

# Gold Duo Digital Servo Drive Installation Guide EtherCAT



# Notice

This guide is delivered subject to the following conditions and restrictions:

- This guide contains proprietary information belonging to Elmo Motion Control Ltd. Such information is supplied solely for the purpose of assisting users of the Gold Duo in its installation.
- The text and graphics included in this manual are for the purpose of illustration and reference only. The specifications on which they are based are subject to change without notice.
- Information in this document is subject to change without notice.

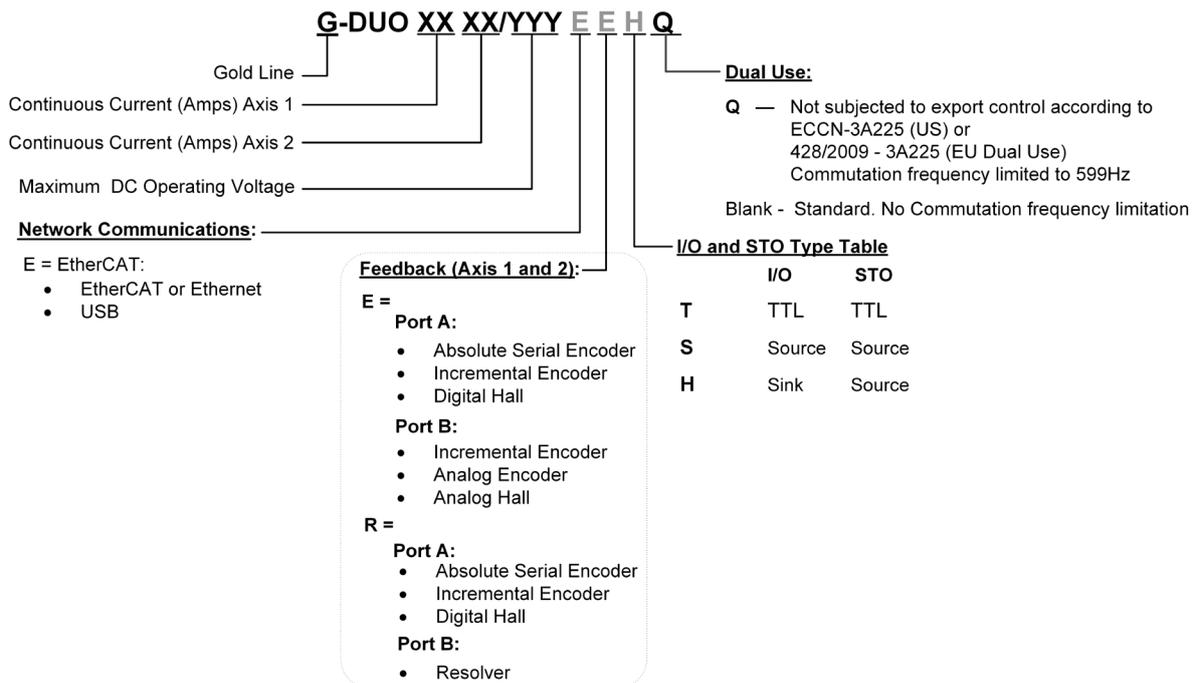
Document no. MAN-G-DUOIG-E (Ver. 1.509)

Copyright © 2021

Elmo Motion Control Ltd.

All rights reserved.

## Catalog Number



## Cable Kit

Catalog number: CBL-GDUOKIT01 (can be ordered separately)

For further details, see the MAN-G-DUO-CBLKIT documentation for this cable kit.

## Revision History

Version	Date
Ver. 1.500	July 2014
Ver. 1.501	Aug 2014
Ver. 1.502	Nov 2014
Ver. 1.503	Mar 2015
Ver. 1.504	July 2015
Ver. 1.505	Oct 2015
Ver. 1.506	May 2016
Ver. 1.507	Aug. 2017
Ver. 1.508	Jan 2021
Ver. 1.509	Sept 2021



- Chapter 1: This Installation Guide .....6**
- Chapter 2: Safety Information .....6**
  - 2.1. Warnings .....7
  - 2.2. Cautions.....7
  - 2.3. CE Marking Conformance.....7
  - 2.4. Warranty Information .....7
- Chapter 3: Product Description.....8**
  - 3.1.1. Accessories .....8
- Chapter 4: Technical Information.....9**
  - 4.1. Physical Specifications.....9
  - 4.2. Technical Data Per Axis .....9
    - 4.2.1. Auxiliary Supply .....10
    - 4.2.2. Product Features Per Axis.....11
  - 4.3. Environmental Conditions.....12
    - 4.3.1. Gold Line.....12
  - 4.4. Gold Line Standards.....13
    - 4.4.1. Dual Use.....13
- Chapter 5: Installation.....14**
  - 5.1. Unpacking the Drive Components .....14
  - 5.2. Connectors Types .....15
  - 5.3. Mounting the Gold Duo.....17
  - 5.4. The Gold Duo Connection Diagram.....18
- Chapter 6: Wiring.....19**
  - 6.1. Basic Recommendations .....20
    - 6.1.1. General .....20
    - 6.1.2. Feedback Cable Port A and Port B Connector .....21
    - 6.1.3. Feedback Cable Port C Connector .....22
    - 6.1.4. IO Cable Connector.....22
    - 6.1.5. STO (Port C) Cable Connector.....23
  - 6.2. Motor Power Connector Pinouts .....24
  - 6.3. Main and Auxiliary Power .....27
    - 6.3.1. Description .....27
    - 6.3.2. Main Power .....28
    - 6.3.3. Auxiliary Power Supply .....29
    - 6.3.4. Connectivity.....30
      - 6.3.4.1. Power Rating 200 V .....30
      - 6.3.4.2. Power Rating 100 V .....31
  - 6.4. Drive Status Indicator .....33

6.5.	STO (Safe Torque Off).....	34
6.5.1.	Source Mode – PLC Voltage Level .....	35
6.5.2.	TTL Mode – TTL Voltage Level .....	35
6.5.3.	Sink Mode – PLC Voltage Level.....	36
6.6.	Feedback Port A Per Axis.....	37
6.6.1.	Incremental Encoder .....	38
6.6.2.	Halls Sensor .....	38
6.6.3.	Absolute Serial Encoder.....	39
6.6.3.1.	Hiperface .....	40
6.7.	Feedback Port B Per Axis.....	41
6.7.1.	Incremental Encoder .....	42
6.7.2.	Interpolated Analog Encoder .....	43
6.7.3.	Resolver .....	44
6.8.	Feedback Port C and I/O.....	45
6.8.1.	Port C – Emulated Encoder Output .....	47
6.8.2.	Analog Input .....	48
6.8.3.	Digital Input and Output TTL Mode.....	49
6.8.4.	Digital Input and Output PLC Source Mode .....	51
6.8.5.	Digital Input and Output Sink Mode.....	53
6.9.	USB 2.0 Communication per Axis.....	55
6.10.	EtherCAT Communication Version.....	56
6.10.1.	EtherCAT IN Pin Assignments .....	56
6.10.2.	EtherCAT OUT Pin Assignments.....	57
6.10.3.	EtherCAT Wiring .....	57
6.10.4.	EtherCAT Status Indicator .....	58
6.11.	Ethernet Pin Assignments .....	59
6.12.	Powering Up.....	60
6.13.	Initializing the System .....	60
<b>Chapter 7:</b>	<b>Dimensions .....</b>	<b>61</b>

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

This installation Guide details the technical data, pinouts, and power connectivity of the Gold Duo. 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 Duo, 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 Duo 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 Duo 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 Duo 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 Duo 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 Duo, 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 Duo 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 Duo 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 Duo is an advanced high power density servo drive delivering up to **1.6 kW of continuous power** or **3.2 kW of peak power** per axis in a 394 cc (24.0 in<sup>3</sup>) package (150 x 105 x 25.8 mm or 5.9" x 4.1" x 1.0"). The Gold Duo is a highly compact integrated solution containing two drives in a single package. The solution operates under a single power supply and is designed for applications with up to two axes. The Gold Duo has a fully featured motion controller and local intelligence.

This advanced, high power density servo drive provides top performance, advanced networking and built-in safety, as well as a fully featured motion controller and local intelligence. The Gold Duo is powered by a single 12 V – 195 V isolated DC power source (not included) and a “smart” control-supply algorithm enables the drive to operate up to 95V with only one power supply with no need for an auxiliary power supply for the logic.

The Gold Duo 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 Gold Duo drive is easily set up and tuned using Elmo Application Studio (EAS) software tools. As part of the Gold product line, it is fully programmable with the Elmo motion control language. For more about software tools, refer to the Elmo Application Studio Software Manual.

The Gold Duo is available in a variety of options. There are multiple power rating options, a variety of feedback selections and I/O configuration possibilities.

### 3.1.1. Accessories

Cable Kit, catalog number: CBL-GDUOKIT01 (can be ordered separately)

For further details, see the MAN-G-DUO-CBLKIT documentation for this cable kit.

## Chapter 4: Technical Information

### 4.1. Physical Specifications

Feature	Units	All Types
Weight	g (oz)	479 g (16.9 oz)
Dimensions	mm (in)	150 x 105 x 25.8 mm (5.9" x 4.13" x 98")
Mounting method		Wall Mount / Book Shelf

### 4.2. Technical Data Per Axis

Feature	Units	5/100	10/100	15/100	20/100
Minimum supply voltage	VDC	12			
Nominal supply voltage	VDC	85			
Maximum supply voltage	VDC	95			
Maximum continuous power output	W	400	800	1200	1600
Efficiency at rated power (at nominal conditions)	%	> 99			
Maximum output voltage		> 95% of DC bus voltage at f = 22 kHz			
Auxiliary power supply	VDC	12 – 95 VDC (up to 6 VA inc. 5 V/2 x 200 mA for encoder)			
Amplitude sinusoidal/DC continuous current	A	5	10	15	20
Sinusoidal continuous RMS current limit (I <sub>c</sub> )	A	3.5	7	10.6	14.1
Peak current limit	A	2 x I <sub>c</sub>			

Table 1: Power Ratings

**Note on current ratings:** The current ratings of the Gold Duo 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.



Elmo now offers a 200 VDC maximum output rating selection of Gold Duo, according to the following technical data:

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

#### 4.2.1. Auxiliary Supply

Feature	Details
Auxiliary power supply	<i>Isolated DC source only</i>
Auxiliary supply input voltage	12 V to 95 V
Auxiliary supply input power	≤ 4 VA without external loading per axis ≤ 6 VA with full external loading per axis



#### 4.2.2. Product Features Per Axis

Main Feature	Details	Presence and No.
<b>STO</b>	TTL, or	√
	PLC Source	√
<b>Digital Input</b>	TTL, or	6
	PLC Source, or	6
	PLC Sink	6
<b>Digital Output</b>	TTL, or	4
	PLC Source, or	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	√



### 4.3. Environmental Conditions

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

#### 4.3.1. Gold Line

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



## 4.4. Gold Line Standards

The following table describes the Main Standards of the Gold Duo 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 4.3.1 Gold Line 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>Approved IEC/EN 61800-5-1</b>	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
<b>Recognized UL61800-5-1</b>	Adjustable speed electrical power drive systems Safety requirements – Electrical, thermal and energy
<b>Recognized UL 508C</b>	Power Conversion Equipment
<b>In compliance with UL 840</b>	Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment
<b>Conformity with CE 2006/95/EC</b>	Low-voltage directive 2006/95/EC
<b>Recognized CSA C22.2 NO. 14-13</b>	Industrial Control Equipment

### 4.4.1. 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  $\leq 599$  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

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

### 5.1. Unpacking the Drive Components

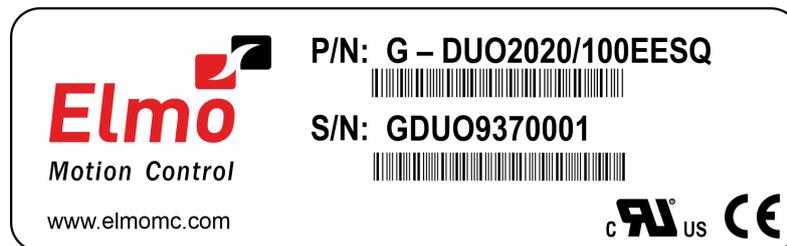
Before you begin working with the Gold Duo, verify that you have all of its components, as follows:

- The Gold Duo servo drive
- The Elmo Application Studio software and software manual

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

#### To unpack the Gold Duo:

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



4. Verify that the Gold Duo 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 Duo has 15 connectors.

Connector	Pins	Type	Function
<b>Bottom Connectors</b>			
J13	5	Phoenix, 5 mm Pitch 'HC'	Main Power
J12	2	Phoenix 3.81 mm Pitch	Auxiliary supply
J14, J15	4	Phoenix 5 mm Pitch 'HC' (2)	Motor phases
<b>Front Connectors</b>			
J2, J5	24	2.54 mm Pitch Molex (2)	I/O and Port C
J3, J6	8	2.54 mm Pitch Molex (2)	Feedback Port B
J1, J4	12	2.54 mm Pitch Molex (2)	Feedback Port A



