombone is delivered from a separated power supply. Elmo recommends using the Tambourine power supply for servo applications designed for use in conjunction with Elmo drives.

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

The power stage of the Gold Solo Trombone is fully isolated from the other sections of the Gold Solo Trombone, 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 Solo Trombone.**

In addition, this isolation simplifies the requirements of the DC power supply that is used to power the DC bus of the Gold Solo Trombone, by allowing it to operate with a direct-to-mains connection eliminating 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 Solo Trombone can also operate from an isolated power supply or batteries.

When rectifying an AC voltage source, the AC voltage level for the G-TROXX/400 servo drive must be limited to 270 VAC so as not to exceed the maximum 390 VDC. Similarly, for the G-TROXX/800 servo drive, the AC is limited to 528 VAC input (Phase to Phase), so as not to exceed the maximum 747 VDC (in the case of an 800 VDC drive).

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 AC 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

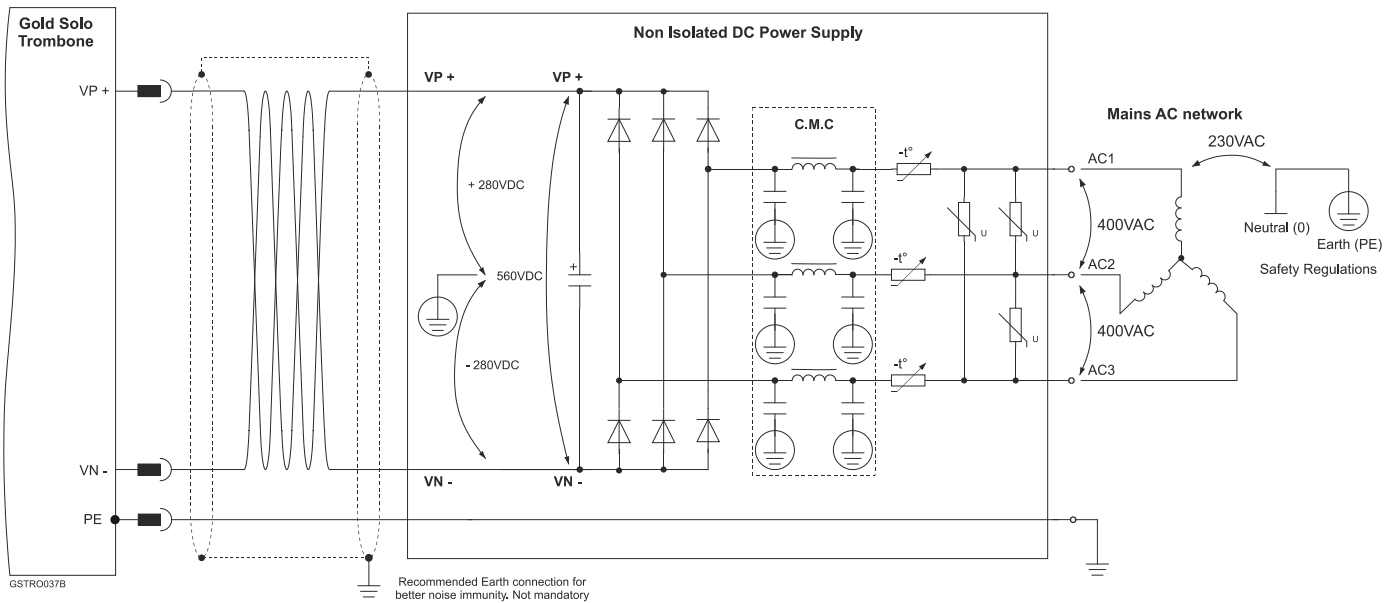


Figure 14: Non-Isolated Three-Phase Connection Topology

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

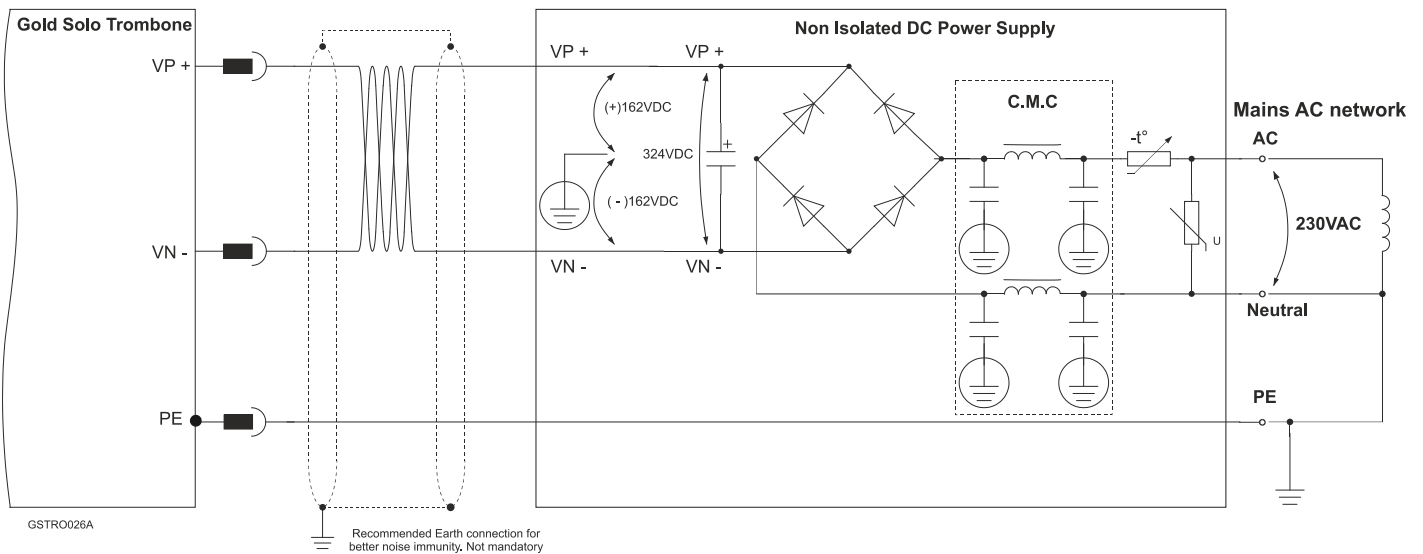


Figure 15: Non-Isolated Single-Phase Connection Topology

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



6.3.1.3. 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 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.

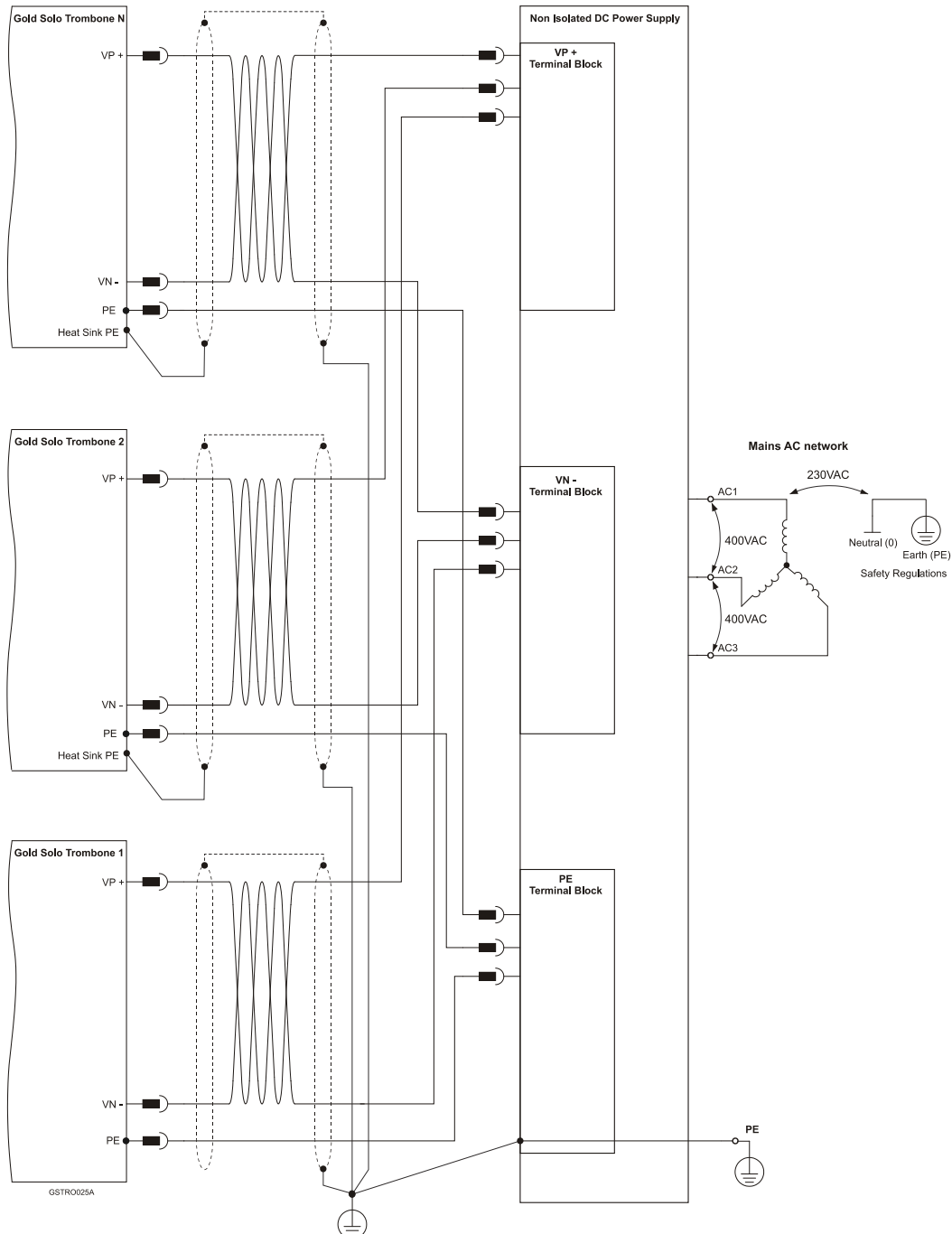


Figure 16: Non-Isolated Three-Phase Multiple Connection Topology



6.3.2. Battery Power Supply

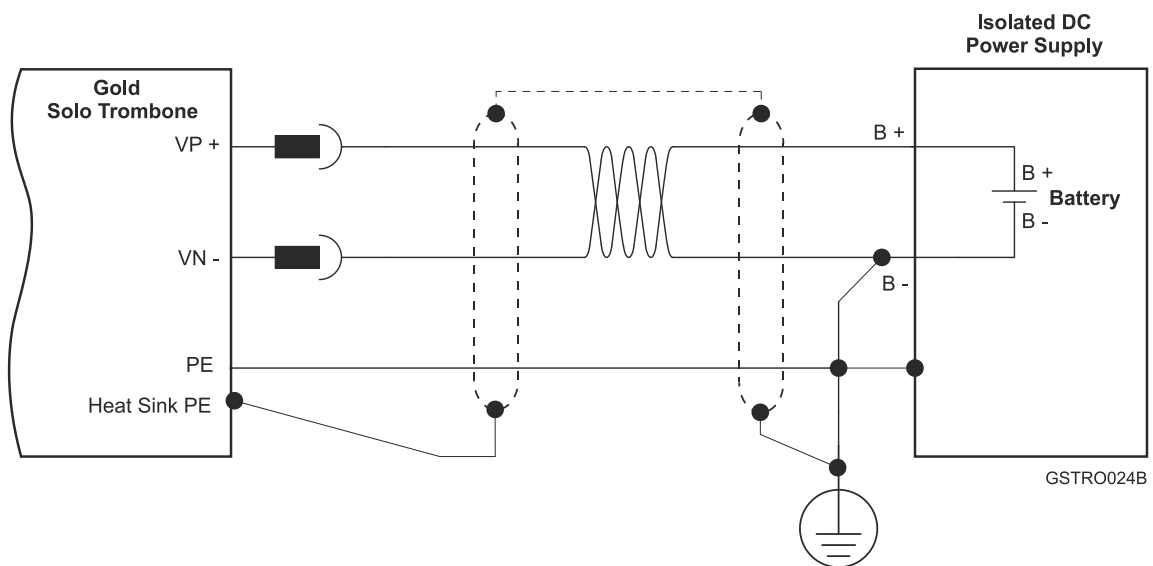


Figure 17: Battery Connection Topology



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. Auxiliary Power

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

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

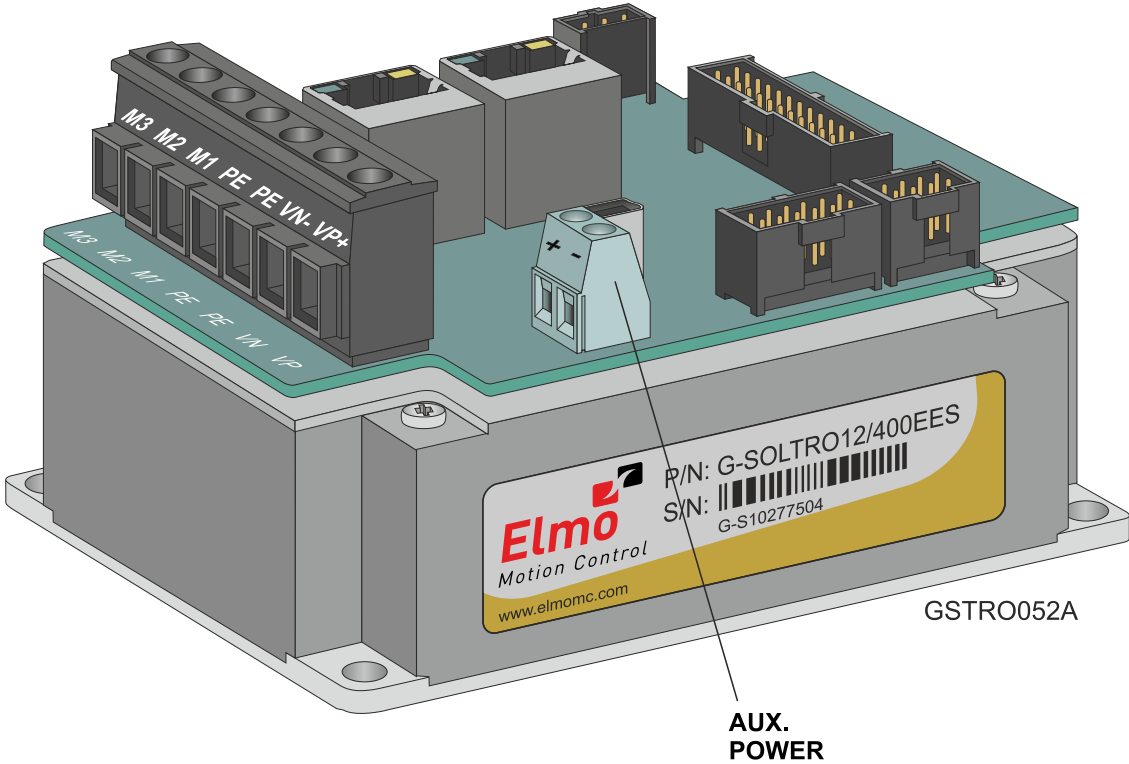
Pin	Function	Cable
H, S, T or AP option type		
VL+	+24 V Auxiliary Supply Input Positive	DC Power
VL-	24 V RET Auxiliary Supply Return	DC Power
		
Cable Connector		
2-Pin Pluggable 5.08 mm Phoenix High Current		

Table 4: Auxiliary 24 VDC Backup Supply Pins and Polarity

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 Solo Trombone to operate with the main power supply only, *with no need for an auxiliary 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 H, S, T, or AP option Gold Solo Trombone should be used, with an external 24 VDC isolated supply connected to it.

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



Connect the auxiliary 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 be braided.
2. The source of the 24VDC backup supply must be isolated from the Mains.
3. For safety and EMI reasons, connect the return of the 24VDC backup supply to the closest Earth Connection (PE).
4. Connect the cable shield to the closest ground (PE) near the power source.
5. Before applying power, first verify that the polarity of the connection is correct.

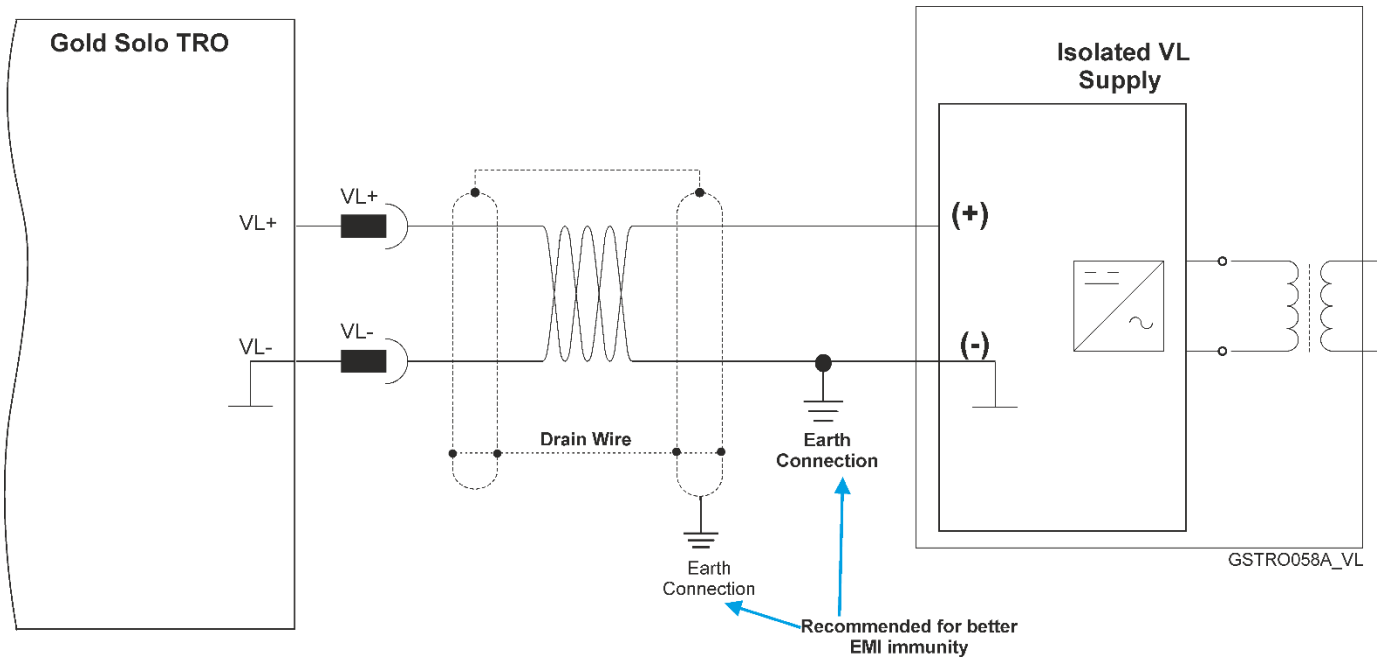
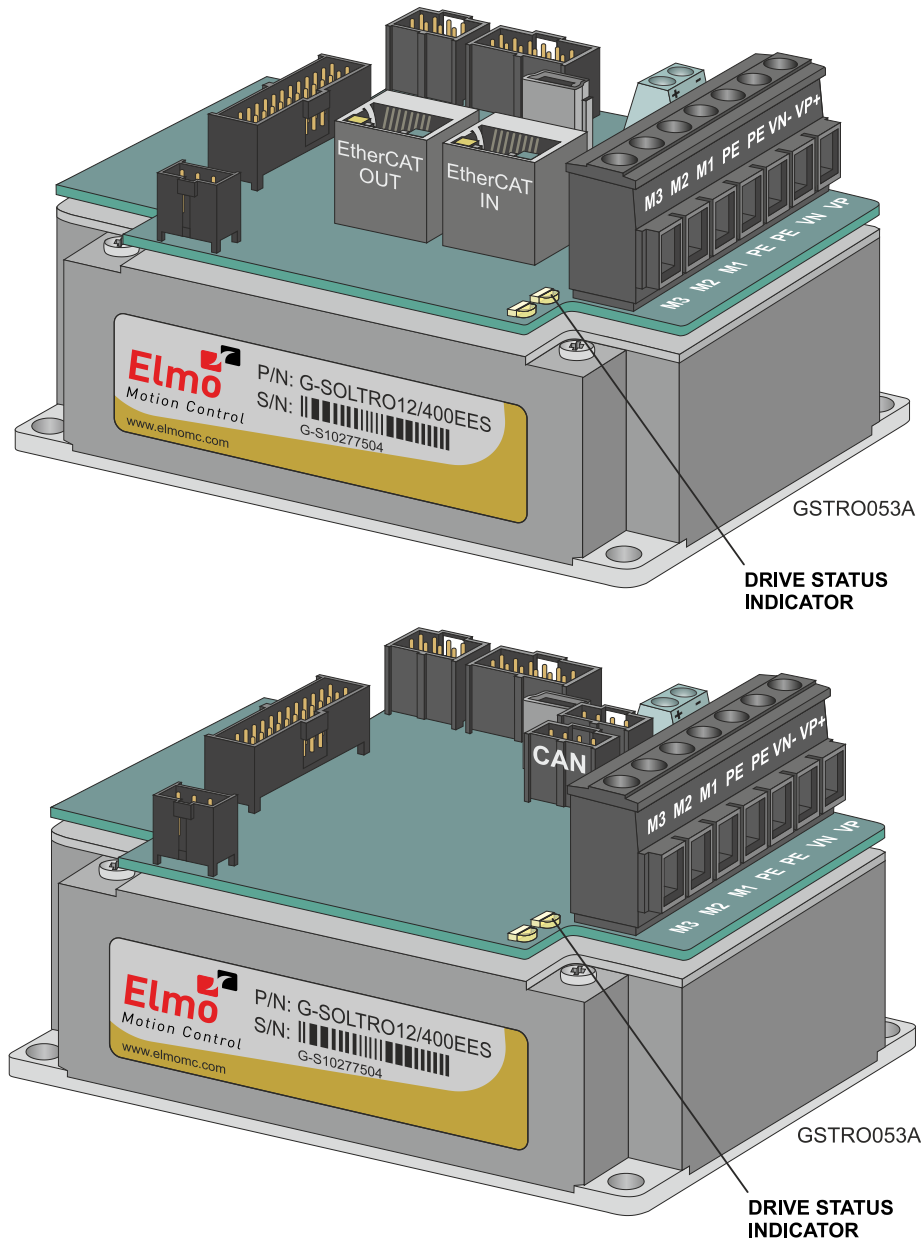


Figure 18: 24 VDC Backup Supply VL Connection Diagram



6.5. Drive Status Indicator

The Gold Solo Trombone is equipped with several light-emitting diode (LED) indicators.



This 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).

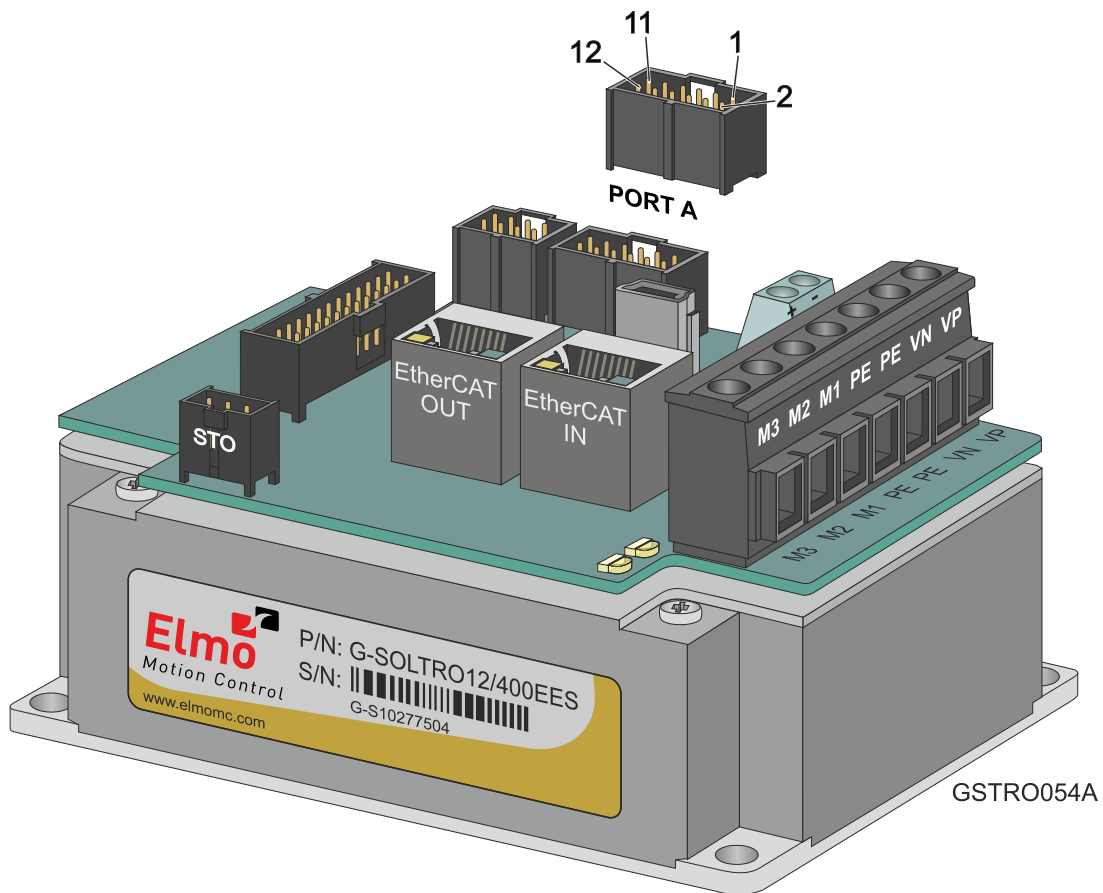


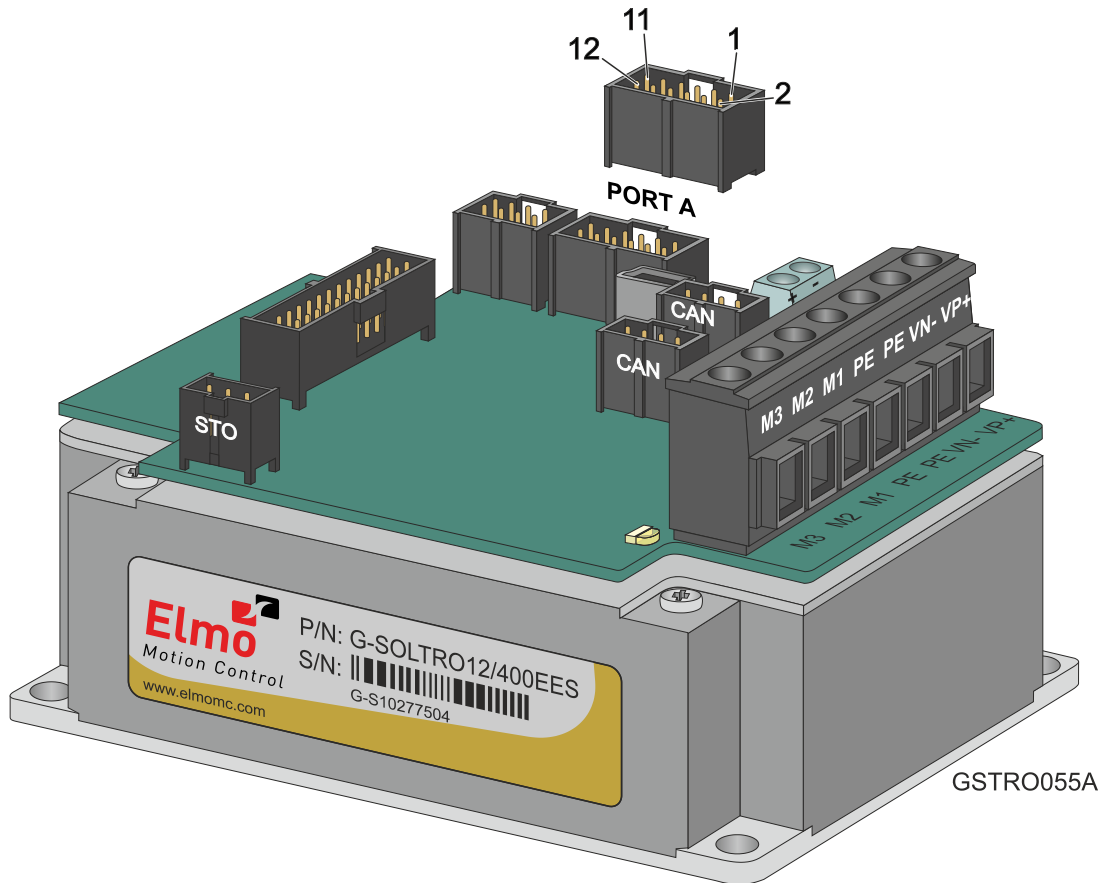
6.6. Port A

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

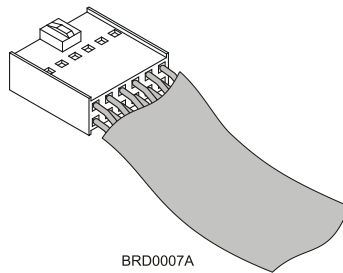
Incremental Encoder			Absolute Serial Encoder	
Pin	Signal	Function	Signal	Function
1	+5V	Encoder +5V supply	+5V	Encoder +5V supply
2, 12	COMRET	Common Return	COMRET	Common Return
3	PortA_ENC_A+	Channel A +	ABS_CLK+	Absolute encoder clock+
4	PortA_ENC_A-	Channel A -	ABS_CLK-	Absolute encoder clock-
5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

Pin Positions





Cable Connector



12-Pin Molex Plug

This cable is included in the cable kit described in Section 3.1.1.

Table 5: Port A Connector



6.6.1. Incremental Encoder

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

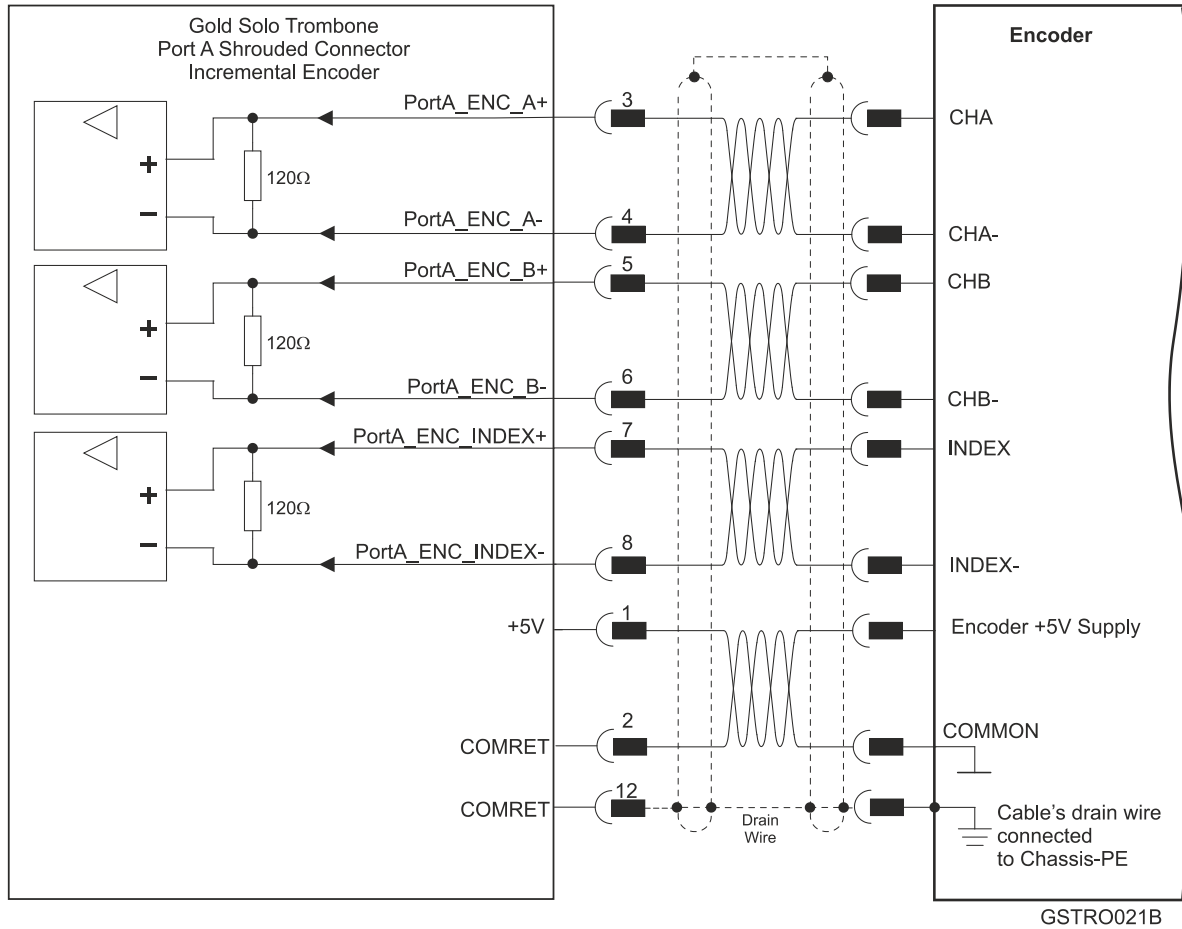


Figure 19: Port A Incremental Encoder Input – Recommended Shrouded Type Connection Diagram