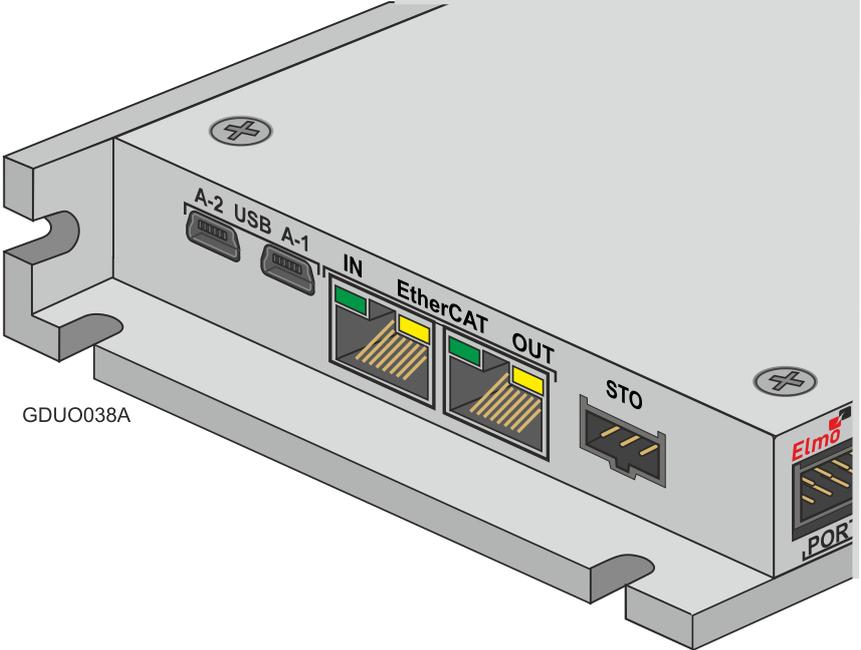
Connector	Pins	Type	Function
<b>Top Connectors</b>			
			
J9, J10	5	USB Device Mini-B (2)	USB
J7	8	RJ-45	EtherCAT in
J8	8	RJ-45	EtherCAT out
J11	3	2.54 mm Pitch Molex	STO

Table 2: Connector Types



### 5.3. Mounting the Gold Duo

The Gold Duo has been designed for two standard mounting options:

- Wall Mount along the back (can also be mounted horizontally on a metal surface)
- Book Shelf along the side

M4 round head screws, one through each opening in the heat sink, are used to mount the Gold Duo (see the diagram below).

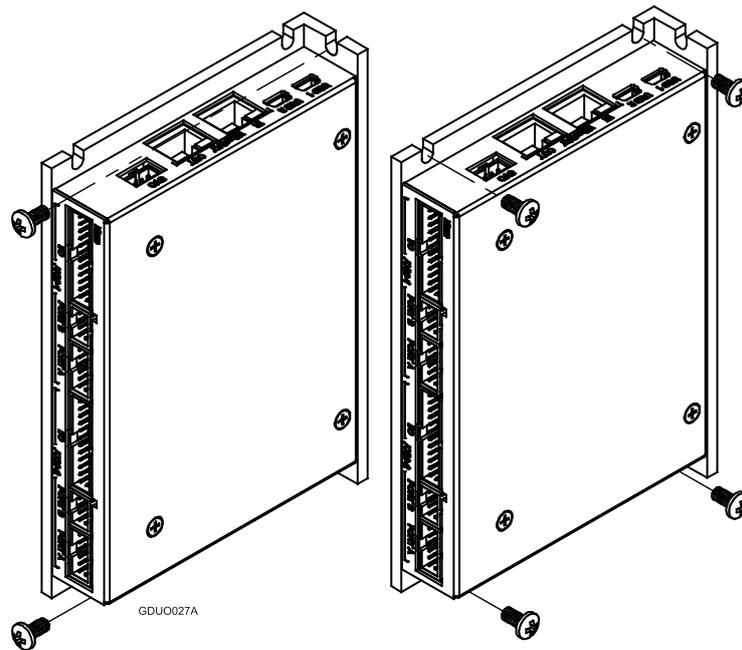


Figure 1: Mounting the Gold Duo

## 5.4. The Gold Duo Connection Diagram

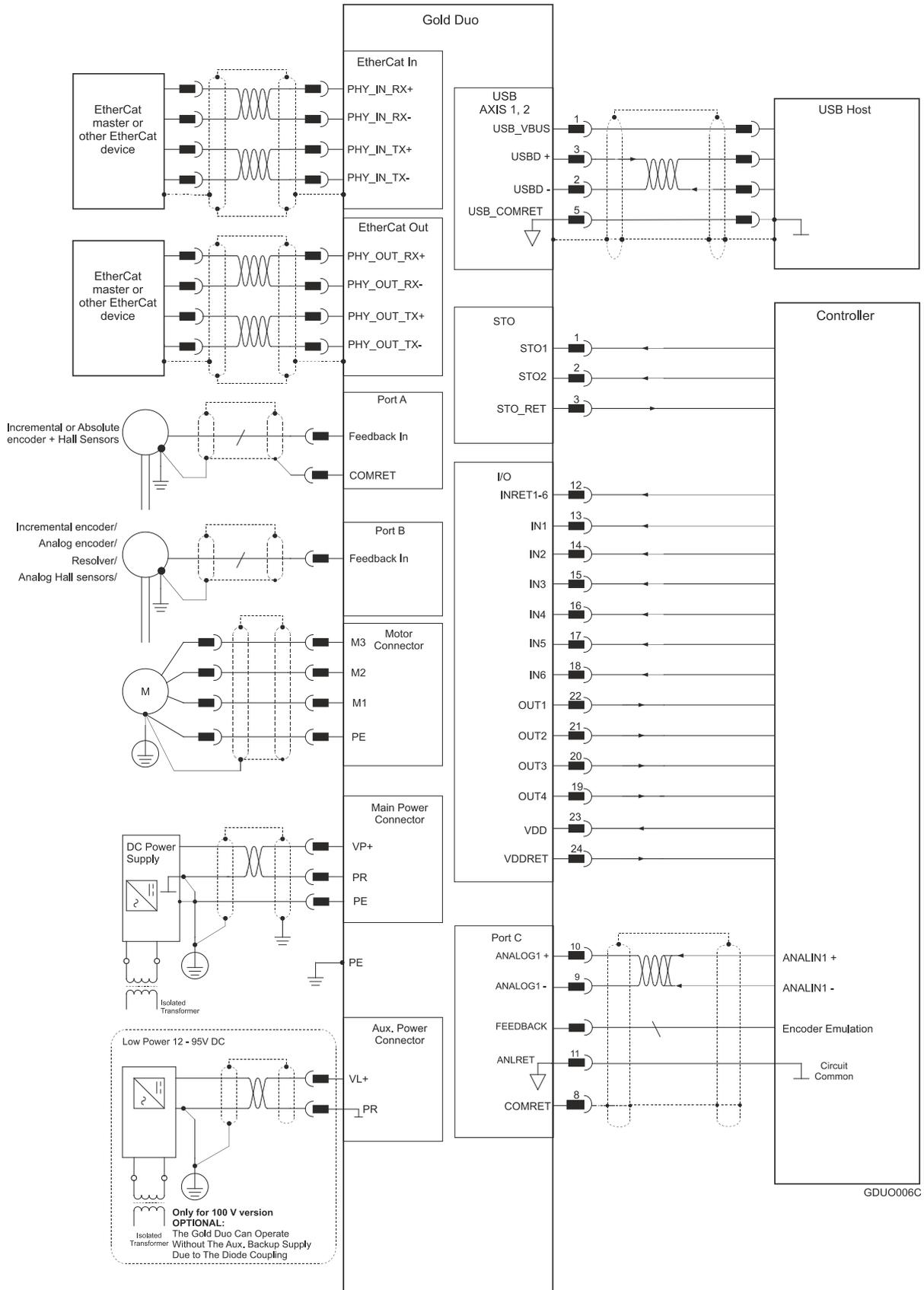


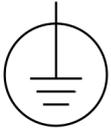
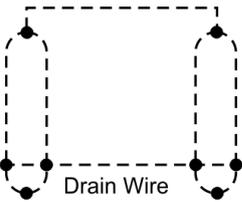
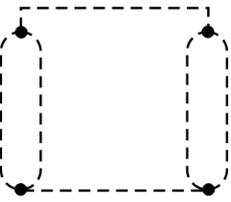
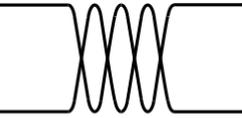
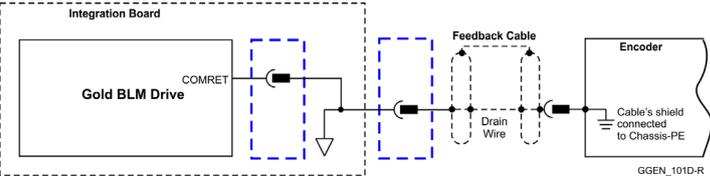
Figure 2: The Gold Duo Connection Diagram



## 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.

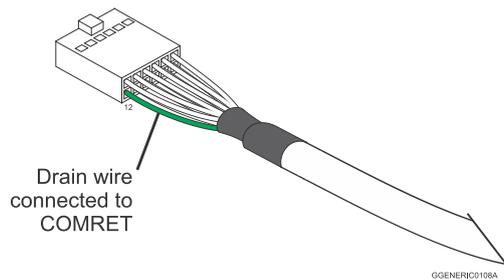
Wiring Symbol	Description
 GGEN_DTYPE101C-A	Earth connection (PE)
 GGEN_DTYPE101C-B	Protective Earth Connection
 GGEN_DTYPE101C-C	Common at the Controller
 GGEN_101D-D	Shielded cable with drain wire. The drain wire is a non-insulated wire that is in direct contact with the braid (shielding). Shielded 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-R	Encoder Earthing. The cable's shield is connected to the chassis (PE) in the connector. Earthing the Encoder and connecting the Earth (PE) to the drive COMRET is mandatory to insure reliable operation, high noise immunity and rejection of voltage common mode interferences.



## 6.1. Basic Recommendations

### 6.1.1. General

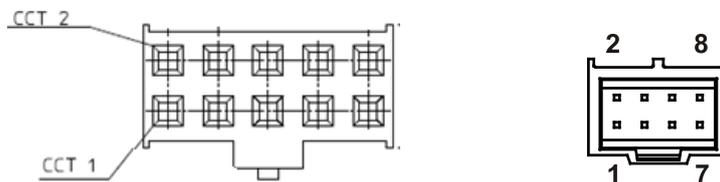
1. Use shielded cables. For best results, the cable should have an aluminum foil shield covered by copper braid, and should contain a drain wire.  
Use 24, 26 or 28 AWG twisted-pair shielded with drain wire cables.
2. Keep the cable as short as possible.  
Do not mount the power cables of the motor and 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 3: 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 4).



**Figure 4: Molex vs Elmo Technical Diagram Examples Showing Pinout Numbers**

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.

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 Molex feedback connector (Figure 4).
- b. At the motor, connect the feedback cable drain wire to the GND motor chassis terminal of the feedback connector (Figure 5).

The drawing displays two earth connections.