6.6.2. Hall Sensor

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

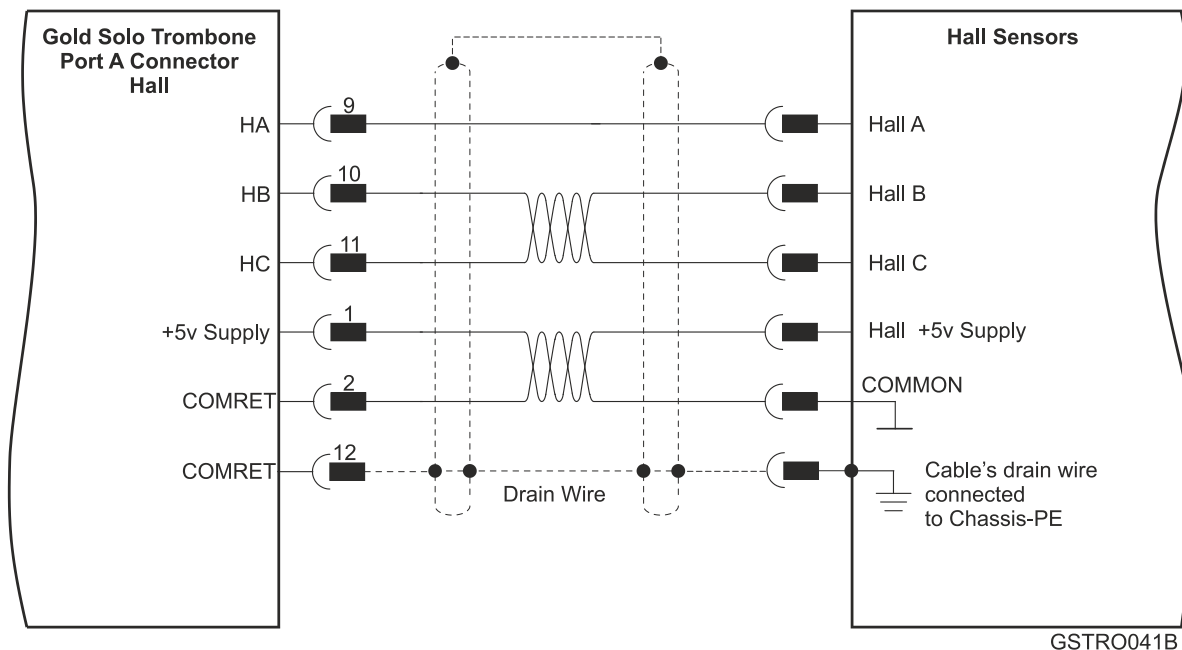


Figure 20: Hall Sensor Connection Diagram



6.6.3. Absolute Serial Type Encoder

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

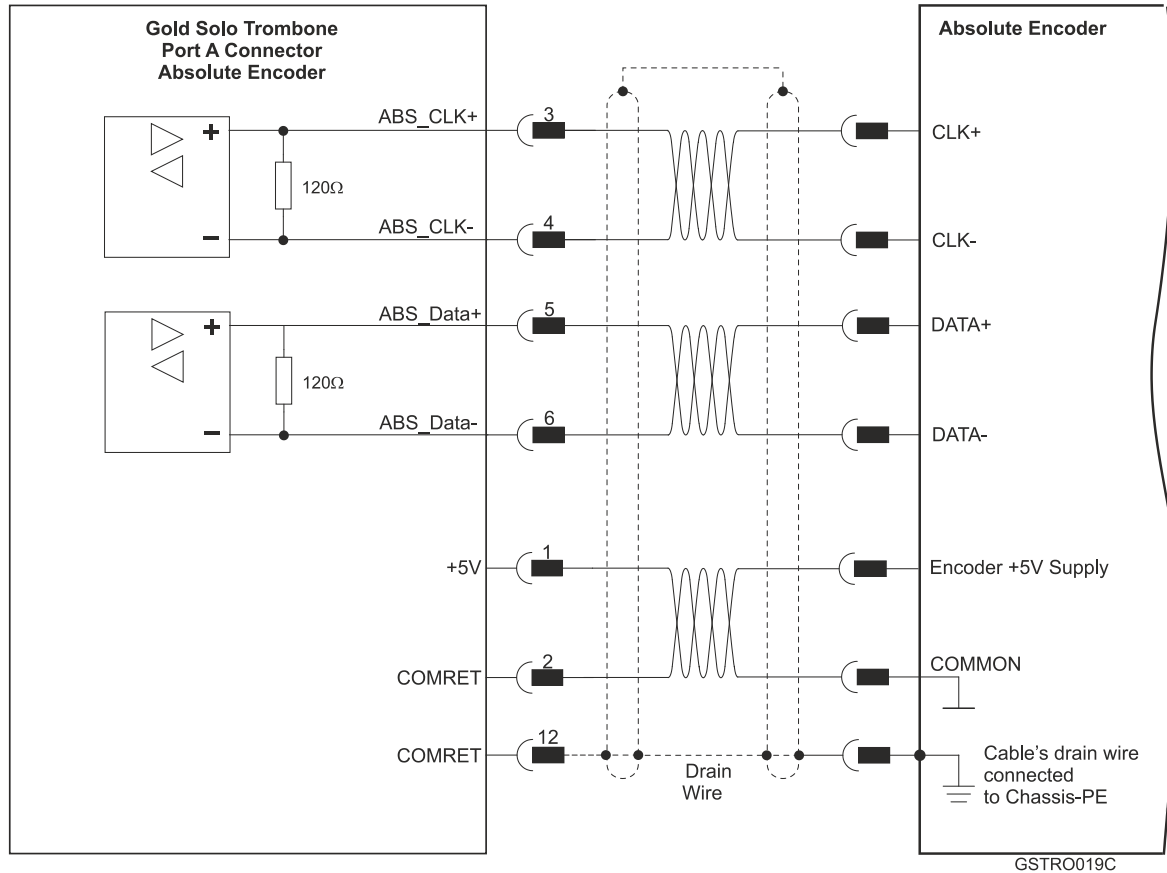


Figure 21: Absolute Serial Encoder – Recommended Shrouded Type Connection Diagram for EnDAT, Biss, and SSI

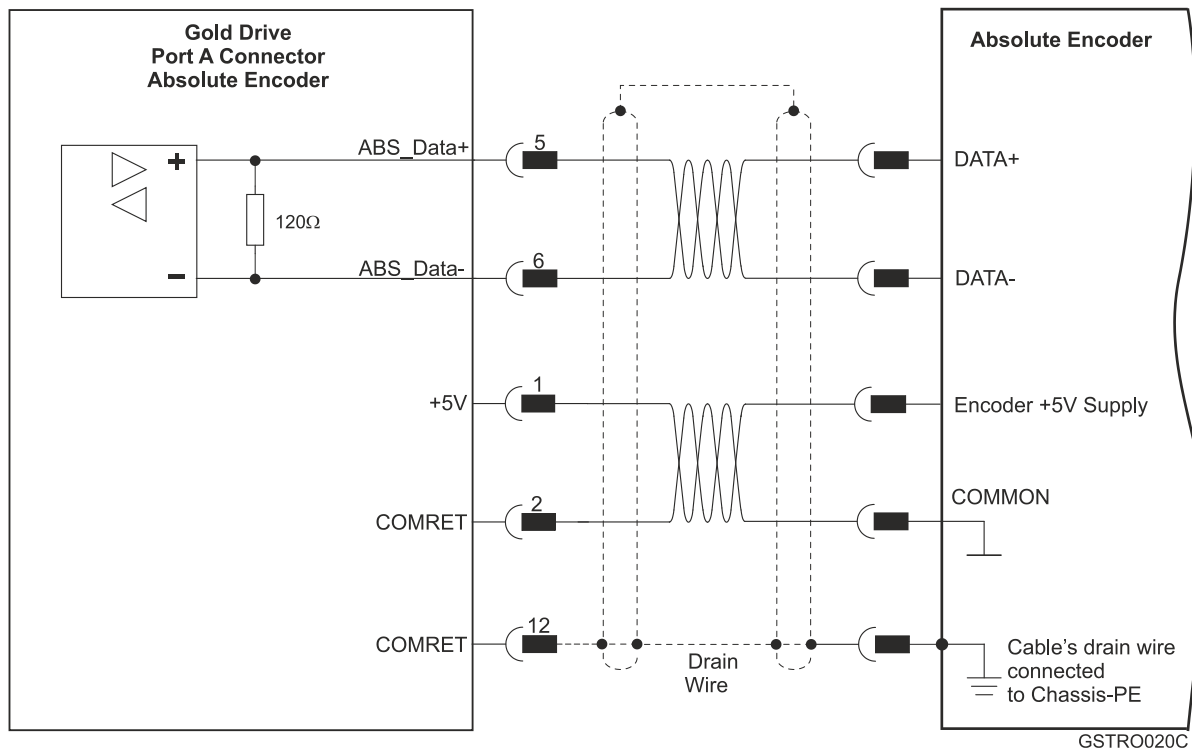


Figure 22: Absolute Serial Encoder – Recommended Shrouded Type Connection Diagram for Sensors Supporting Data Line Only (NRZ types, e.g., Panasonic / Mitutoyo / Sanyo Danki / Tamagawa)

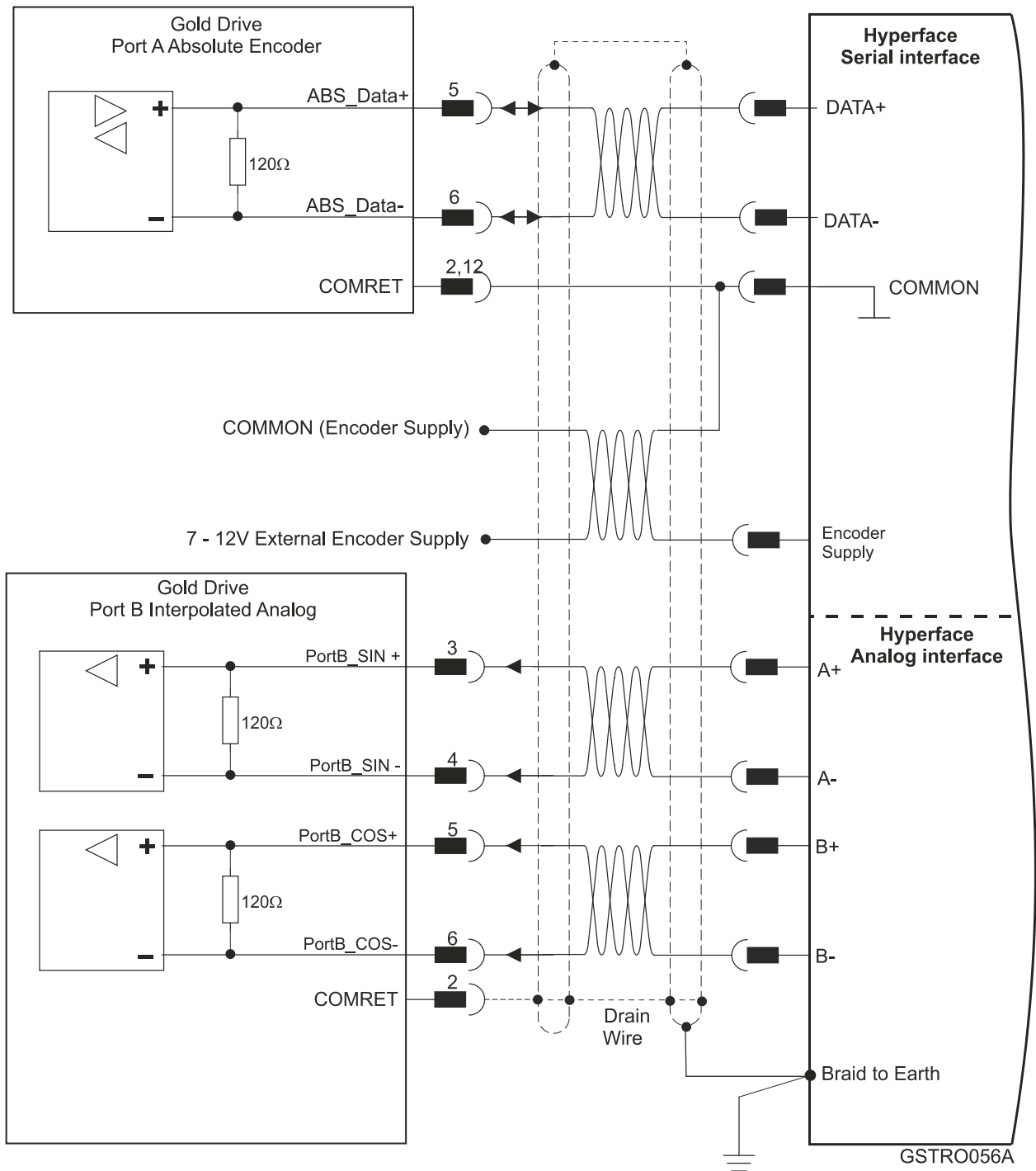


Figure 23: Absolute Serial Encoder – Recommended Shrouded Type Connection Diagram for Stegmann Hyperface

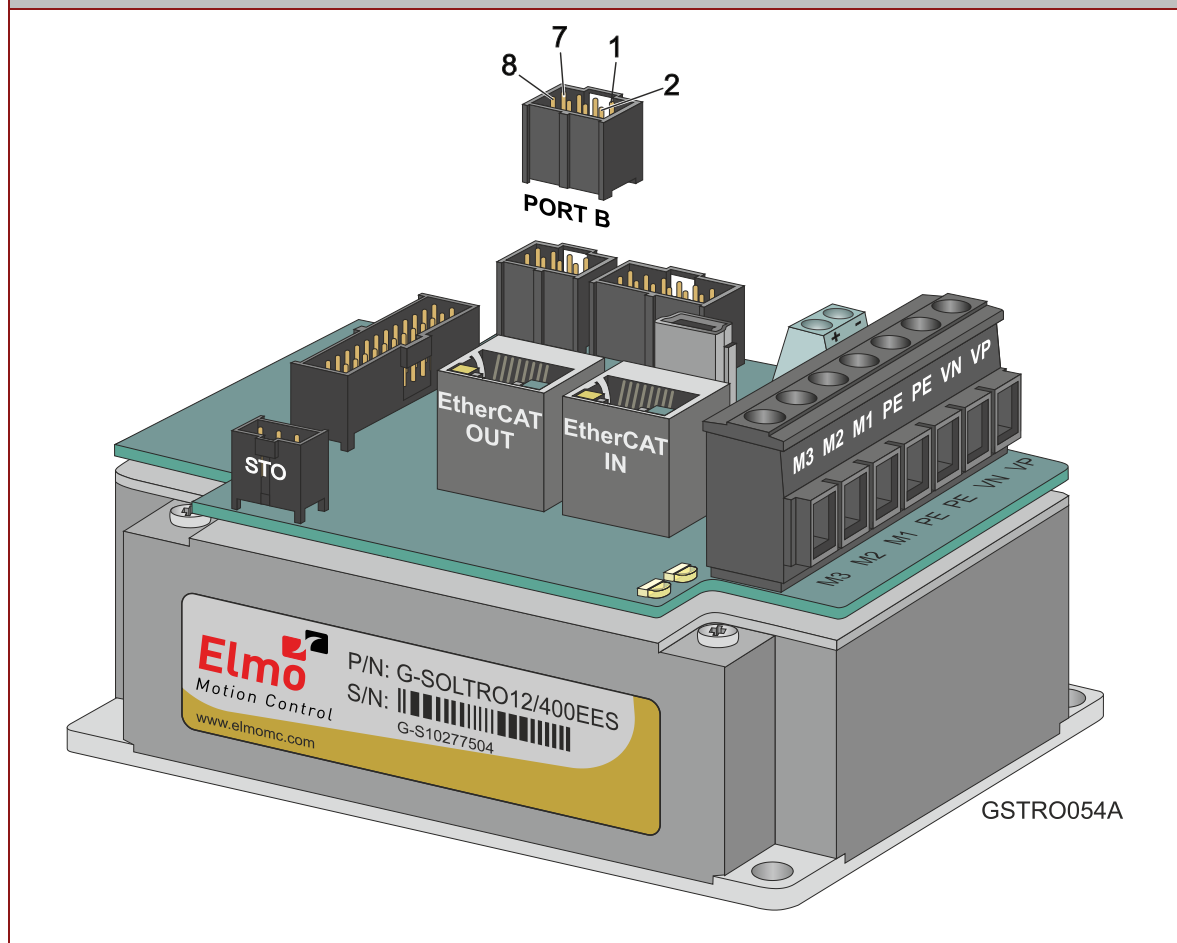


6.7. Port B

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-SOLTRO $XX/YYYEX$			G-SOLTRO $XX/YYYRX$	
Pin	Signal	Function	Signal	Function
1	+5V	Encoder +5V supply	NC	
2	COMRET	Common Return	COMRET	Common Return
3	PortB_ENC_A+/SIN+	Channel A+/Sine+	SIN+	Sine+
4	PortB_ENC_A-/SIN-	Channel A-/Sine-	SIN-	Sine-
5	PortB_ENC_B+/COS+	Channel B+/Cosine+	COS+	Cosine+
6	PortB_ENC_B-/COS-	Channel B-/Cosine-	COS-	Cosine-
7	PortB_ENC_INDEX+/Analog_Index+	Channel_Index+/Analog_Index+	RESOLVER_OUT+	Vref f=1/TS, 50 mA Max.
8	PortB_ENC_INDEX-/Analog_Index-	Channel_Index-/Analog_Index-	RESOLVER_OUT-	Vref complement f= 1/TS, 50 mA Maximum