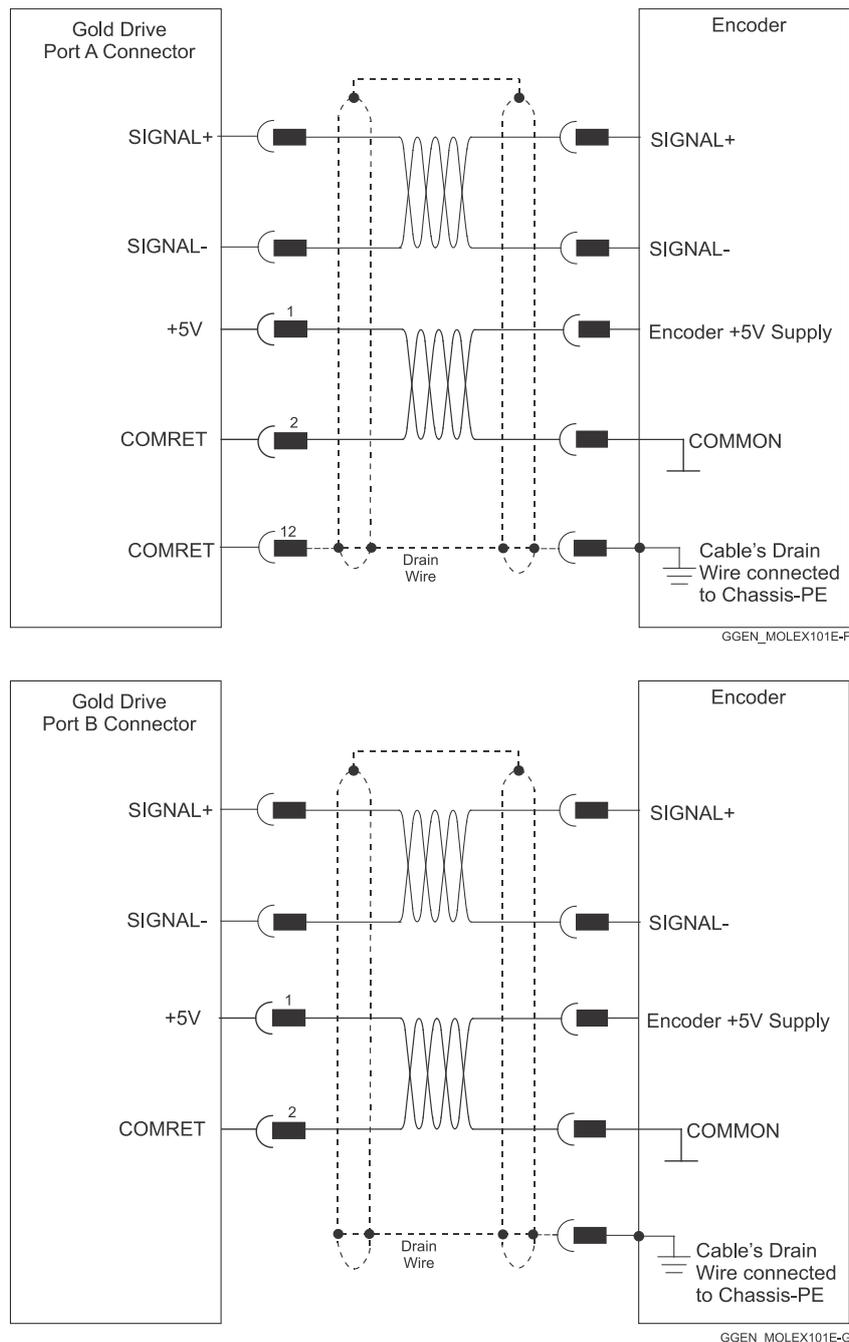


Figure 5: Feedback Port A and B Cable Assemblies



### 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.

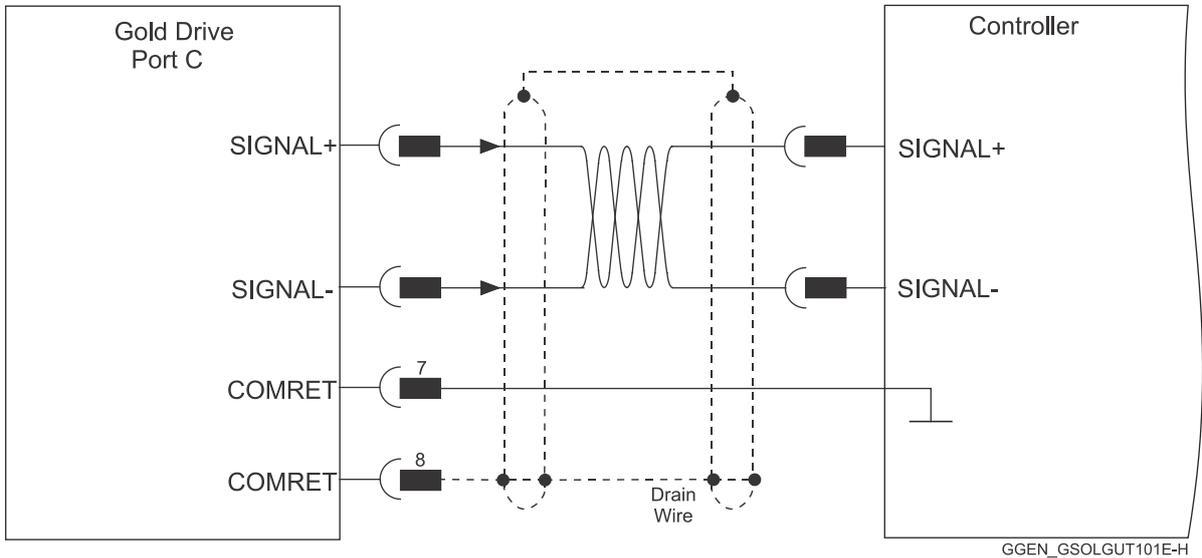


Figure 6: Feedback Port C Cable Assemblies

### 6.1.4. IO Cable Connector

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

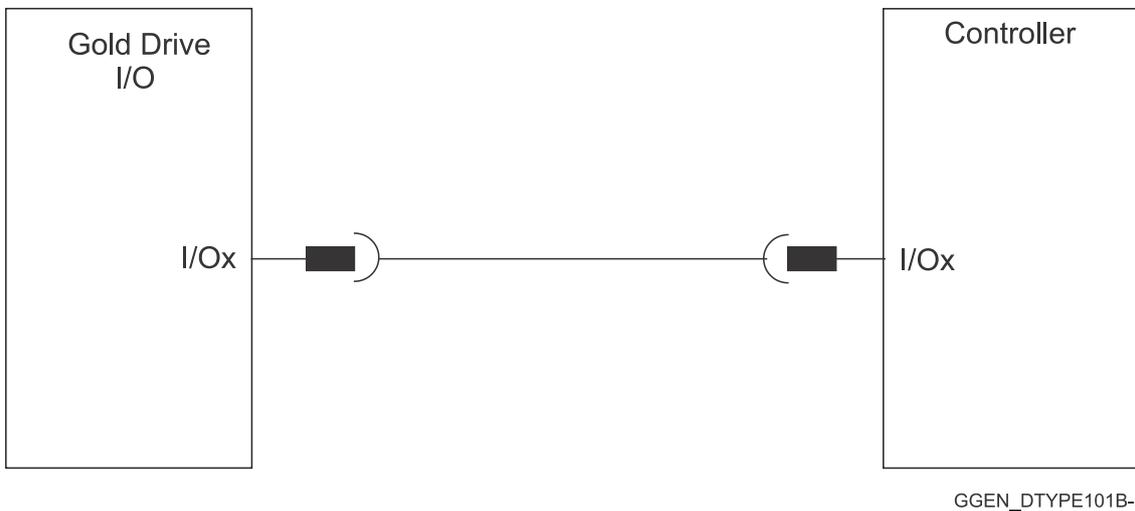


Figure 7: Feedback IO Cable Assemblies



### 6.1.5. STO (Port C) Cable Connector

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

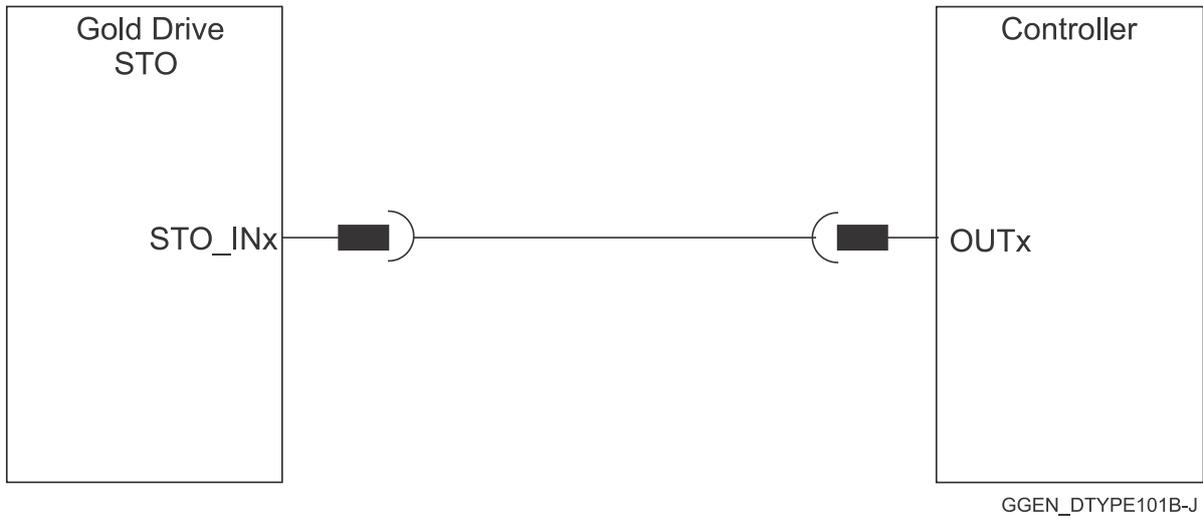


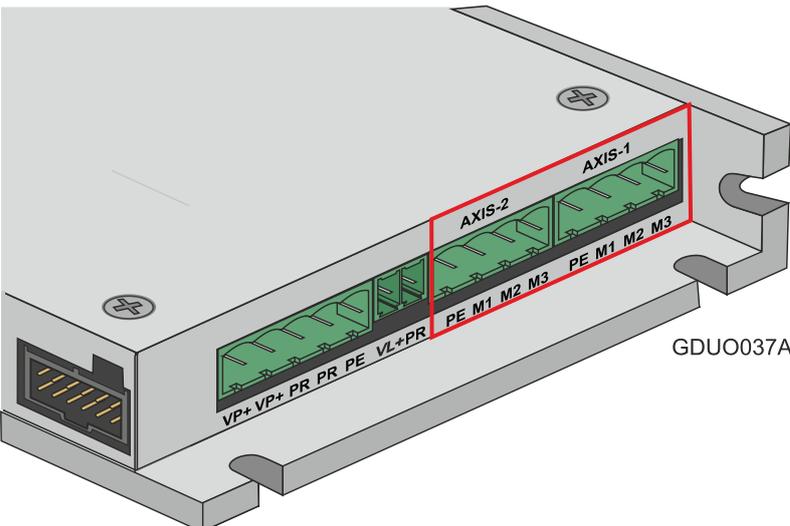
Figure 8: STO Cable Assemblies

## 6.2. Motor Power Connector Pinouts

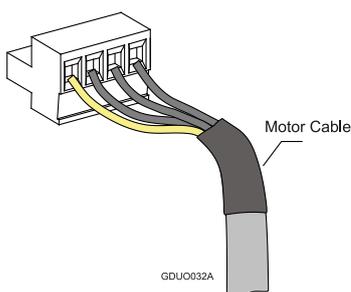
See Chapter 8 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Signal	Function	Cable (Wires)	
			Brushless Motor	Brushless DC Motor
J14/1	PE	Protective earth	Motor	Motor
J14/2	M1	Motor phase Axis 1	Motor	N/C
J14/3	M2	Motor phase Axis 1	Motor	Motor
J14/4	M3	Motor phase Axis 1	Motor	Motor
J15/1	PE	Protective earth	Motor	Motor
J15/2	M1	Motor phase Axis 2	Motor	N/C
J15/3	M2	Motor phase Axis 2	Motor	Motor
J15/4	M3	Motor phase Axis 2	Motor	Motor



**Axis 1 and Axis 2: 4-Pin Phoenix 5 mm Pitch 'HC'**



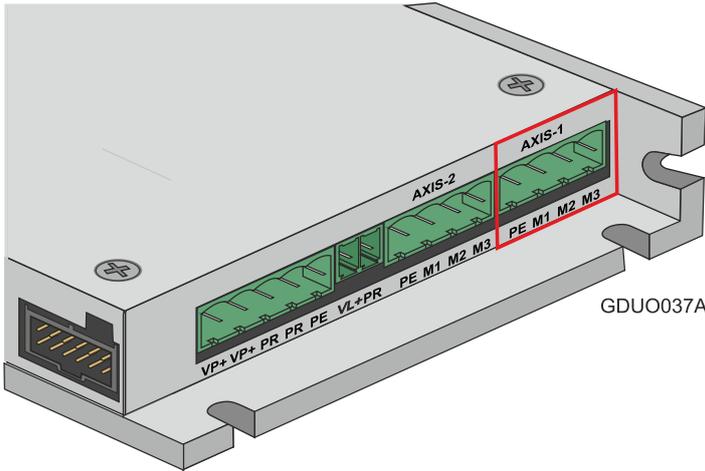
**4-Pin Phoenix Plug-in Connector**

**Table 3: Motor Power Pin Assignments**

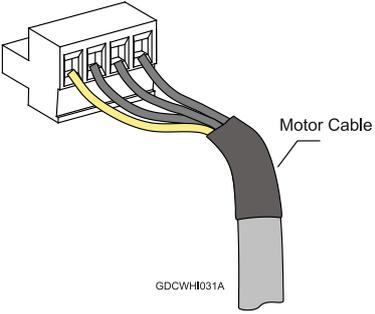
See Chapter 8 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

Pin	Function	Cable	
		Brushless Motor	Brushed DC Motor
PE	Protective Earth	Motor	Motor
M1	Motor phase	Motor	N/C
M2	Motor phase	Motor	Motor
M3	Motor phase	Motor	Motor



**4-Pin Phoenix 5 mm Pitch 'HC'**



**4-Pin Phoenix Plug-in Connector**

Table 4: Connectors for Motor

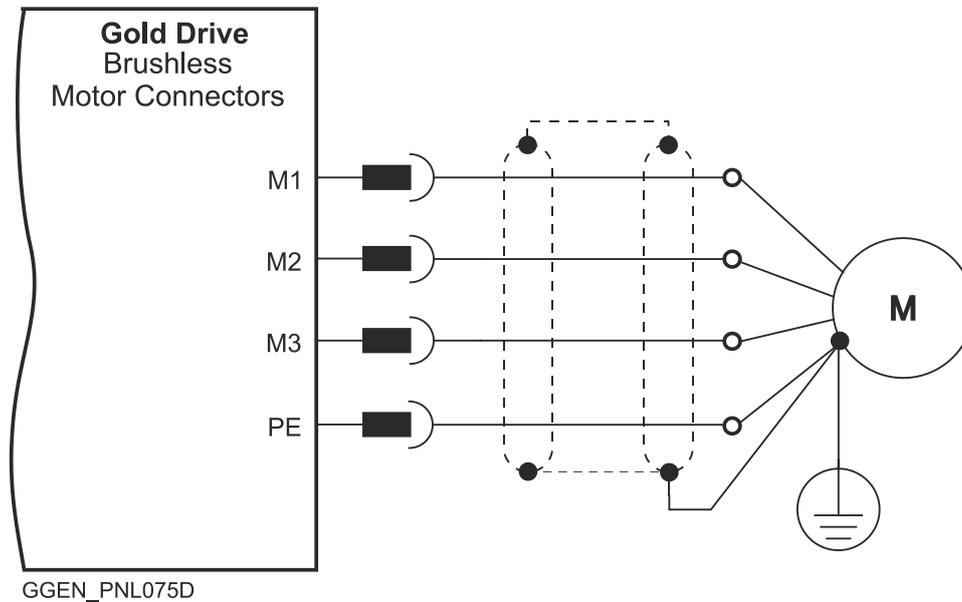


Figure 9: Brushless Motor Power Connection Diagram

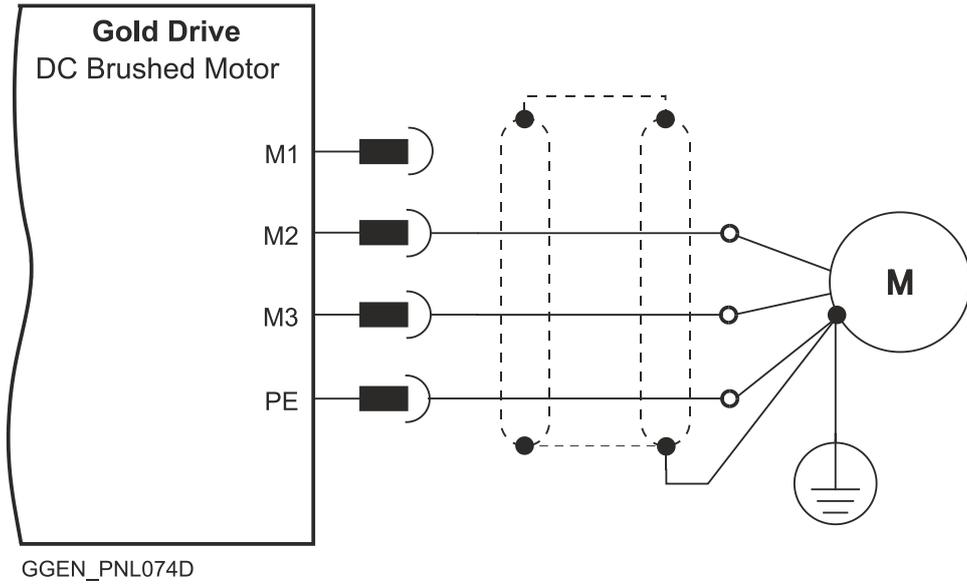


Figure 10: Brushed Motor Power Connection Diagram



## 6.3. Main and Auxiliary Power

### 6.3.1. Description

The Gold Duo receives power from main and auxiliary supplies and delivers power to the motor.

**Note:** There are multiple voltage ratings of the Gold Duo (12 V to 195 V), so you must use the correct power supply according to the maximum operating voltage of the Gold Duo. Refer to Chapter 4: Technical Information.

This section describes the Main and Auxiliary Power for power ratings 200V and 100V, and provides details for the optional Backup (Auxiliary) Supply.

- The Gold Duo Power rating is 12 to 195 VDC
- There are Two power ratings for Gold Duo; 100V and 200V:
  - **For power rating 200V**  
Two power isolated DC power sources are required, main power 12 - 195V and Auxiliary Power 12-95V for the logic.
  - **For power rating of 100V**  
Single DC Power Supply - Power to the Gold Duo is provided by a 12–95 VDC single isolated DC power source (not included with the Gold Duo). A “smart” control-supply algorithm enables the Gold Duo to operate with only one power supply with no need for an auxiliary power supply for the logic.

#### Optional Backup (Auxiliary) Supply

If backup functionality is required in case of power loss, e.g., to keep the original position, a 12–95 VDC external isolated supply should be connected (via the Gold Duo’s VL+ terminal). This is more flexible than the requirement for 24 VDC supply.

If backup is not needed, a single power supply is used for both the power and logic circuits.

There are two voltage ratings of the Gold Duo, therefore the correct power supply must be used, according to the maximum operating voltage of the Gold Duo. Refer to section 4.2 Technical Data.



### 6.3.2. Main Power

Pin	Signal	Function	Cable (Wires)
J13/1	VP+	Pos. Power input	DC Power
J13/2	VP+	Pos. Power input	DC Power
J13/3	PR	Power return	DC Power
J13/4	PR	Power return	DC Power
J13/5	PE	Protective earth	DC Power

**5-Pin Phoenix 5 mm Pitch 'HC'**

**5-Pin Phoenix Plug-in Connector**

**Table 5: Main Power Pin Assignments**

Connect the DC power cable to the VP+ and PR terminals on the Main Power Connector.

**To connect the DC power supply:**

1. The source of the 12 to 195 VDC power supply must be isolated.
2. For best immunity, it is highly recommended to use twisted and shielded cables for the DC power supply. A 3-wire shielded cable should be used. The gauge is determined by the actual current consumption of the motor.
3. Connect the cable shield to the closest ground connection near the power supply.
4. Connect the PE to the closest ground connection near the power supply.
5. Connect the PR to the closest ground connection near the power supply.
6. Before applying power, first verify the polarity of the connection.



### 6.3.3. Auxiliary Power Supply

Pin	Signal	Function	Cable (Wires)
J12/1	VL+	Auxiliary Supply Input	Auxiliary Power
J12/2	PR	Auxiliary Supply Return	Auxiliary Power

**2-Pin Phoenix 3.81 mm Pitch**

**2-Pin Phoenix Plug-in Connector**

**Table 6: Auxiliary Supply Pin Assignments**



**Caution:**

Power from the Gold Duo to the motor must come from the Main Supply and **not** from the Auxiliary Supply.

The backup functionality can be used for storing control parameters in case of power-outs, providing maximum flexibility and backup capability when needed.

Connect the VL+ and PR terminal to the **Auxiliary** Connector.

**To connect the auxiliary supply:**

1. The source of the Auxiliary Supply must be isolated.
2. For safety reasons, connect the return (common) of the auxiliary supply source to the closest ground near the auxiliary supply source
3. Connect the cable shield to the closest ground near the auxiliary supply source
4. Before applying power, first verify the polarity of the connection.

### 6.3.4. Connectivity

#### 6.3.4.1. Power Rating 200 V

For Power Rating 200 V, two power isolated DC power sources are required, main power **12 - 195V** and auxiliary Power **12-95V** for the logic.

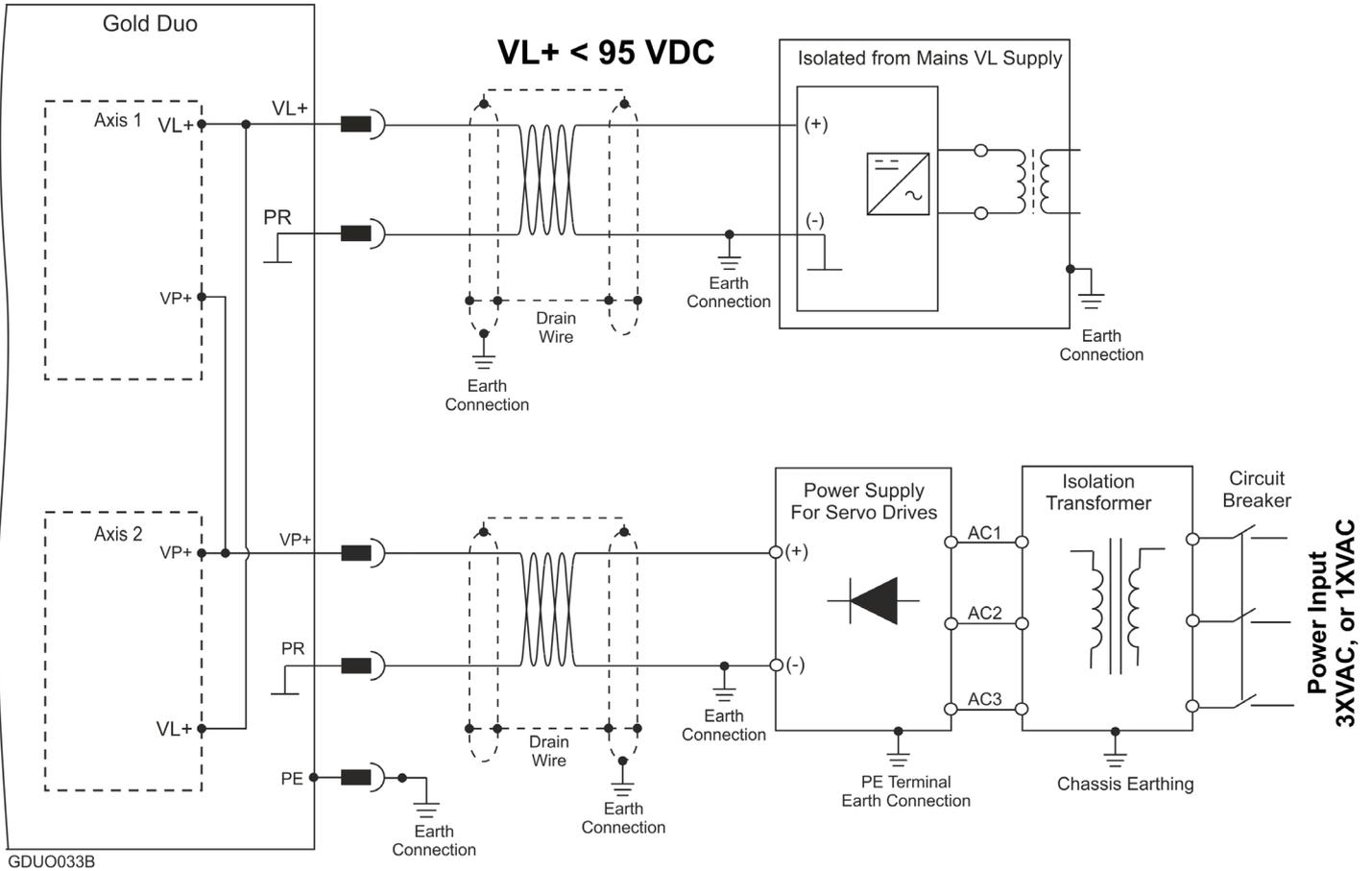


Figure 11: 200 VDC Power Source Connection Diagram



### 6.3.4.2. Power Rating 100 V

#### 6.3.4.2.a Single Power Supply

For power rating 100 V, a single Power Supply is required which contains a “smart” control-supply algorithm, enabling the Gold Duo to operate with only one power supply with no need for an auxiliary power supply for the logic.