Pin Positions



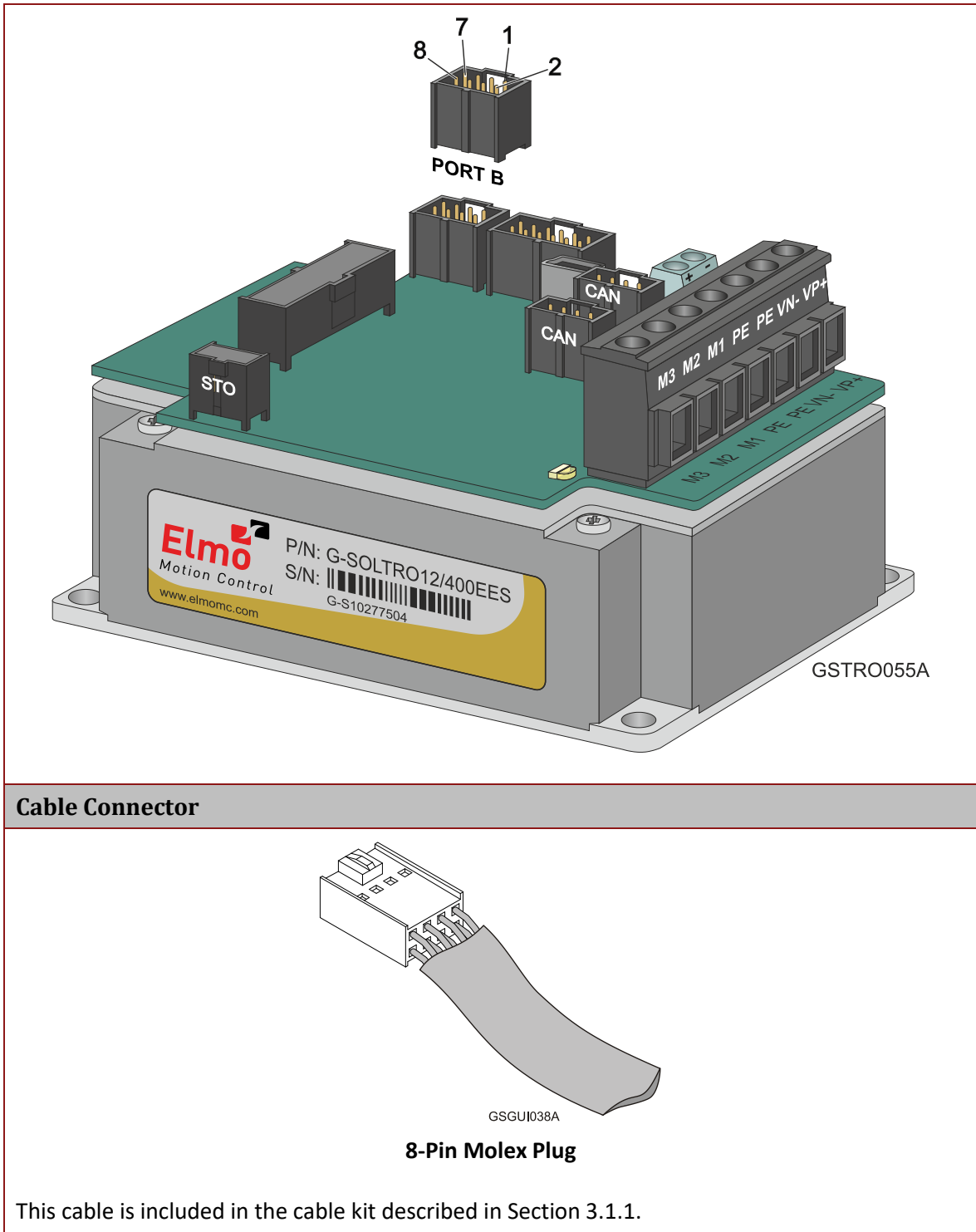


Table 6: Port B Connector



6.7.1. Incremental Encoder

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

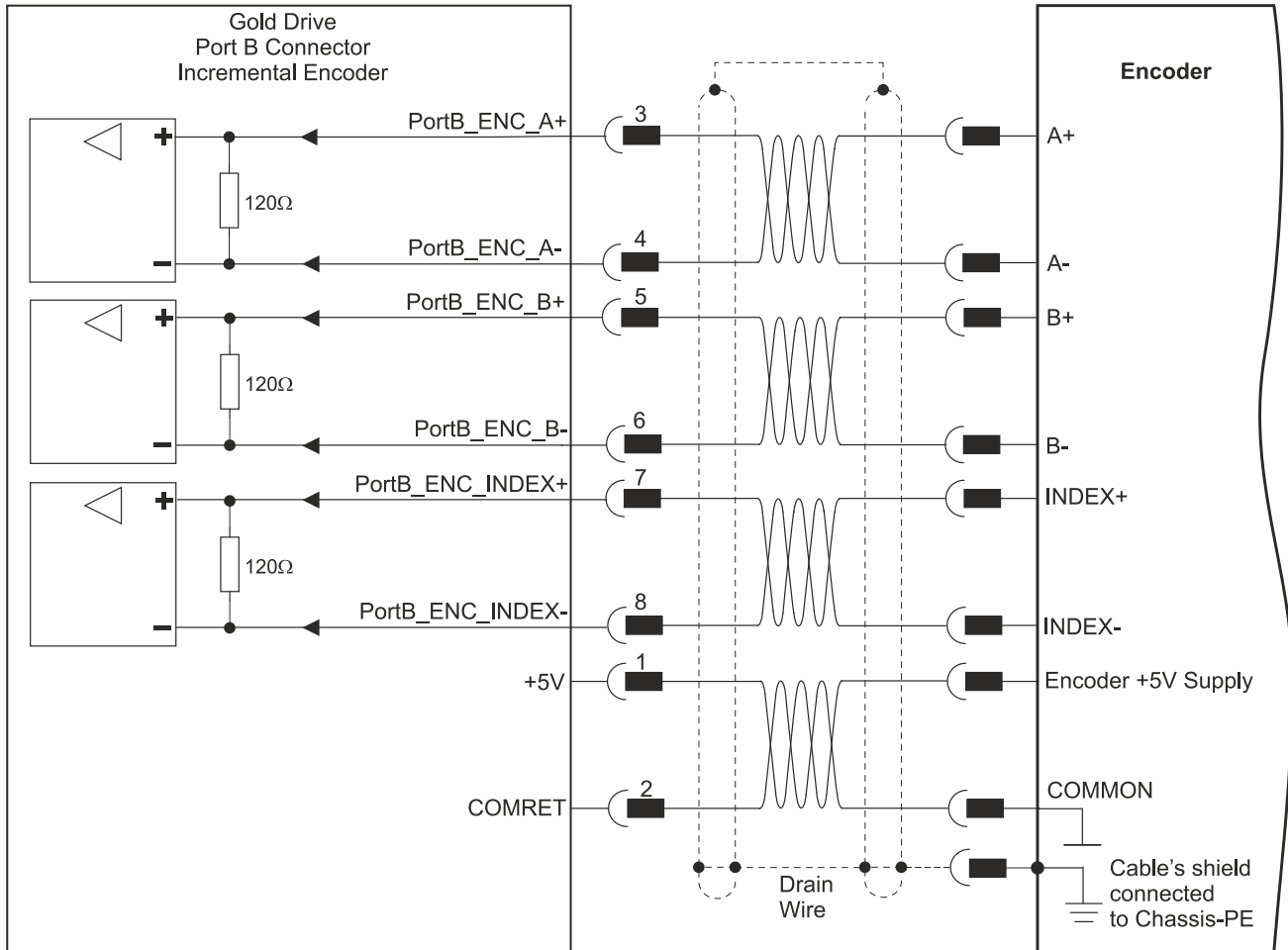


Figure 24: Port B Incremental Encoder Input – Recommended Shrouded Type Connection Diagram



6.7.2. Interpolated Analog Encoder

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

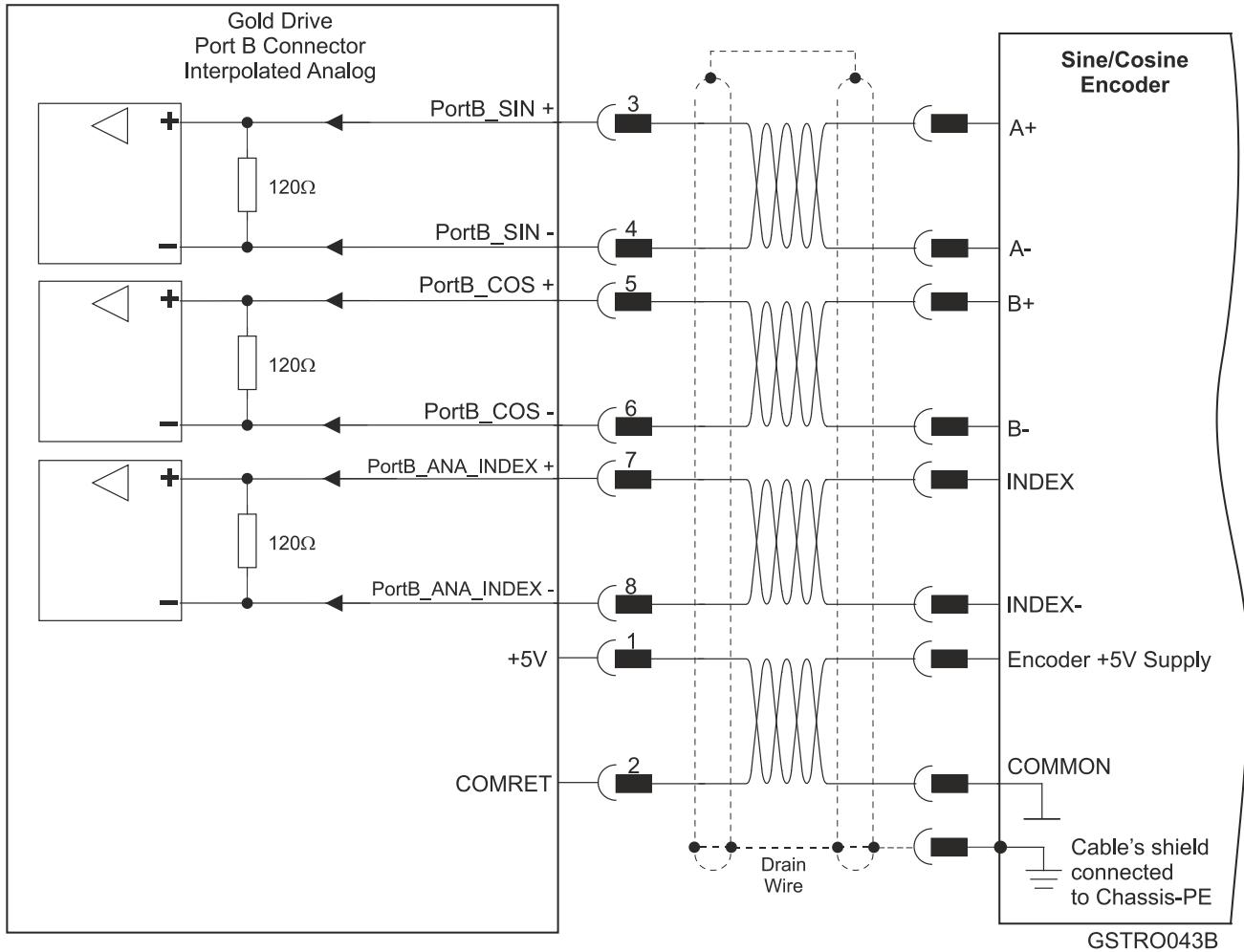


Figure 25: Port B - Interpolated Analog Encoder Shrouded Type Connection Diagram



6.7.3. Resolver

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

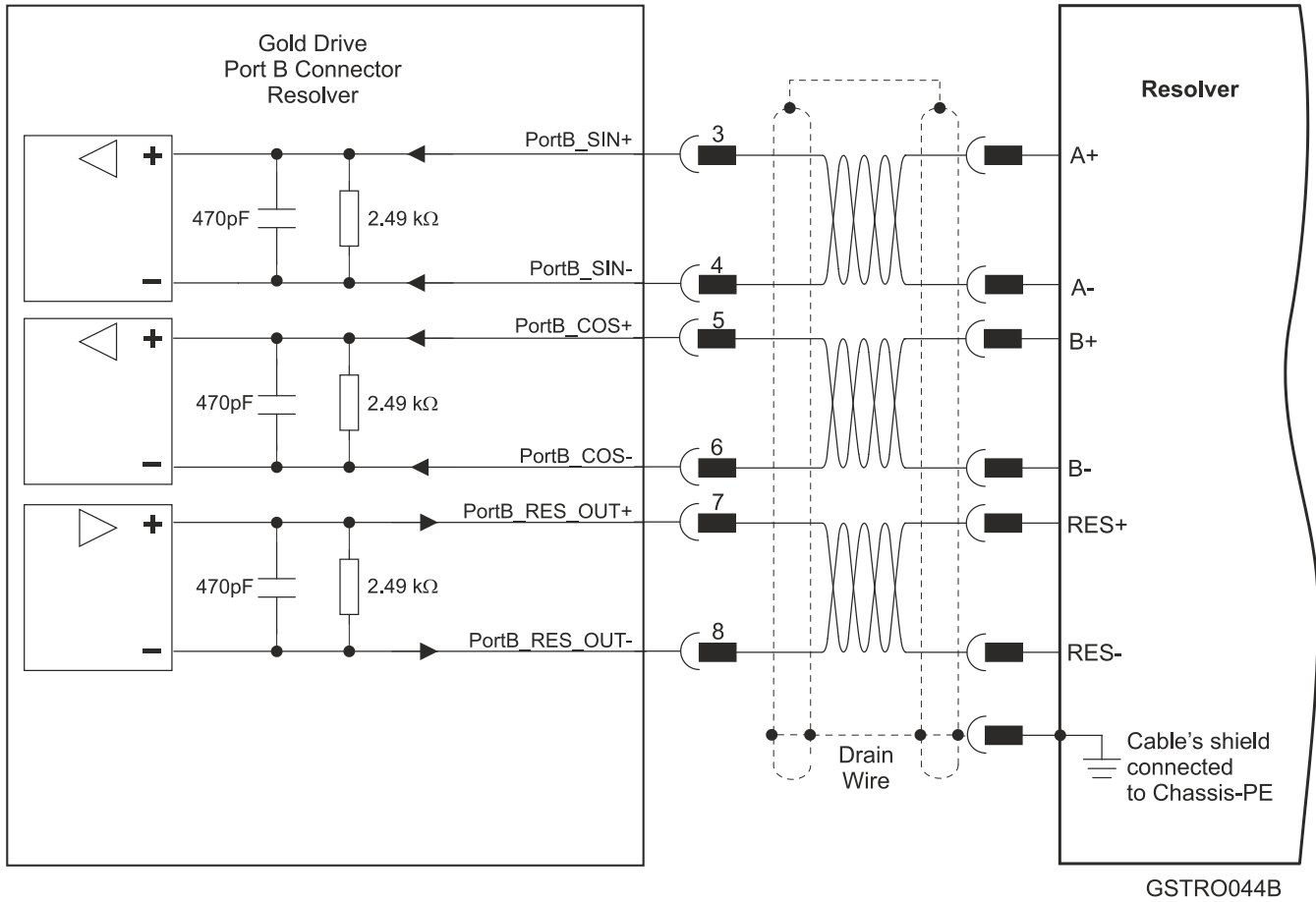


Figure 26: Port B – Resolver Shrouded Type Connection Diagram



6.8. Port C, Analog Input, I/O and STO

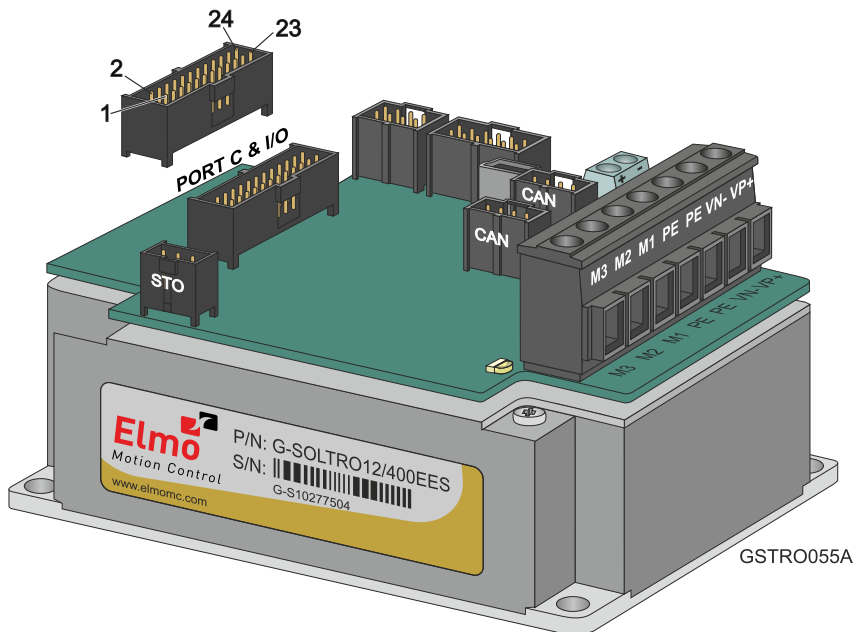
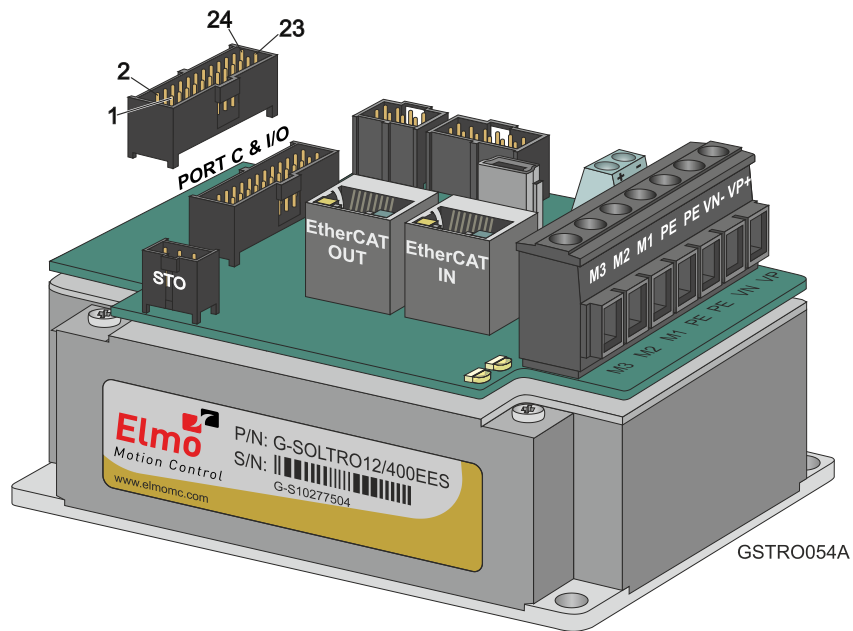
The Port C connector includes the following functions:

- 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.

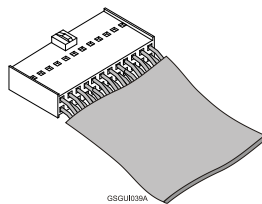
Pin	Signal	Function
1	PortC_ENCO_A+	Buffered Channel A output
2	PortC_ENCO_A-	Buffered Channel A complement output
3	PortC_ENCO_B+	Buffered Channel B output
4	PortC_ENCO_B-	Buffered Channel B complement output
5	PortC_ENCO_Index+	Buffered INDEX output
6	PortC_ENCO_Index-	Buffered INDEX complement output
7	COMRET	Common return
8	COMRET	Common return
9	ANALOG1-	Analog input complement
10	ANALOG1+	Analog input
11	ANALRET	Analog return
12	INRET1_6	Programmable inputs 1 - 6 return for standard version Programmable positive inputs 1 - 6 for AP or H option
13	IN1	Programmable input 1
14	IN2	Programmable input 2
15	IN3	Programmable input 3
16	IN4	Programmable input 4
17	IN5	Programmable input 5
18	IN6	Programmable input 6
19	OUT4	Programmable output 4
20	OUT3	Programmable output 3
21	OUT2	Programmable output 2
22	OUT1	Programmable output 1
23	VDD	Supply for out 1-4
24	VDDRET	Supply return for out 1-4



Pin Positions



Cable Connector



24-Pin Molex Plug

This cable is included in the cable kit described in Section 3.1.1.