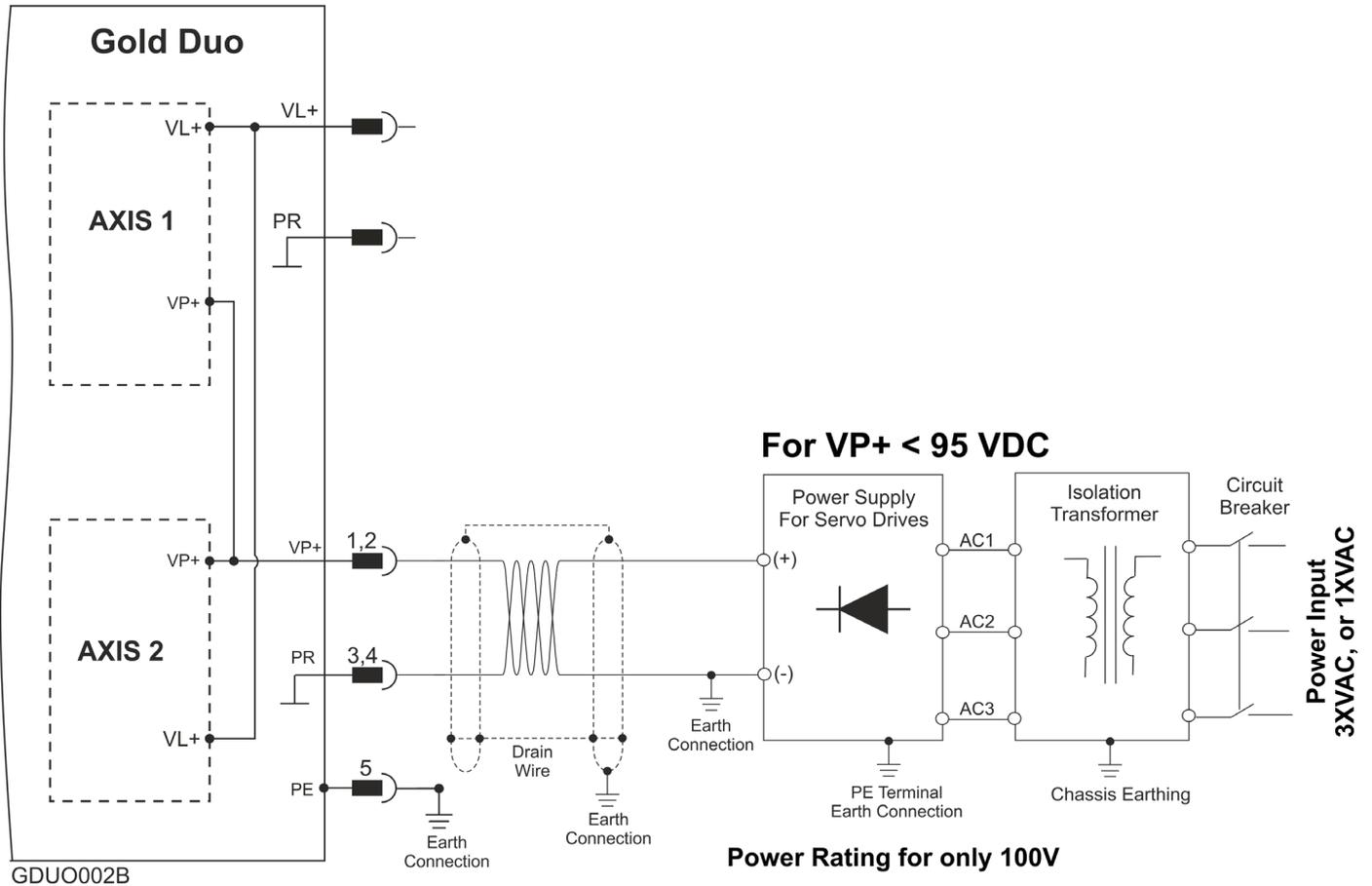


Figure 12: Main Power Supply Connection Diagram

6.3.4.2.b Optional Backup Supply

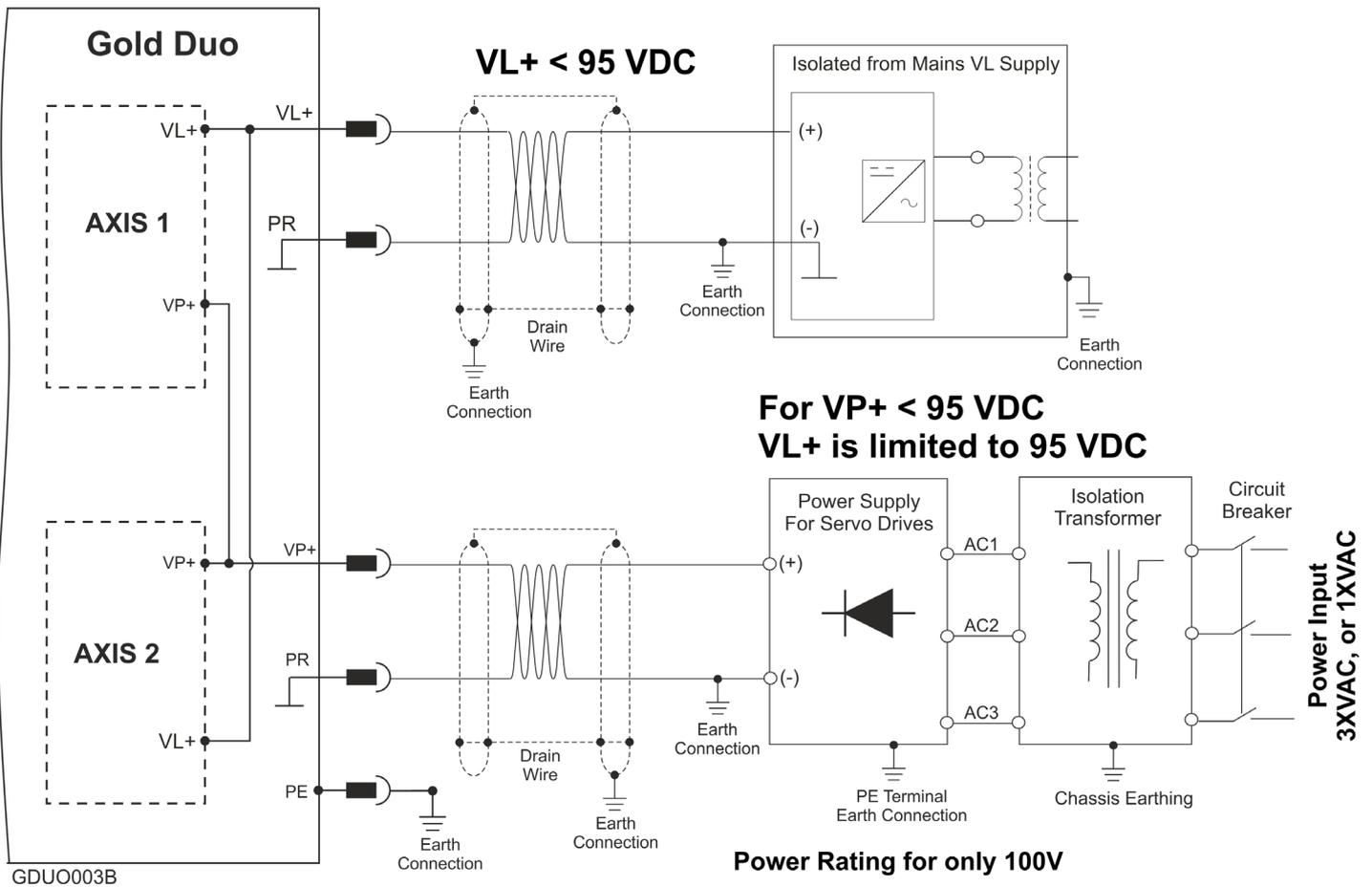


Figure 13: Main Power Supply Connection Diagram with Auxiliary Supply

## 6.4. Drive Status Indicator

Figure 14 shows the position of the red/green dual LED, which is used for immediate indication of the Initiation and Working states. For details refer to Chapter 7 Drive Status Indicator, in the MAN-G-Panel Mounted Drives Hardware manual.

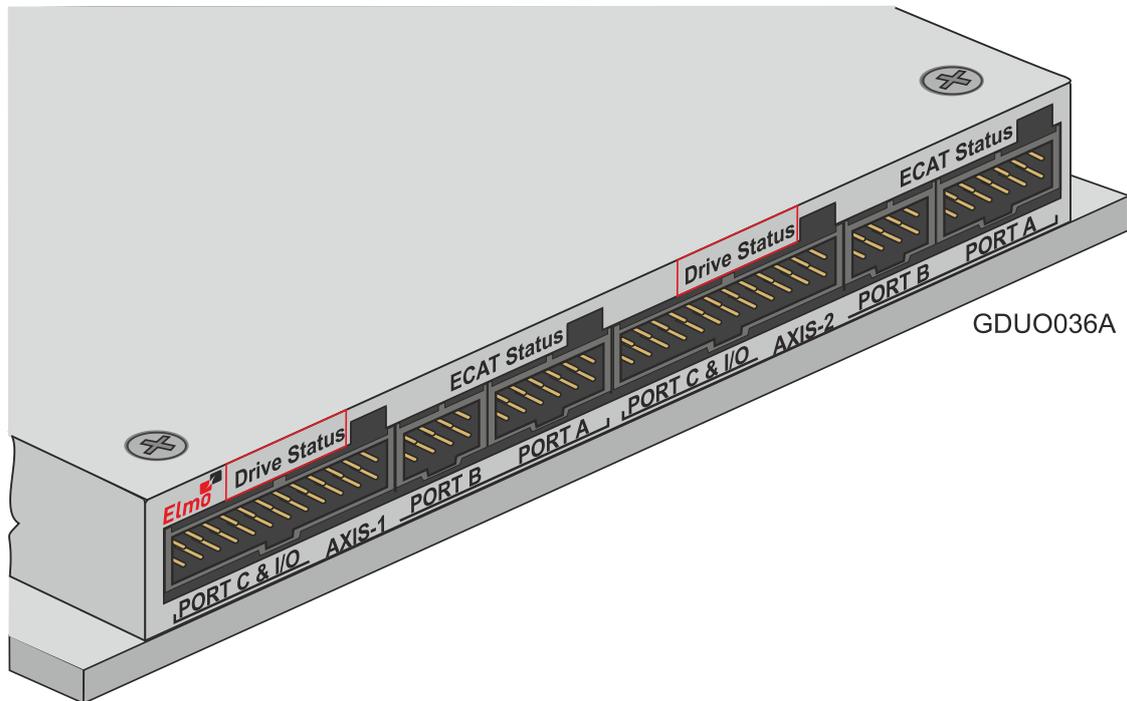


Figure 14: Drive Status Indicator - EtherCAT

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

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

## 6.5. STO (Safe Torque Off)

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

Pin (J11)	Signal	Function
J11/1	STO1	STO1 input (default 24 V)
J11/2	STO2	STO2 input (default 24 V)
J11/3	STO_RET	STO signal return

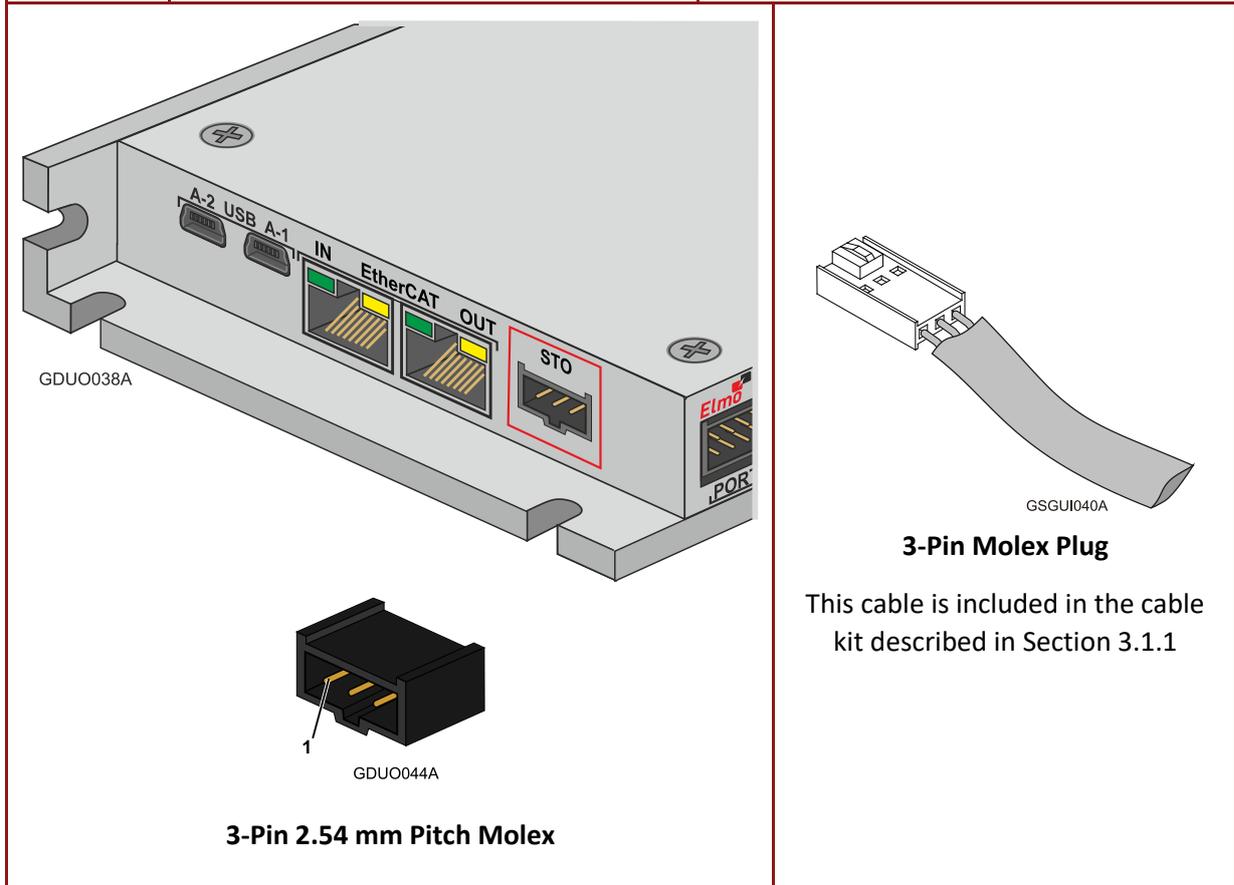


Table 7: STO Inputs Pin Assignments

### 6.5.1. Source Mode – PLC Voltage Level

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

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

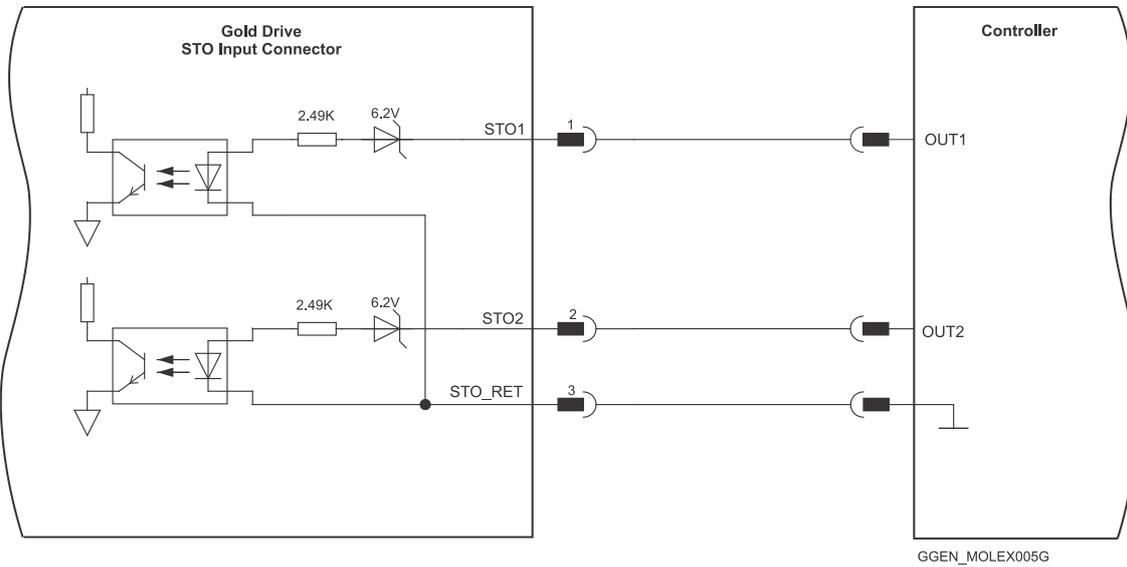


Figure 15: STO Molex Type Input Connection – PLC Source Option

### 6.5.2. TTL Mode – TTL Voltage Level

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

Refer to the diagrams below for TTL option connection.

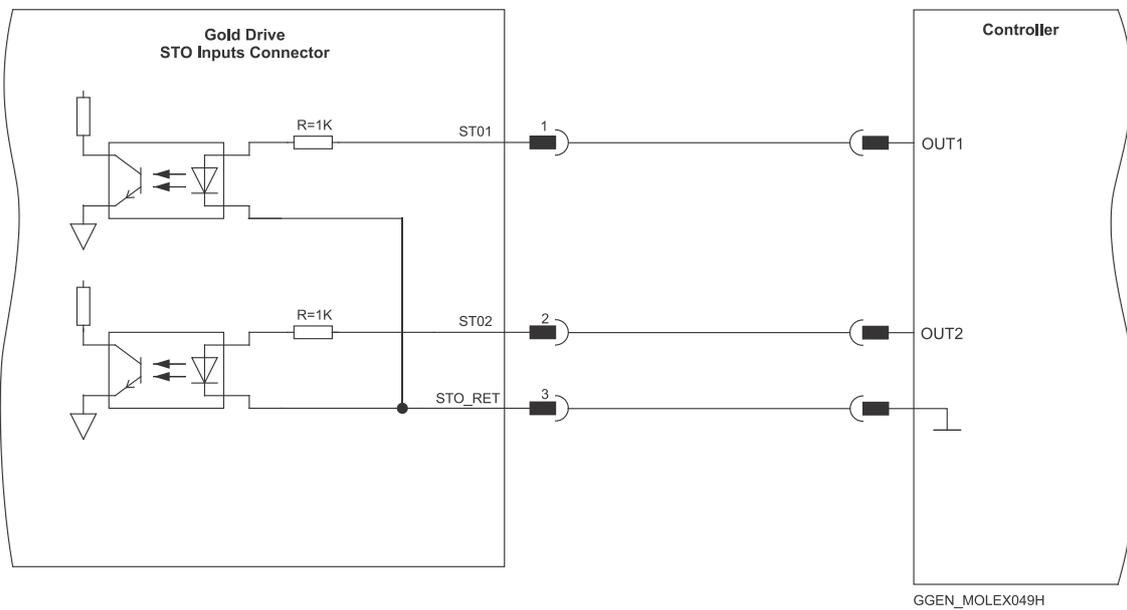


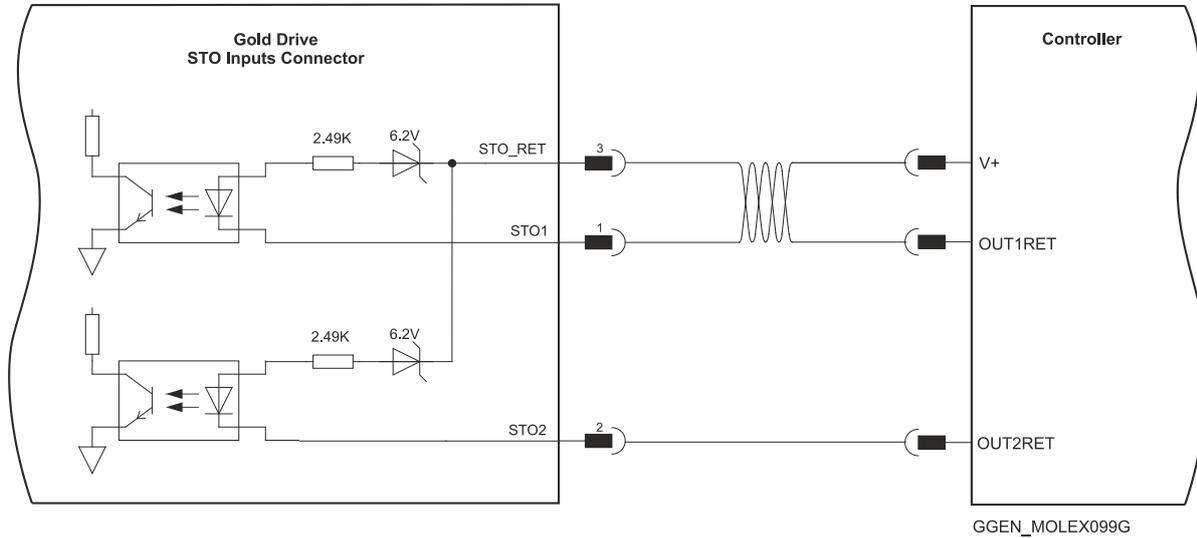
Figure 16: STO Input Connection – TTL Option

### 6.5.3. Sink Mode – PLC Voltage Level

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

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.**

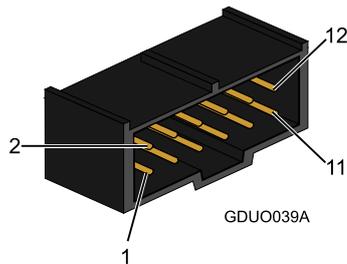
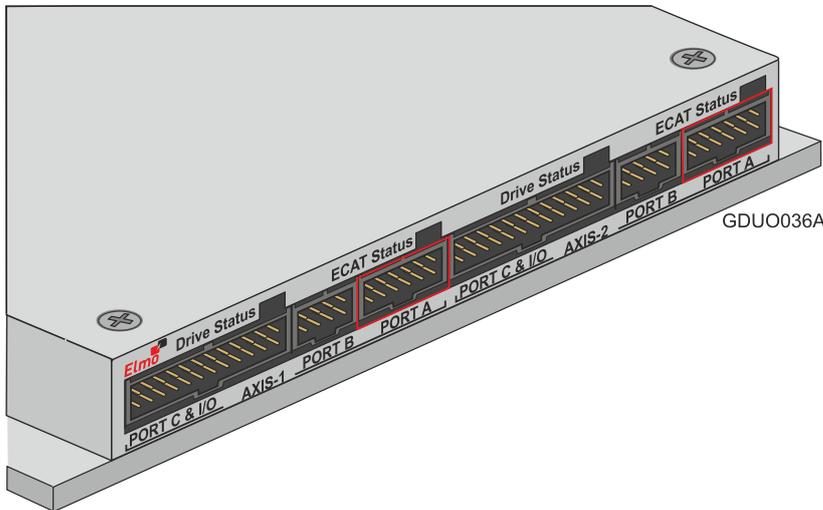


**Figure 17: STO Input Connection – Sink Option**

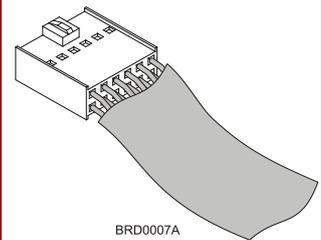
## 6.6. Feedback Port A Per Axis

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

Pin	Incremental Encoder		Absolute Serial Encoder	
	Signal	Function	Signal	Function
1	+5V	Encoder +5V supply	+5V	Encoder +5V supply
2	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
12	COMRET	Common Return	COMRET	Common Return



**12-Pin 2.54 mm Pitch Molex**



**12-Pin Molex Plug**

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

**Table 8: Port A Pin Assignments**

### 6.6.1. Incremental Encoder

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

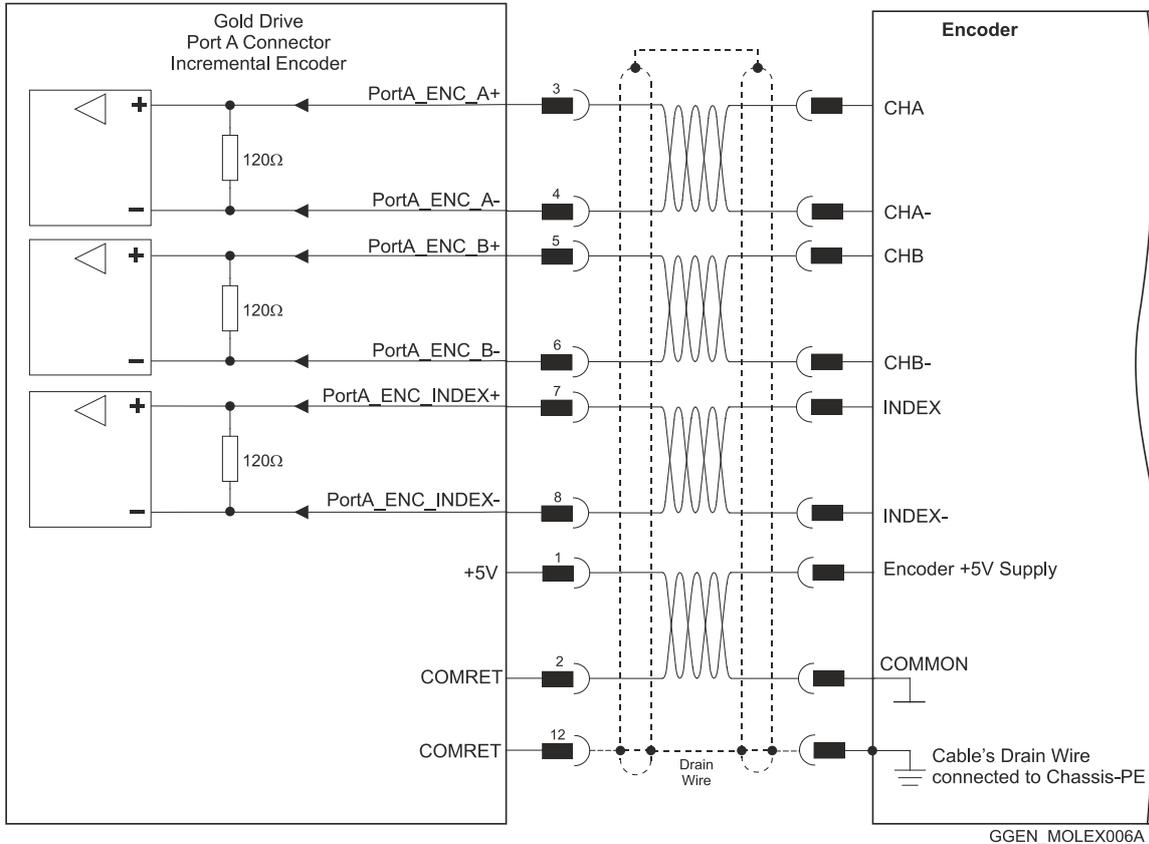


Figure 18: Port A Molex Type Incremental Encoder Input – Recommended Connection Diagram