Table 7: Port C and I/O Connector



6.8.1. Port C

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

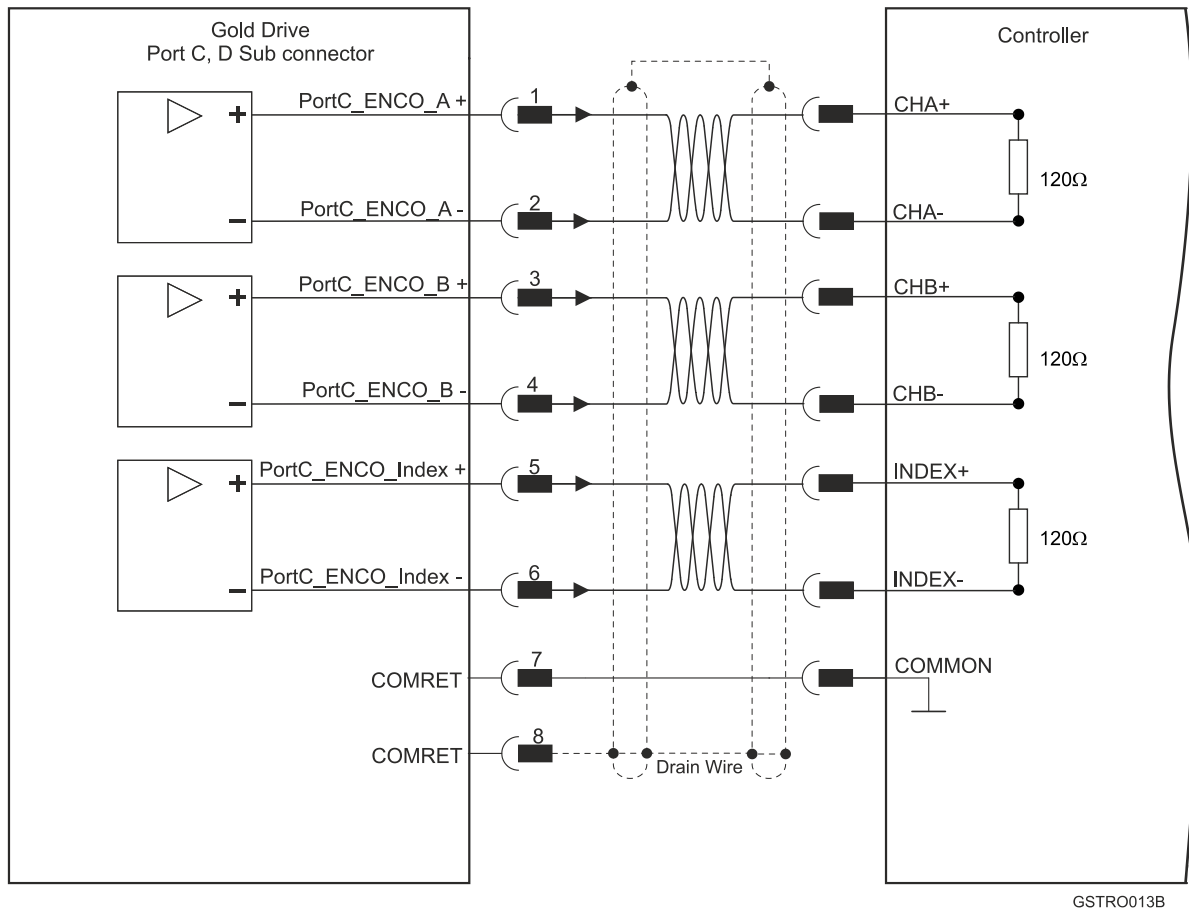


Figure 27: Emulated Encoder Differential Output – Recommended Shrouded Type Connection Diagram

6.8.2. Analog Input

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

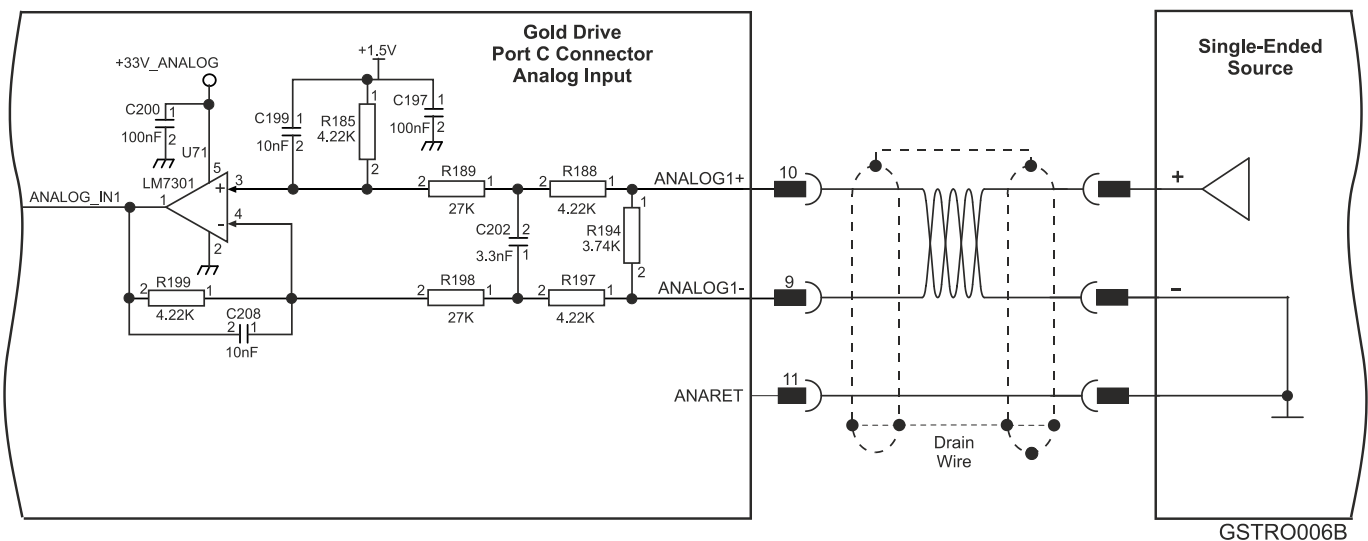


Figure 28: Differential Analog Shrouded Type Input



6.8.3. 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.

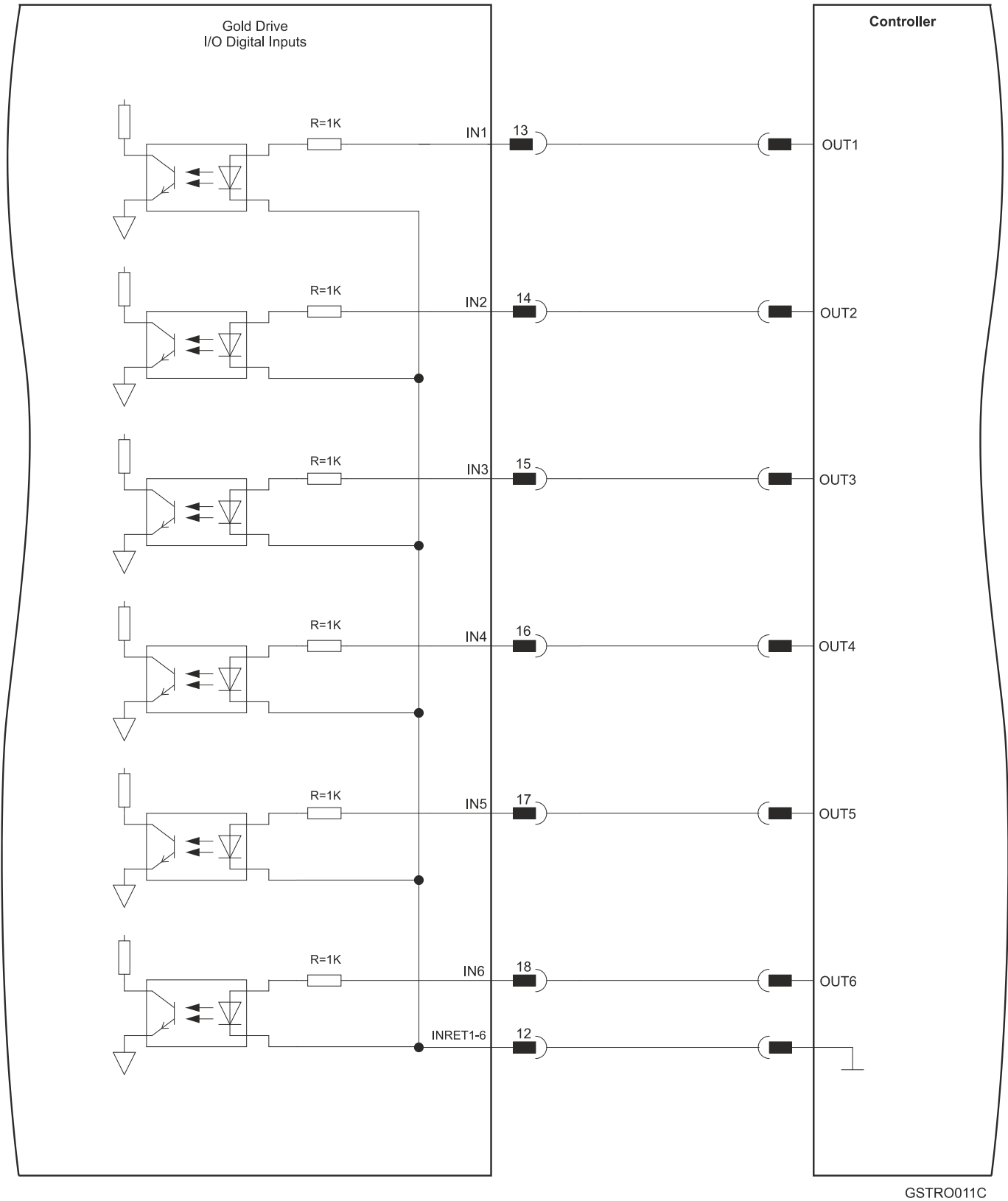


Figure 29: Digital Input TTL Mode Shrouded Type Connection Diagram

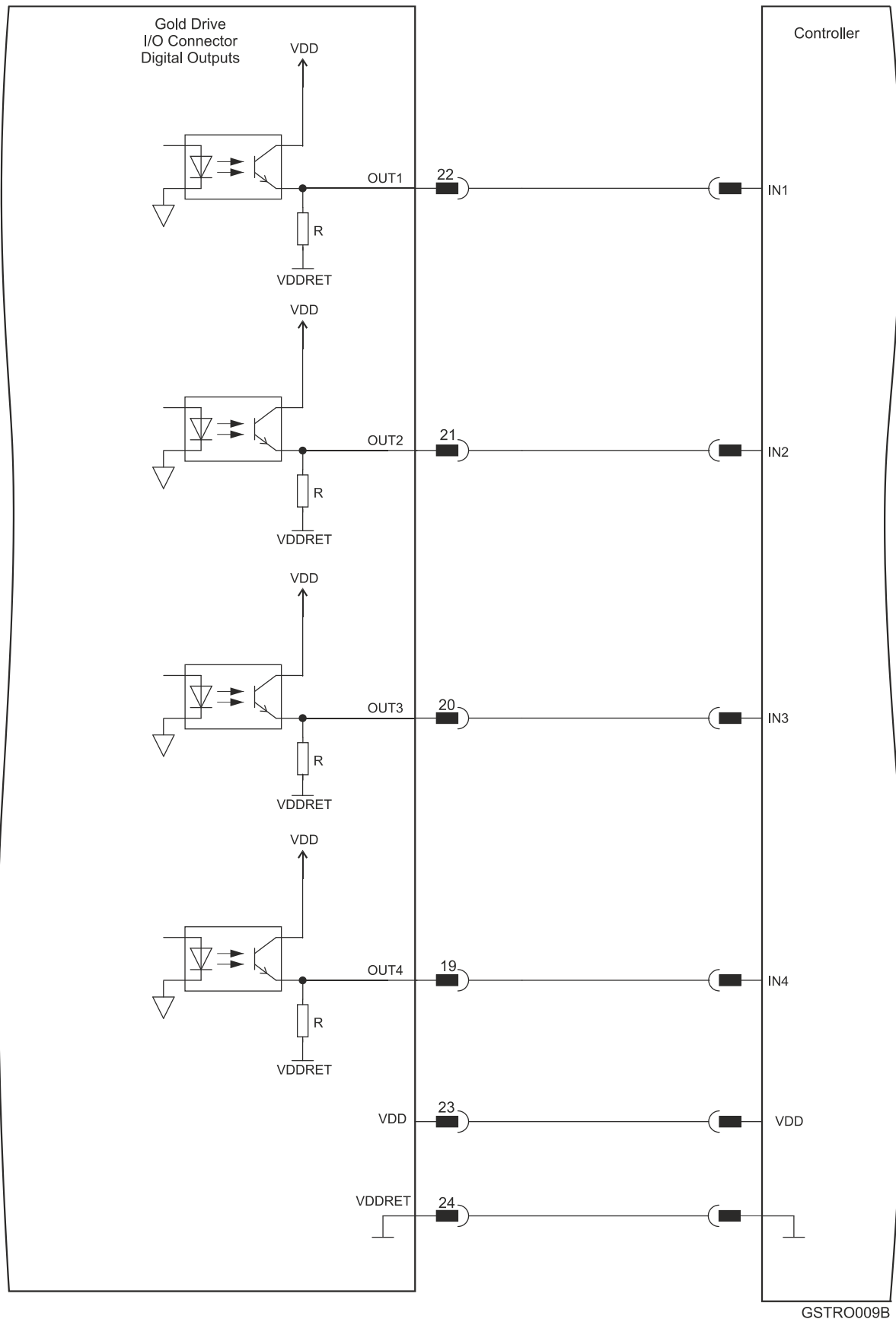


Figure 30: Digital Output Shrouded Type Connection Diagram – TTL Option



6.8.4. 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.