### 6.6.2. Halls Sensor

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

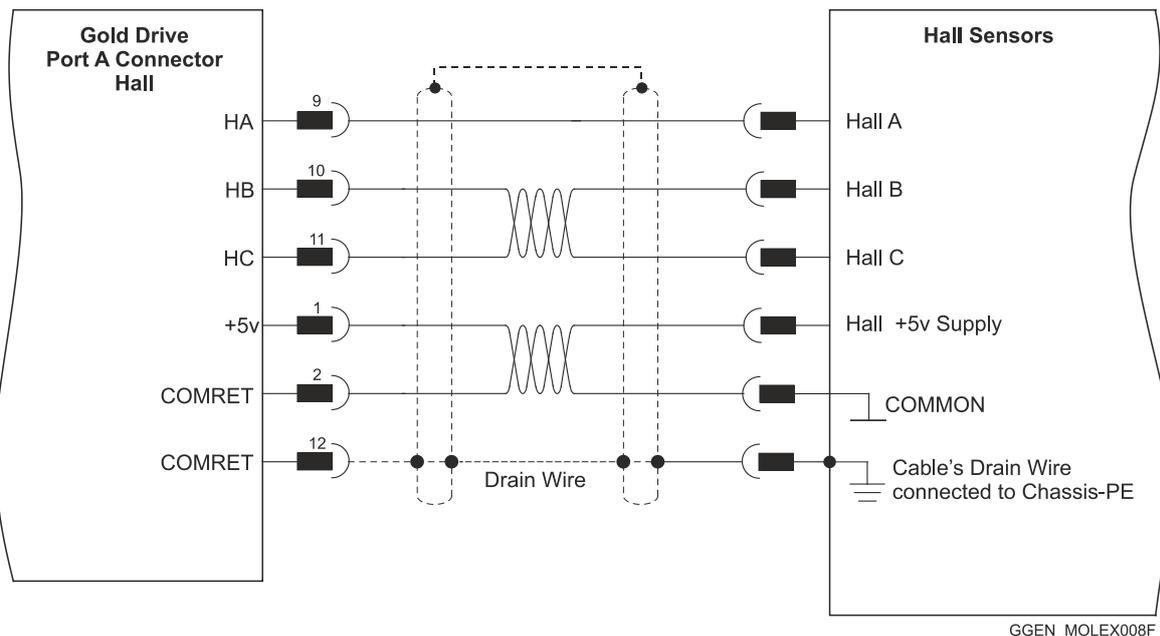


Figure 19: Molex Type Hall Sensors Connection Diagram

### 6.6.3. Absolute Serial Encoder

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

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

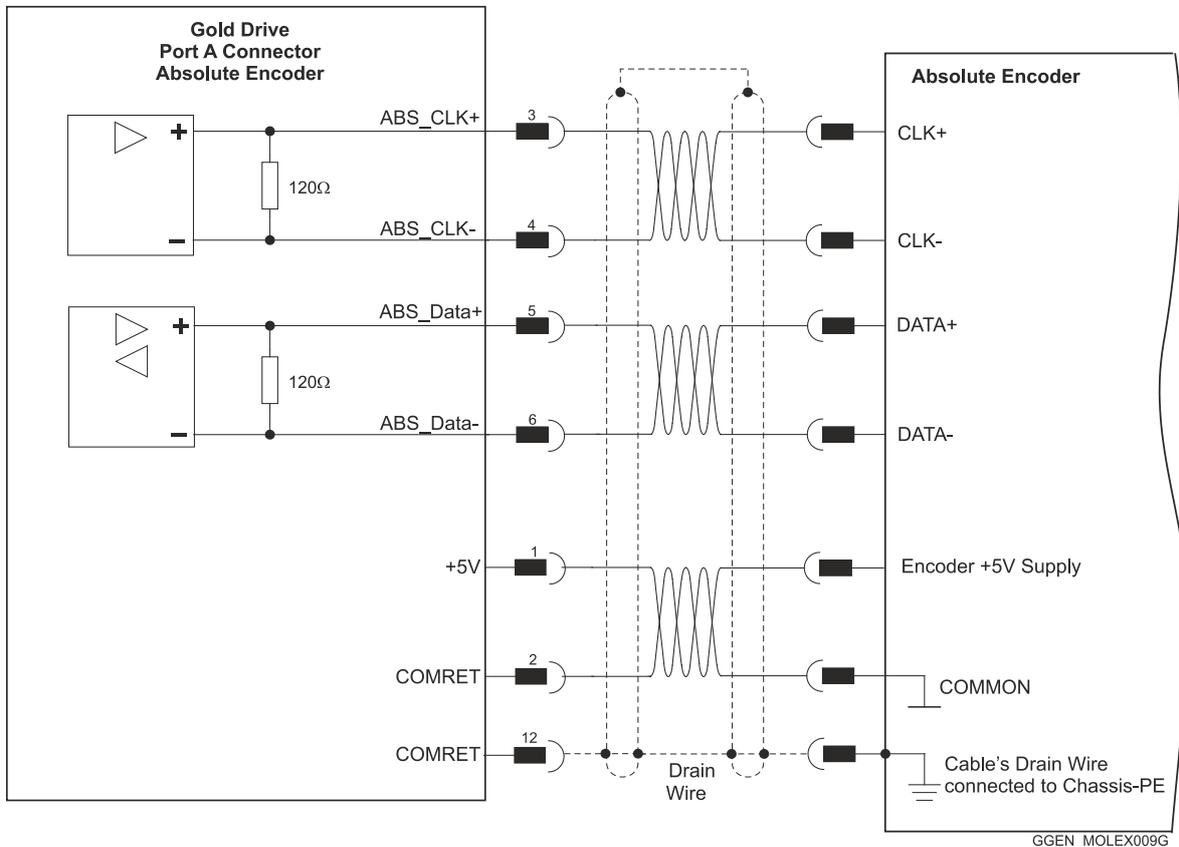


Figure 20: Absolute Serial Encoder – Recommended Connection Diagram for EnDAT, Biss, SSI

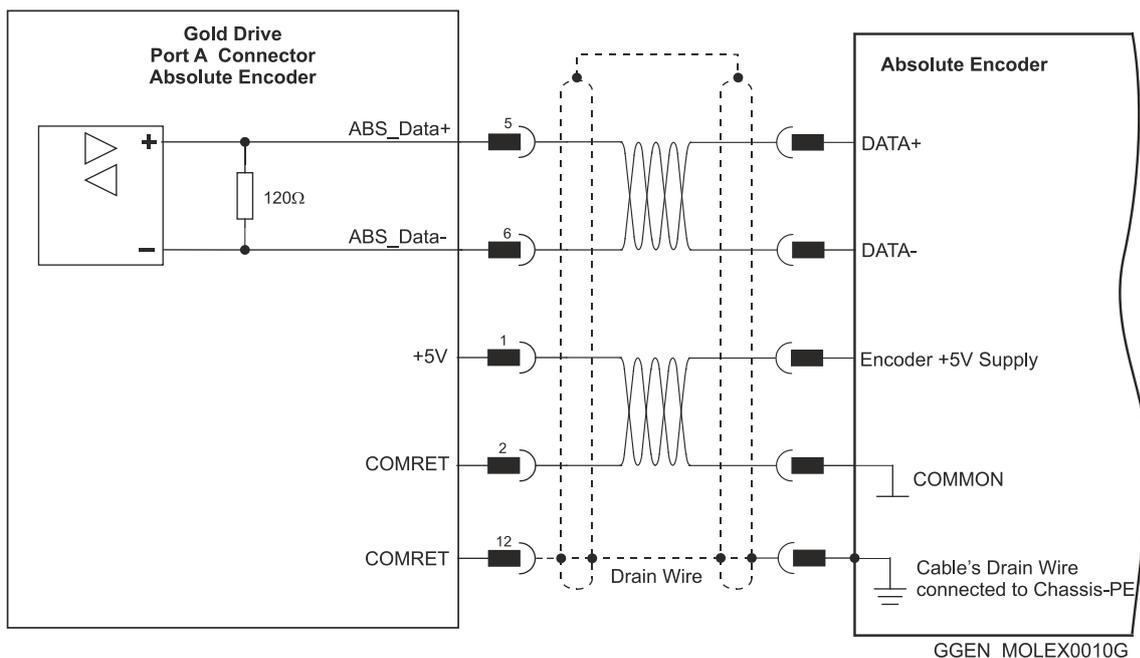
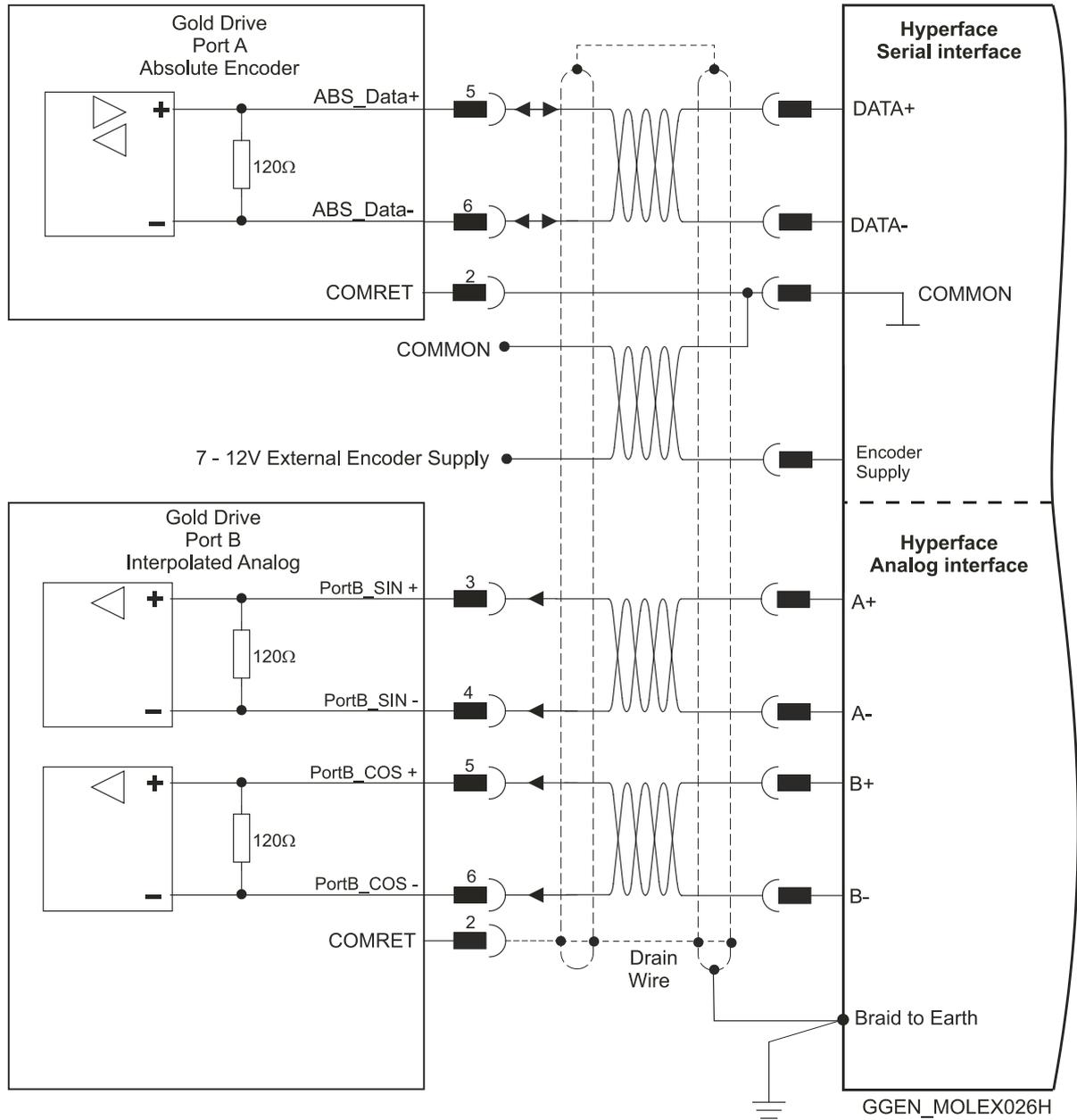


Figure 21: Absolute Serial Encoder – Recommended Connection Diagram for Sensors Supporting Data Line Only (NRZ types, e.g., Panasonic / Mitutoyo / Sanyo Danki / Tamagawa)

### 6.6.3.1. Hiperface

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

The following figure describes the connection diagram.

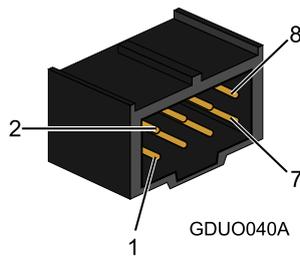
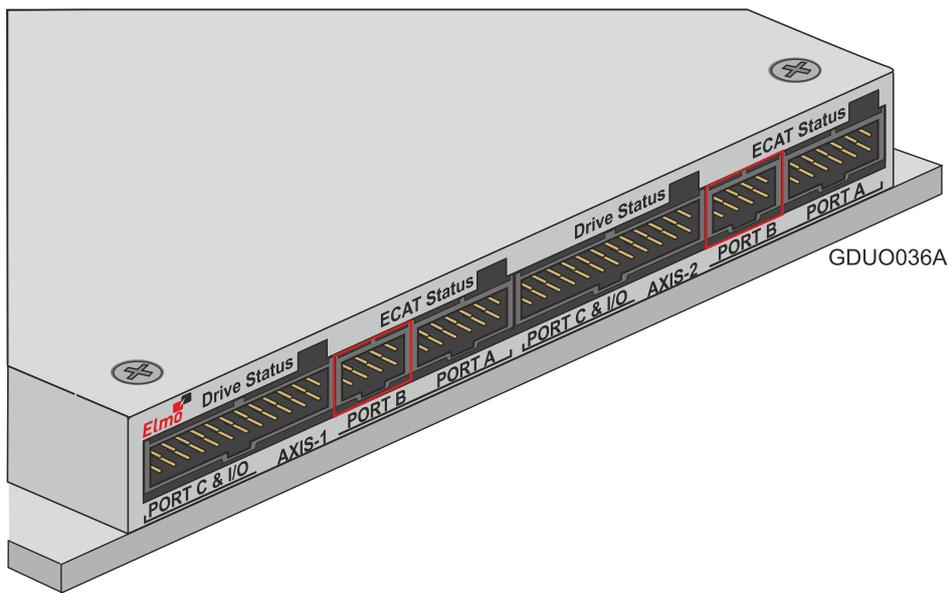


**Figure 22: Absolute Serial Encoder – Recommended Molex Type Connection Diagram for Stegmann Hiperface**

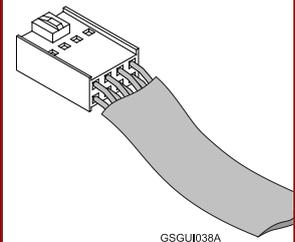
## 6.7. Feedback Port B Per Axis

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-DUOXXXX/YYYEEXX			G-DUOXXXX/YYYRXX	
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