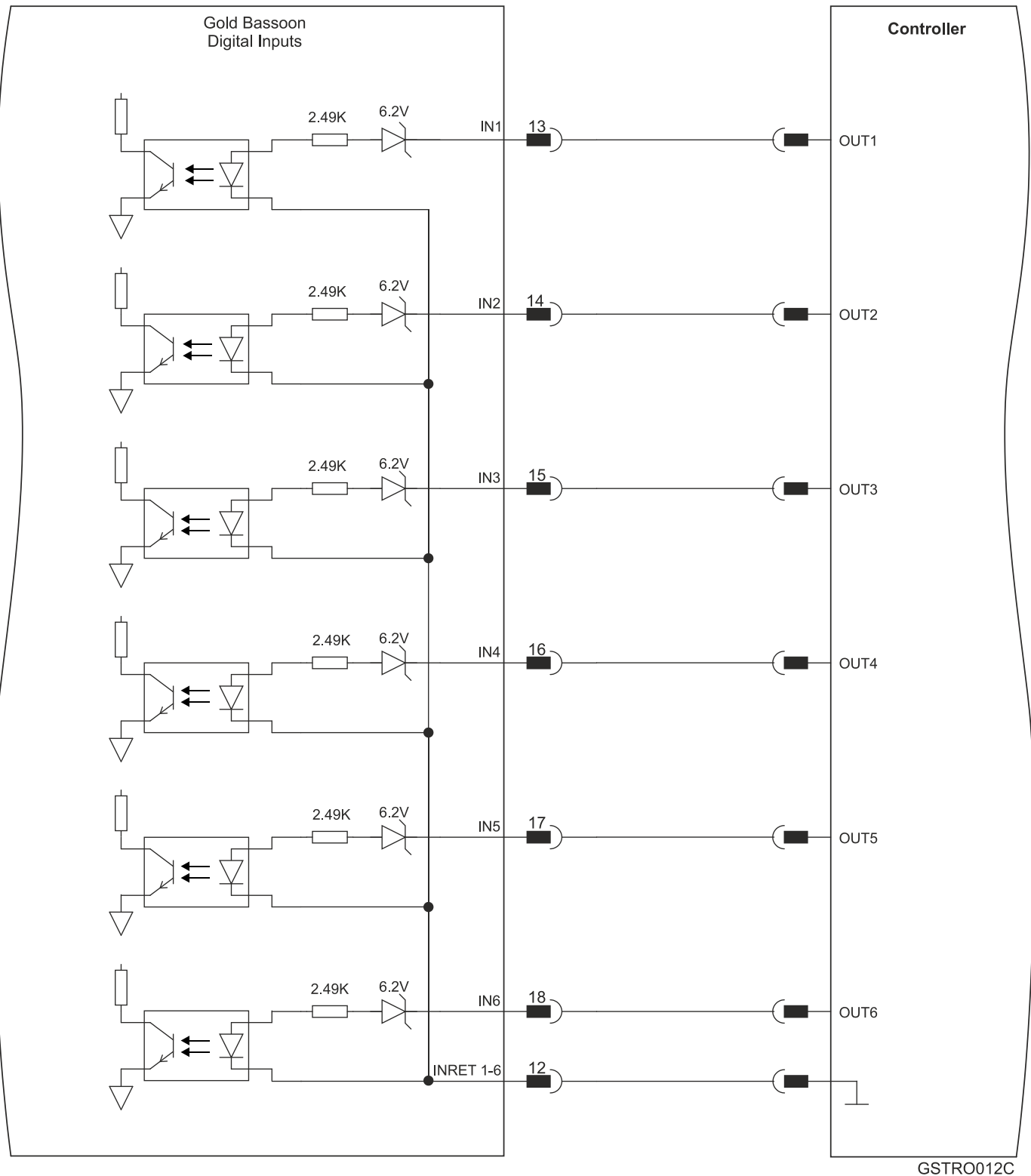


Figure 31: Digital Input Shrouded Type Connection Diagram – Source PLC Option

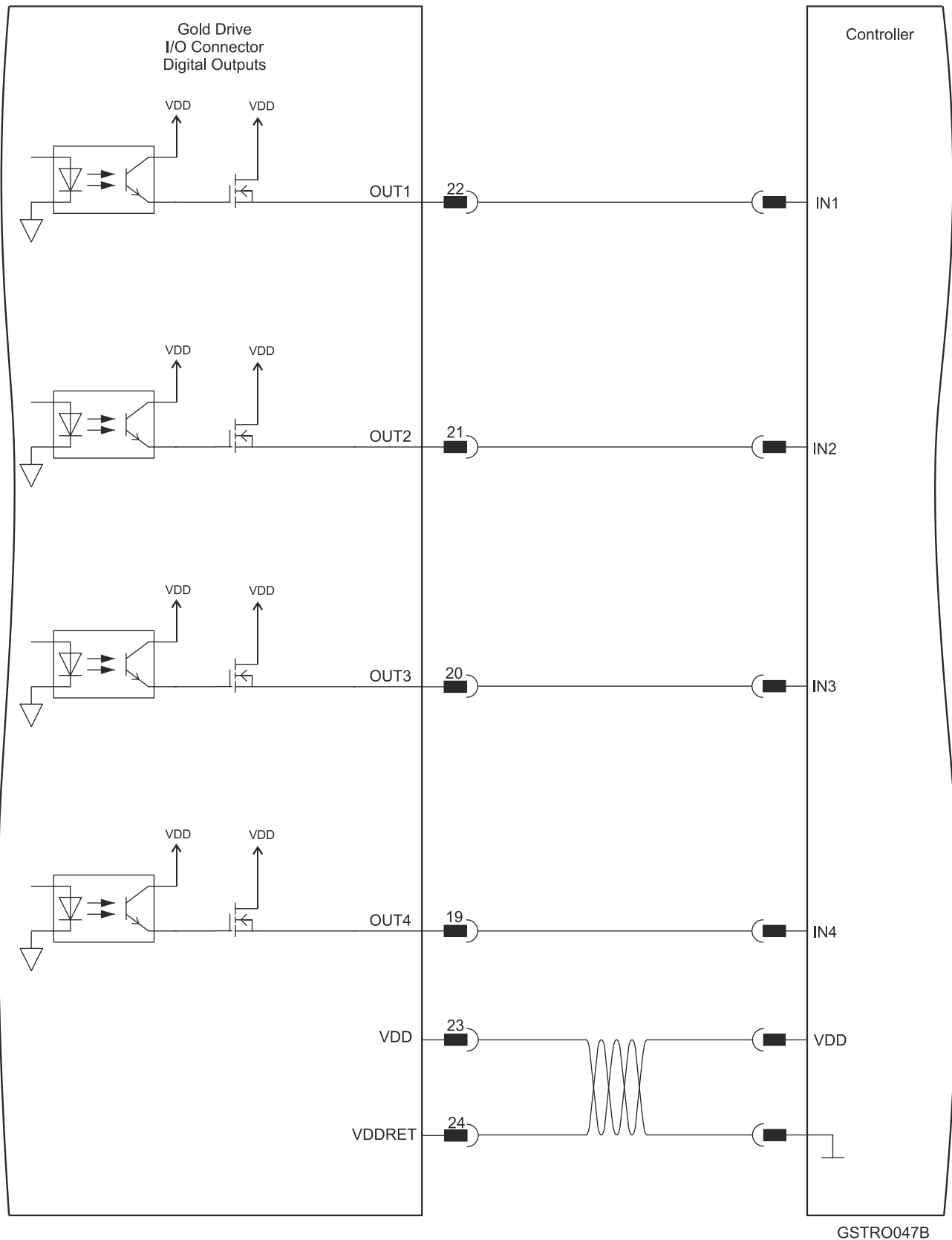


Figure 32: Digital Output Shrouded Type Connection Diagram – Source PLC Option



6.8.5. 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.

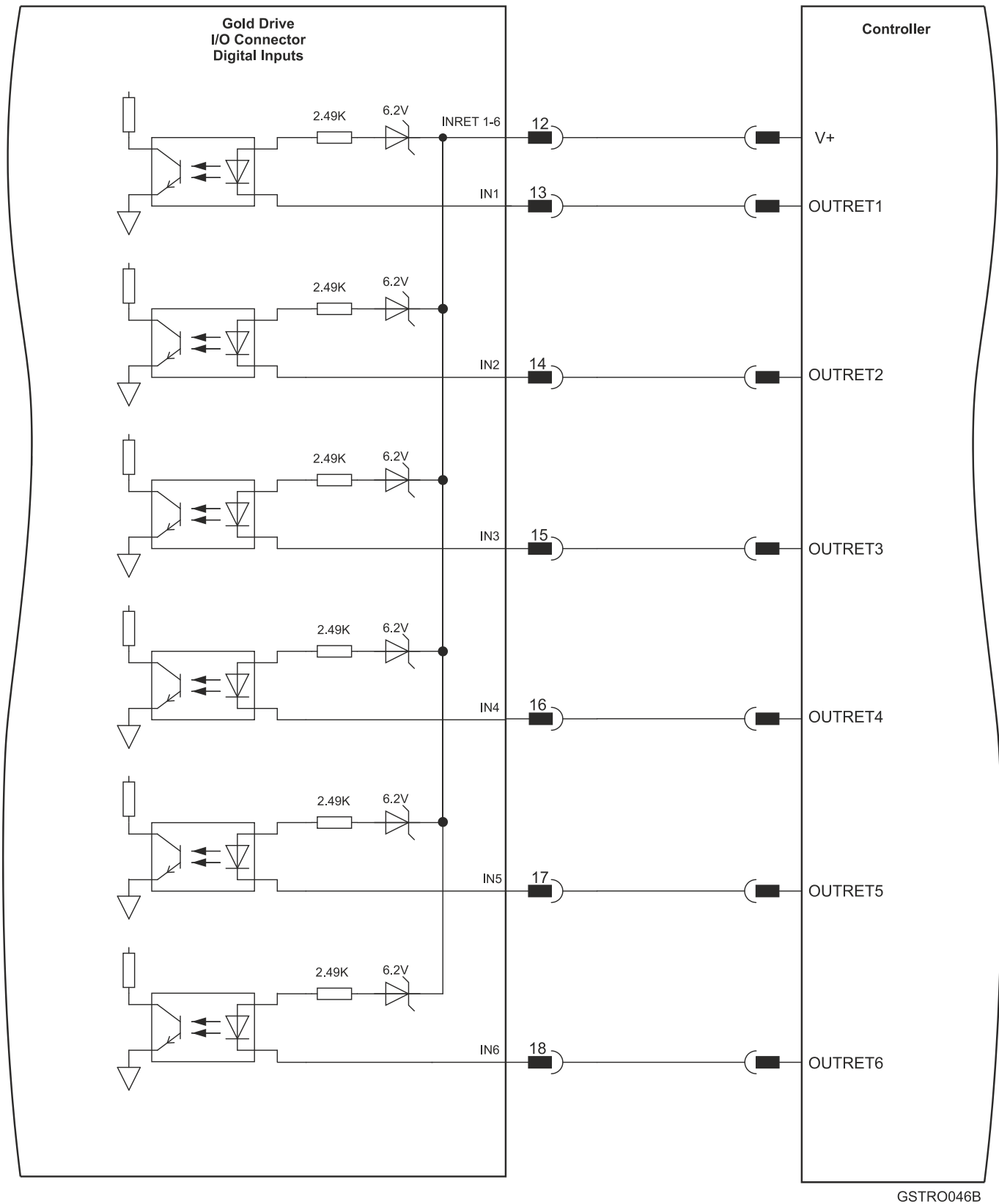


Figure 33: Digital Input Sink Mode – PLC voltage level Shrouded Type Connection Diagram

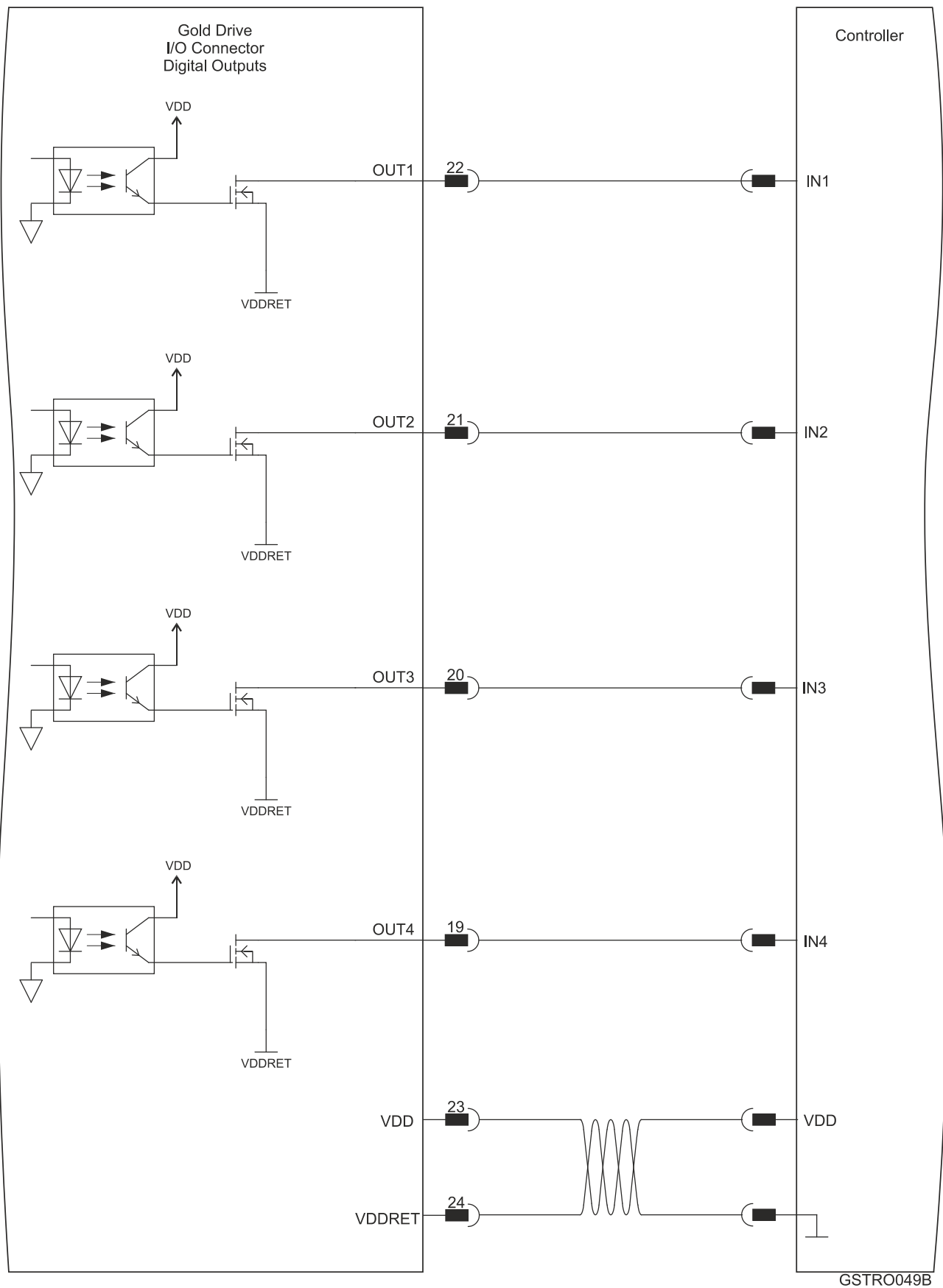


Figure 34: Digital Output as Sink Configuration Shrouded Type Connection Diagram

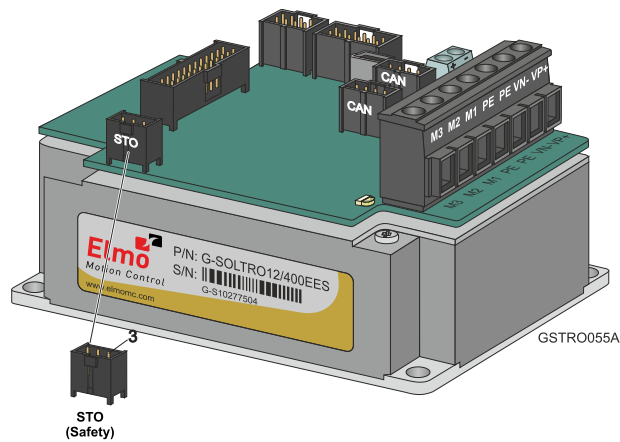
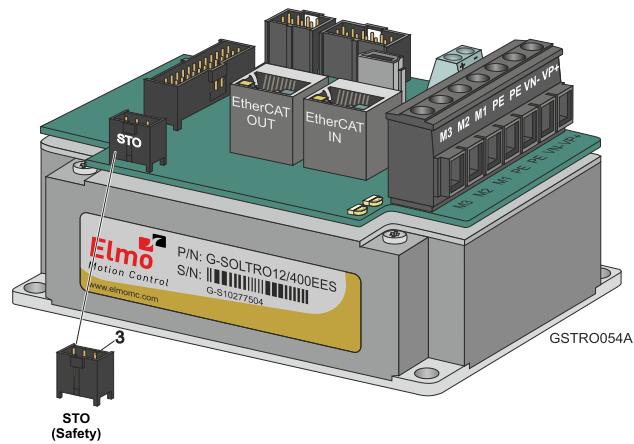


6.9. STO Connector – Safety

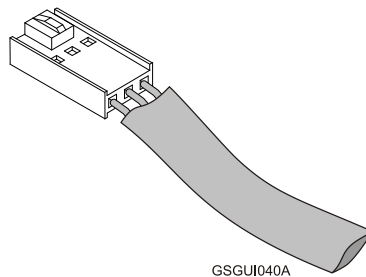
See Chapter 9 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Signal	Function
1	STO1	STO 1 input
2	STO2	STO 2 input
3	STO_RET	STO signal return

Pin Positions



Cable Connector



3-Pin Molex Plug

This cable is included in the cable kit described in Section 3.1.1.

Table 8: STO Connector



The following circuits describe the STO wiring options.

6.9.1.1. Source Mode PLC Voltage Level

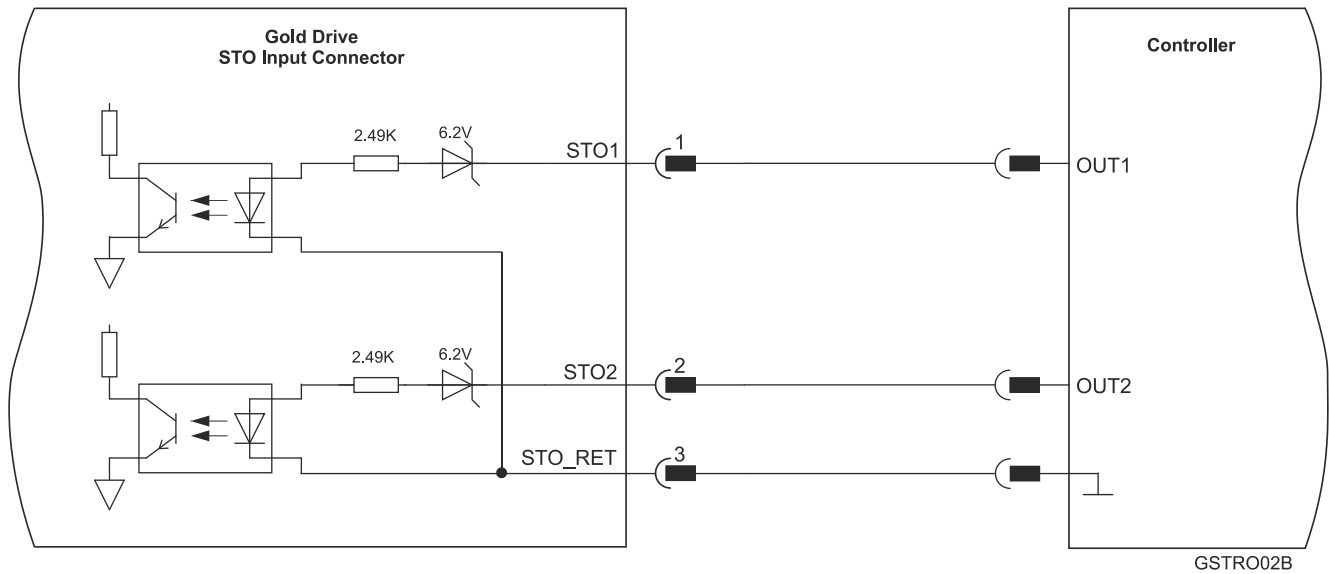


Figure 35: STO Shrouded Type Input Connection – PLC Source Option

6.9.1.2. TTL Mode TTL Voltage Level

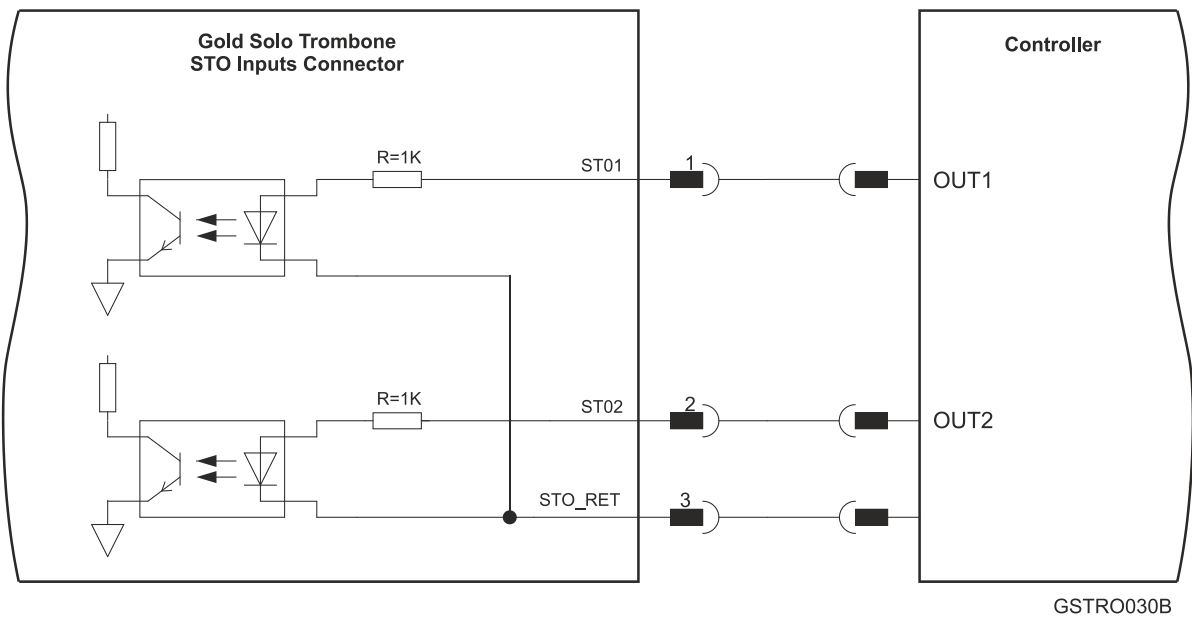


Figure 36: STO Input Connection – TTL Option



6.9.1.3. 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.

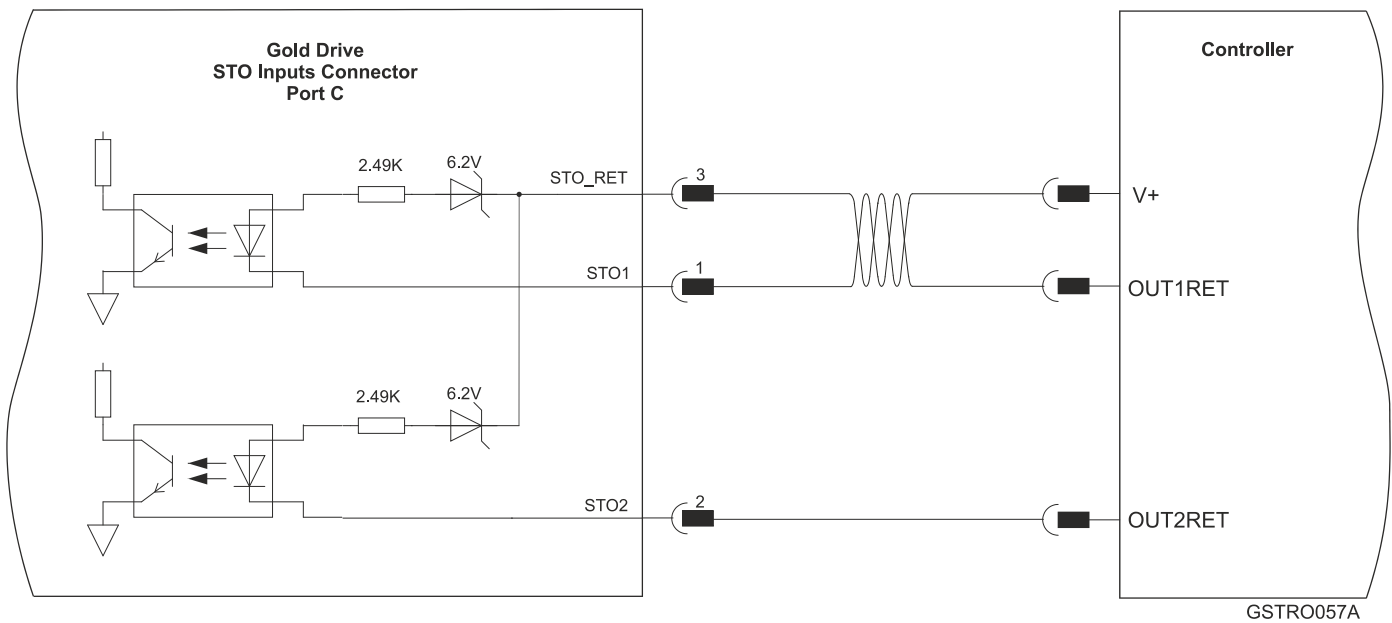


Figure 37: STO Shrouded Type Input Connection – Sink Option

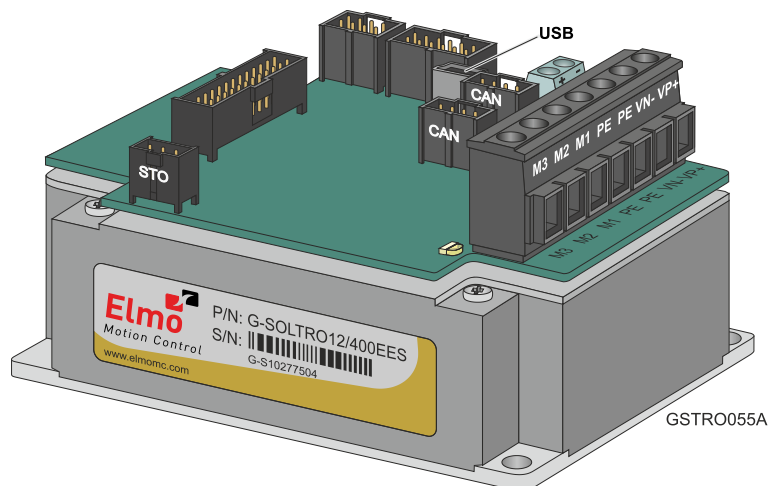
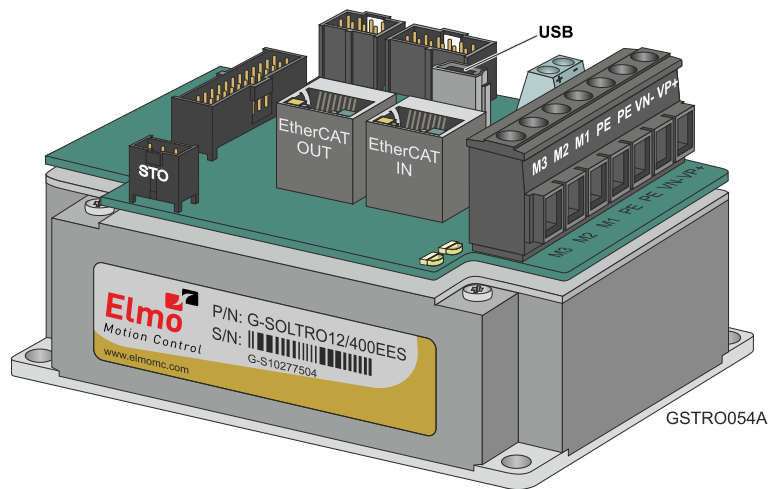


6.10. USB 2.0

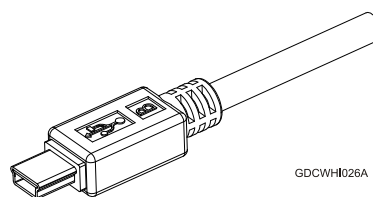
See Section 12.1 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

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

Pin Positions



Cable Connector



USB Device Type Mini B Plug

Table 9: USB 2.0 Connector

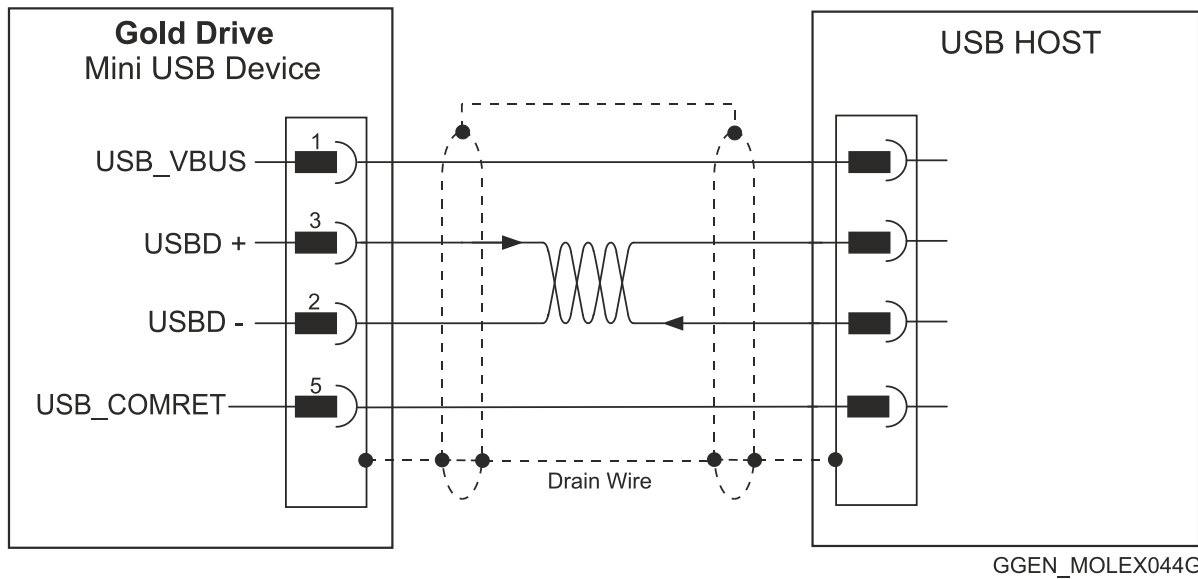


Figure 38: USB Network Diagram



6.11. EtherCAT Communications Version

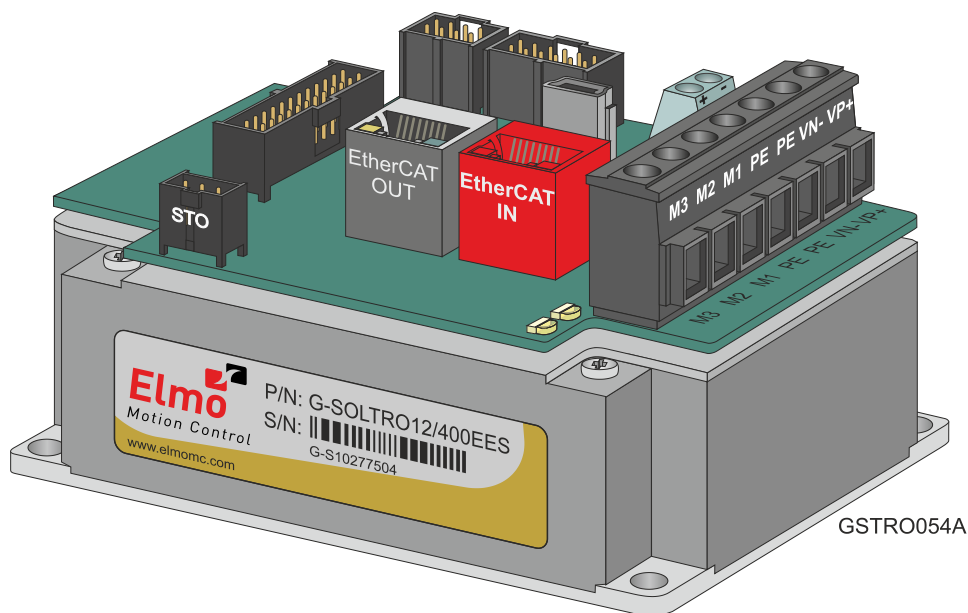
Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Gold Solo Trombone supports the following EtherCAT fieldbus type industrial network protocol.

6.11.1. EtherCAT IN/Ethernet Pinouts

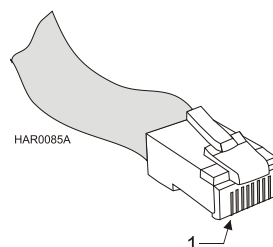
Refer to section 12.2 in the MAN-G-Panel Mounted Drives Hardware manual for more details.

Pin	Signal	Function
1	EtherCAT_IN_TX+ / Ethernet_TX+	EtherCAT in transmit + / Ethernet in transmit +
2	EtherCAT_IN_TX- / Ethernet_TX-	EtherCAT in transmit - / Ethernet in transmit -
3	EtherCAT_IN_RX+ / Ethernet_RX+	EtherCAT in receive + / Ethernet in receive +
4, 5	N/A	
6	EtherCAT_IN_RX-/Ethernet_RX-	EtherCAT in receive - / Ethernet in receive -
7, 8	N/A	

Pin Positions



Cable Connector



EtherCAT In / EtherCAT Out – RJ-45

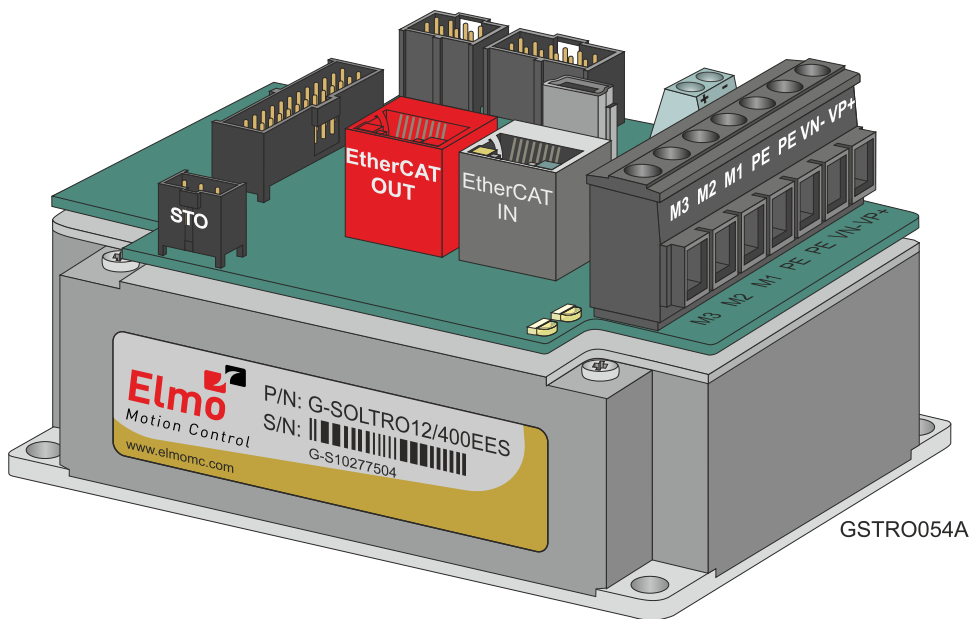
Table 10: EtherCAT IN/Ethernet Connector



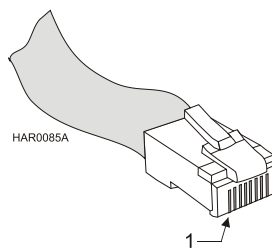
6.11.2. EtherCAT OUT Pinouts

See Section 12.2 in the MAN-G-Panel Mounted Drives Hardware manual for the electrical diagram.

Pin	Signal	Function
1	EtherCAT_OUT_TX+	EtherCAT out transmit +
2	EtherCAT_OUT_TX-	EtherCAT out transmit -
3	EtherCAT_OUT_RX+	EtherCAT out receive +
4/5	N/A	
6	EtherCAT_OUT_RX-	EtherCAT out receive -
7/8	N/A	



Cable Connector



EtherCAT In / EtherCAT Out – RJ-45

Table 11: EtherCAT OUT Connector



6.11.3. EtherCAT Wiring

Figure 39 describes the wiring diagram for the EtherCAT connections.

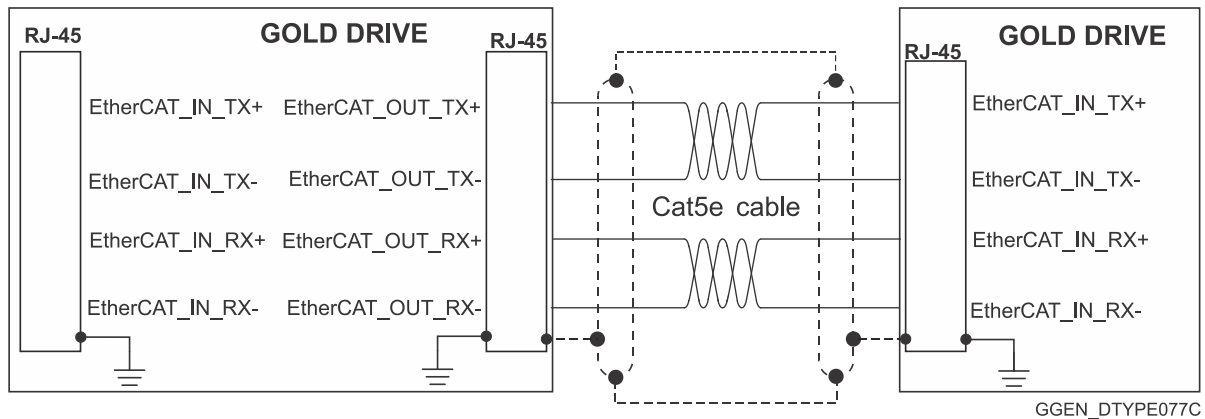


Figure 39: EtherCAT RJ-45 Connections

6.11.4. EtherCAT Link Indicators

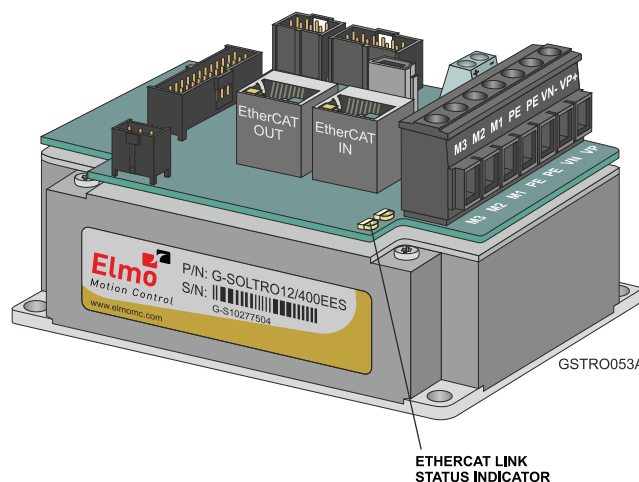
The Gold Solo Trombone can serve as an EtherCAT slave device. For this purpose it has two RJ-45 connectors, which are designated as EtherCAT In and EtherCAT Out. Each of these RJ-45 connectors has two status LEDs, which are shown in Figure 40.



Figure 40: Ethernet Connector LEDs

The green LED is the link/activity indicator. It shows the state of the applicable physical link and the activity on that link. The amber LED is the speed indicator. It shows the speed of the connection on the Ethernet line. Refer to the section 12.2.1.2 in the document; MAN-G-Panel Mounted Drives Hardware manual.

6.11.5. EtherCAT Status Indicator



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.

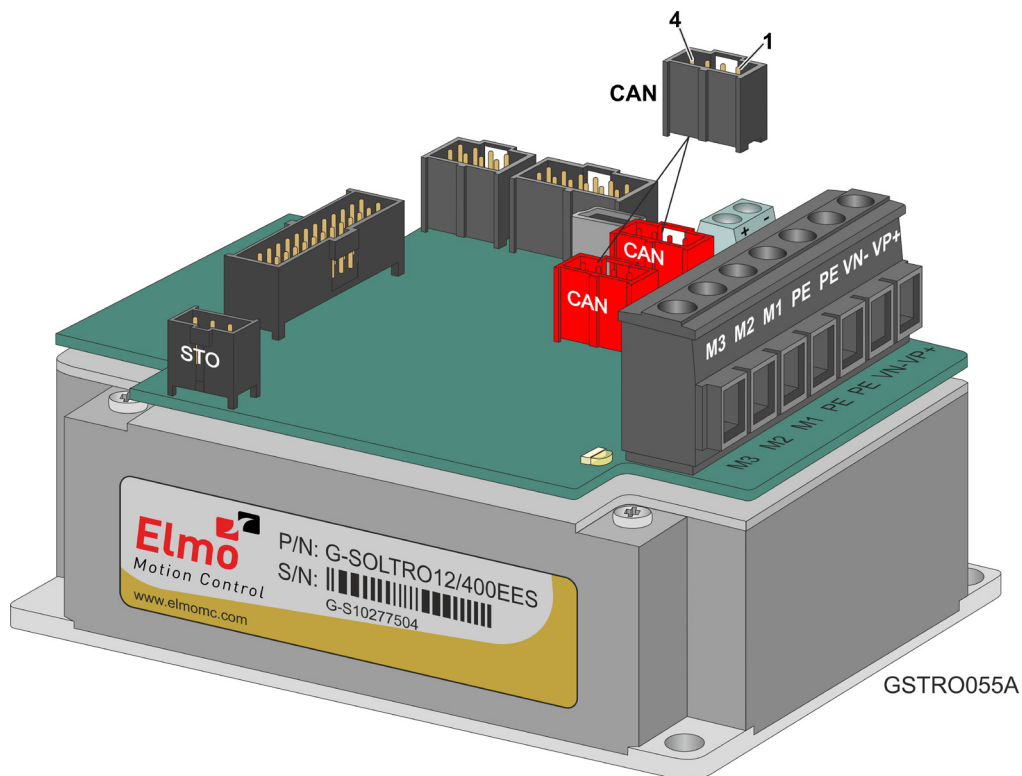


6.12. CAN Communications Version

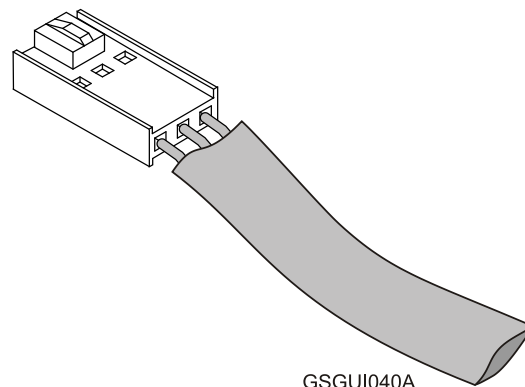
See Section 12.4 in the MAN-G-Panel Mounted Drives Hardware manual for the electrical diagram.

Pin	Signal	Function
1	PE	Earth Connection
2	CAN_COMRET	CAN communication return
3	CAN_L	CAN_L busline (dominant low)
4	CAN_H	CAN_H busline (dominant high)

Pin Positions



Cable Connector



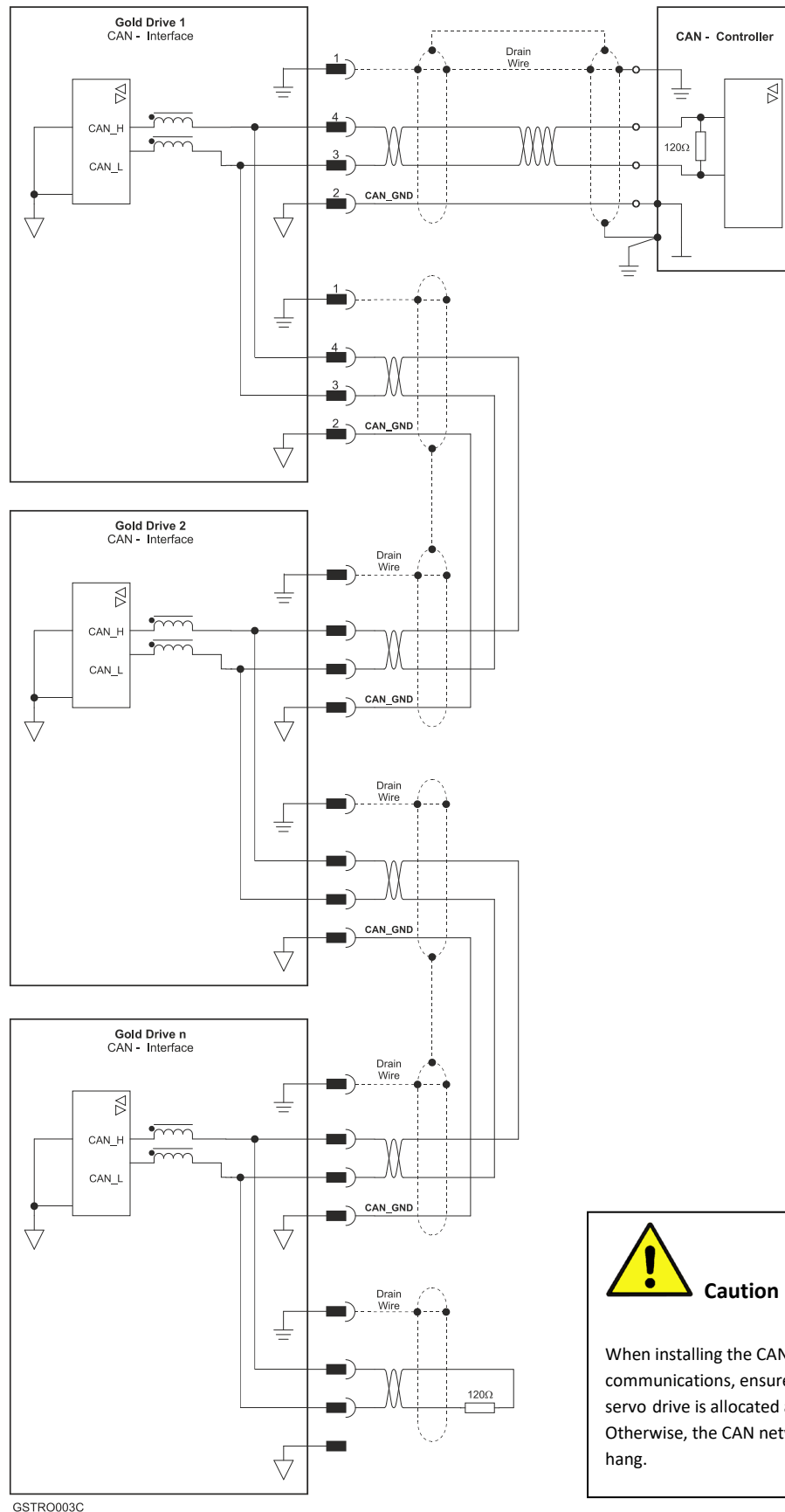
4-Pin Molex Plug

Table 12: CAN In/Out Connectors



6.12.1. CAN Wiring

Figure 41 describes the CAN wiring diagram below.



Caution

When installing the CAN communications, ensure that each servo drive is allocated a unique ID. Otherwise, the CAN network may hang.



6.13. Heat Dissipation

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

6.13.1. Gold Solo Trombone Thermal Data

- Heat dissipation capability (θ): Approximately 5.5 °C/W
- Thermal time constant: Approximately 600 seconds (thermal time constant means that the Gold Solo Trombone will reach two thirds of its final temperature after 10 minutes)
- Shut-off temperature: 86 °C to 88 °C (measured on the heat-sink)

6.13.2. Heat Dissipation Data

Heat Dissipation is shown graphically below:

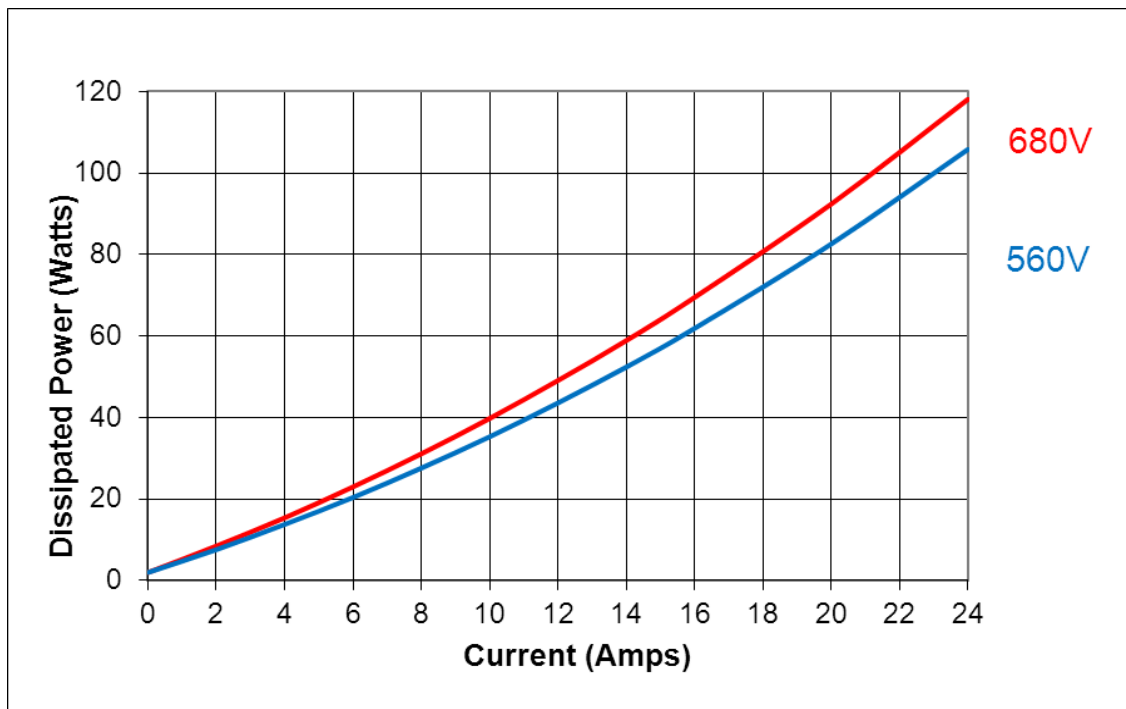


Figure 42: Dissipation versus Current Graph for 560 and 680 VDC

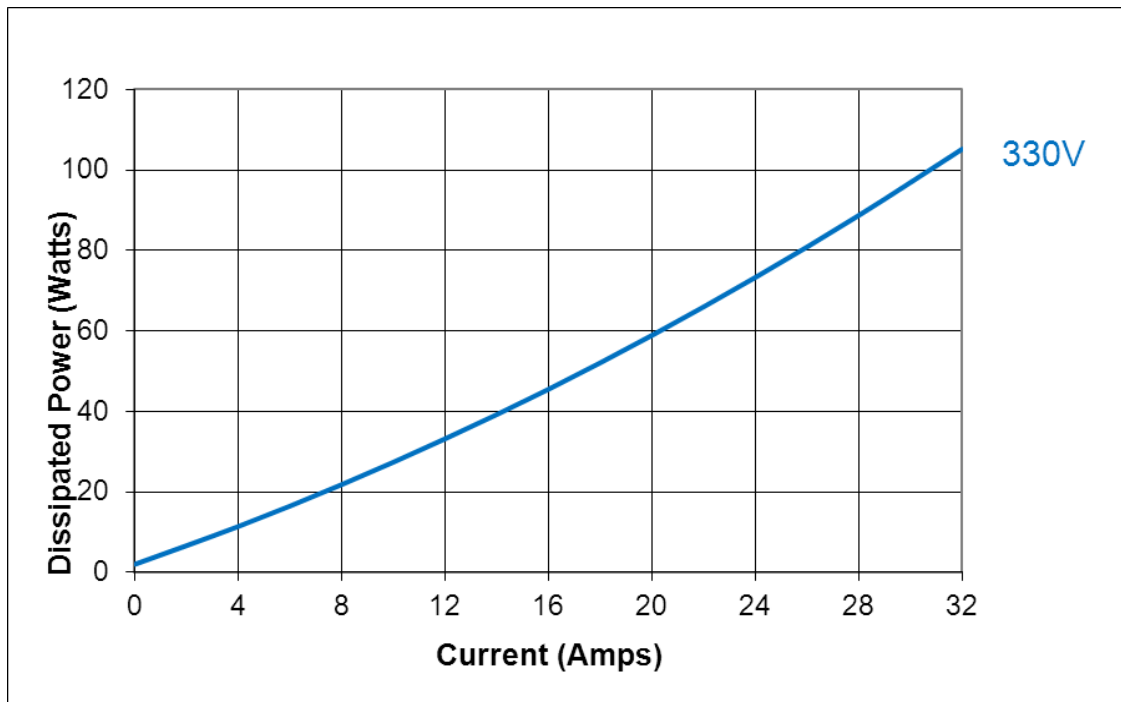


Figure 43: Dissipation versus Current Graph for 330 VDC

6.13.3. How to Use the Charts

The charts above are based upon theoretical worst-case conditions. Actual test results show 30% to 50% better power dissipation.

To determine if your application needs a heat sink:

1. Allow maximum heat sink temperature to be 80 °C or less (shunt down is 6 °C to 8 °C higher).
2. Determine the ambient operating temperature of the Gold Solo Trombone as ≤ 40 °C.
3. Calculate the allowable temperature increase according to the following example: For an ambient temperature of 40 °C, $\Delta T = 80$ to $40^\circ\text{C} = 40^\circ\text{C}$
4. Use the chart to find the actual dissipation power of the drive. Follow the voltage curve to the desired output current and then find the dissipated power.



Chapter 7: Powering Up

After the Gold Solo Trombone 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.

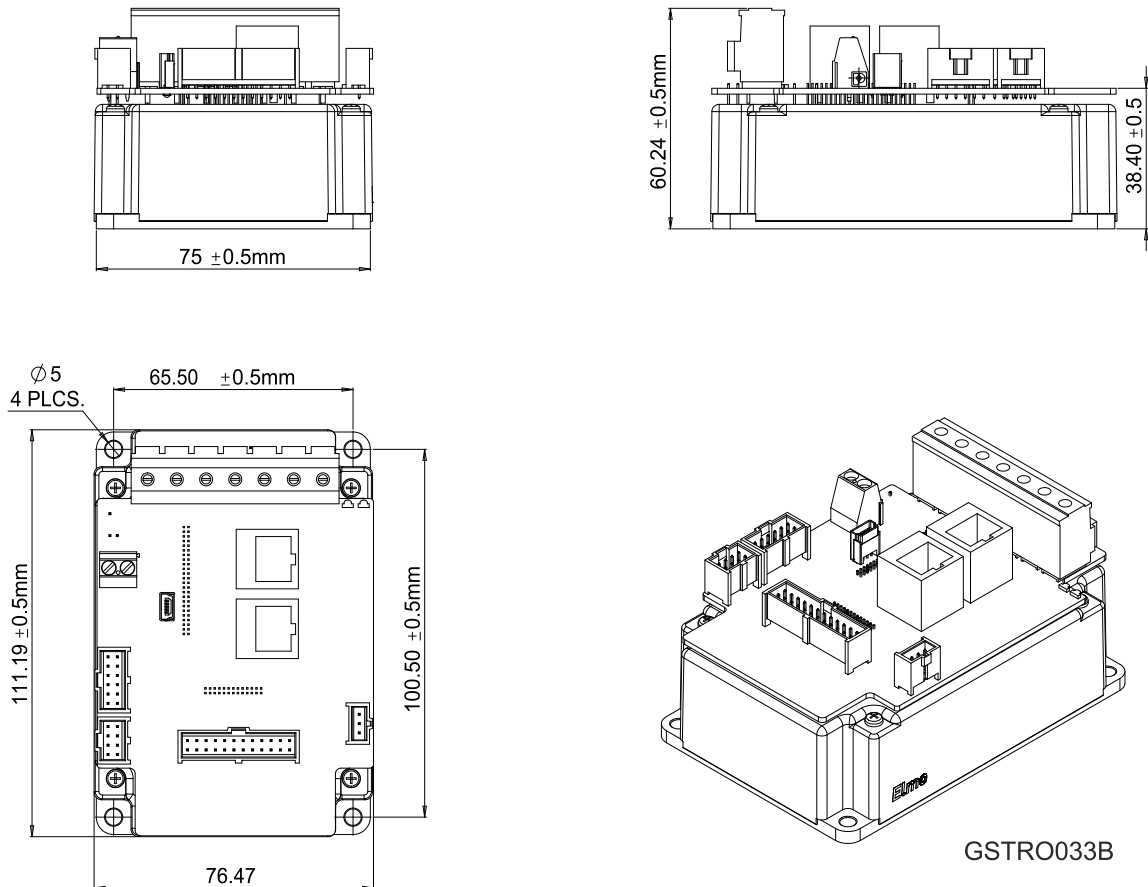
7.1. Initializing the System

After the Gold Solo Trombone 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 8: Gold Solo Trombone Dimensions

This chapter provides detailed technical information regarding the Gold Solo Trombone.



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