**8-Pin 2.54 mm Pitch Molex**



**8-Pin Molex Plug**

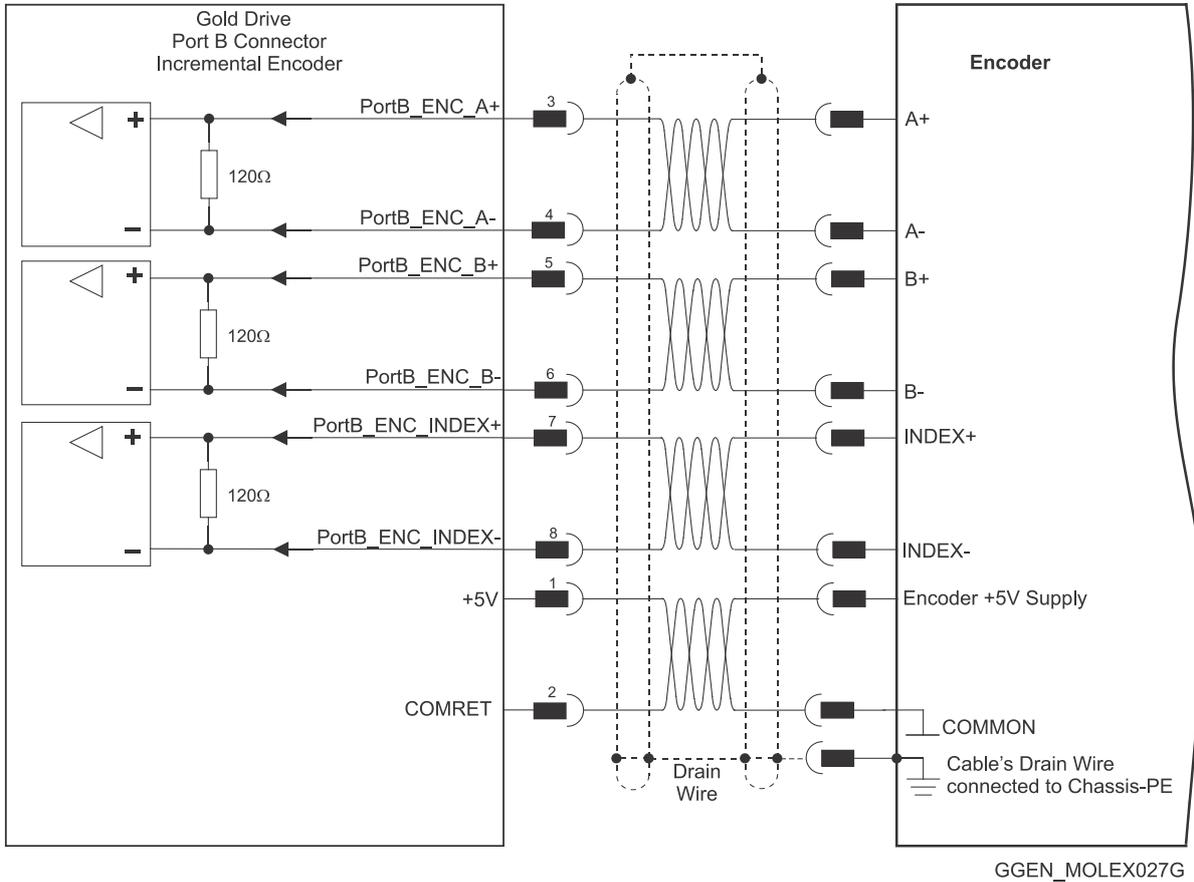
This cable is included in the cable kit described in Section 3.1.1.

**Table 9: Port B Pin Assignments**

### 6.7.1. Incremental Encoder

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

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

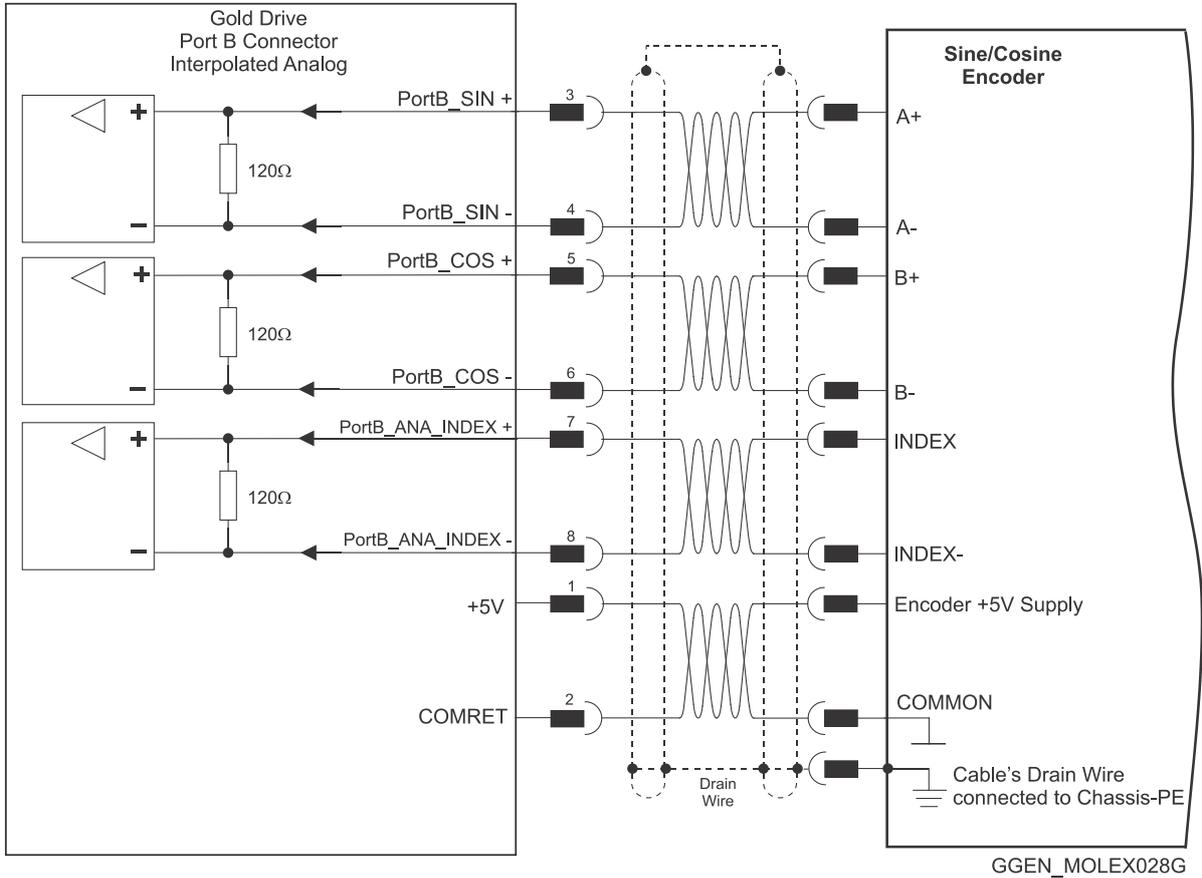


**Figure 23: Port B Incremental Encoder Input – Recommended Connection Diagram**

### 6.7.2. Interpolated Analog Encoder

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

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



**Figure 24: Port B - Interpolated Analog Encoder Molex Type Connection Diagram**

### 6.7.3. Resolver

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

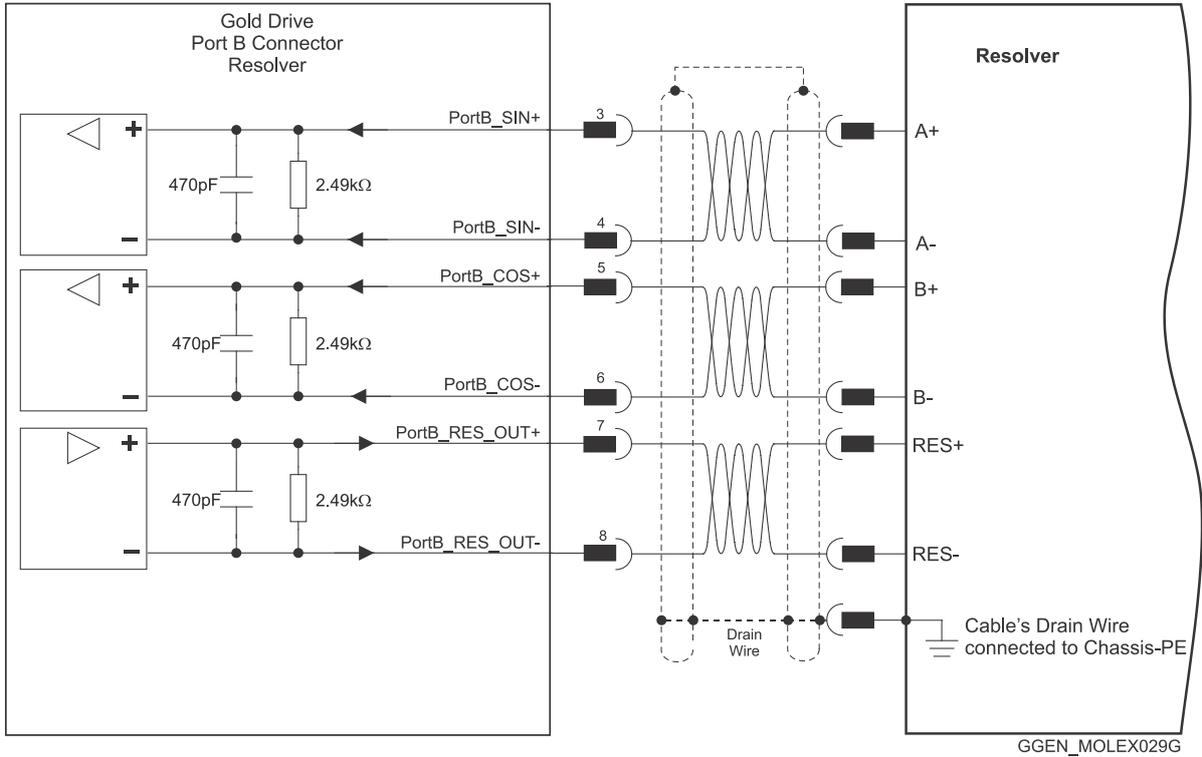


Figure 25: Port B – Resolver Molex Type Connection Diagram



## 6.8. Feedback Port C and I/O

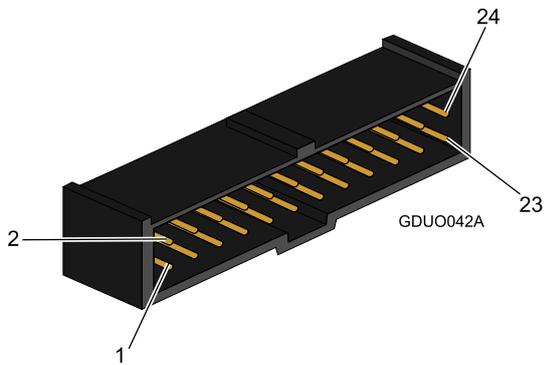
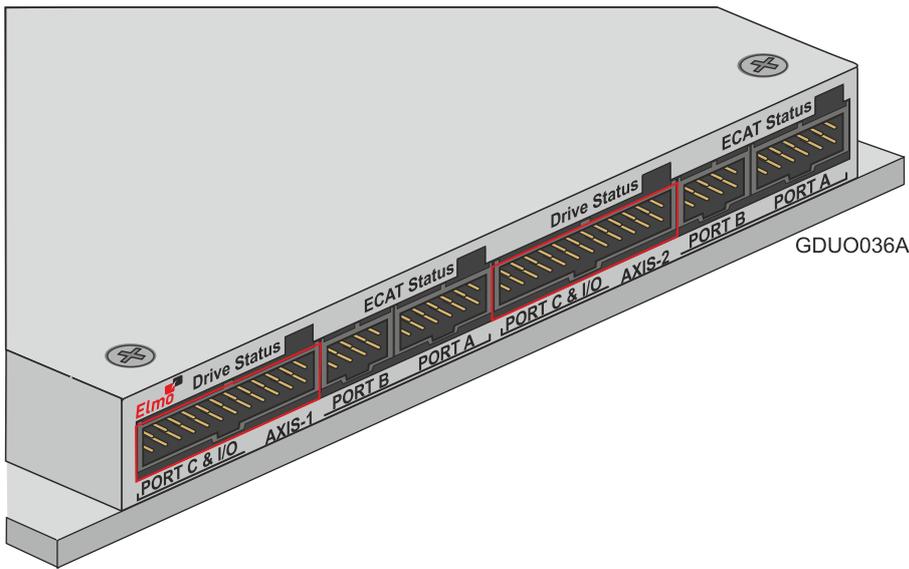
The Port C connector includes the following functions:

- Port C: Refer to Sections 10.5 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details
- I/O: Refer to Chapter 11 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.

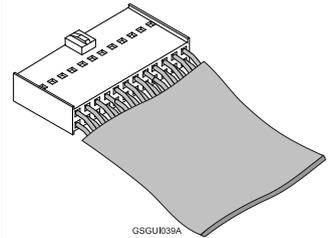
Pin	Signal	Function
1	PortC_ENCO_A+	Buffered Channel A output
2	PortC_ENCO_A-	Buffered Channel A complement output
3	PortC_ENCO_B+	Buffered Channel B output
4	PortC_ENCO_B-	Buffered Channel B complement output
5	PortC_ENCO_Index+	Buffered INDEX output
6	PortC_ENCO_Index-	Buffered INDEX complement output
7	COMRET	Common return
8	COMRET	Common return
9	ANALOG1-	Analog input complement
10	ANALOG1+	Analog input
11	ANARET	Analog return
12	INRET1_6	Programmable input 1 – 6 return
13	IN1	Programmable input 1 (High speed)
14	IN2	Programmable input 2 (High speed)
15	IN3	Programmable input 3 (High speed)
16	IN4	Programmable input 4 (High speed)
17	IN5	Programmable input 5 (High speed)
18	IN6	Programmable input 6 (High speed)
19	OUT4	Programmable output 4
20	OUT3	Programmable output 3
21	OUT2	Programmable output 2
22	OUT1	Programmable output 1
23	VDD	VDD supply. Refer to <a href="#">MAN-G-Panel Mounted Drives Hardware Manual</a> for VDD specification
24	VDDRET	VDD supply return



### Connector Location



**24-Pin 2.54 mm Pitch Molex**



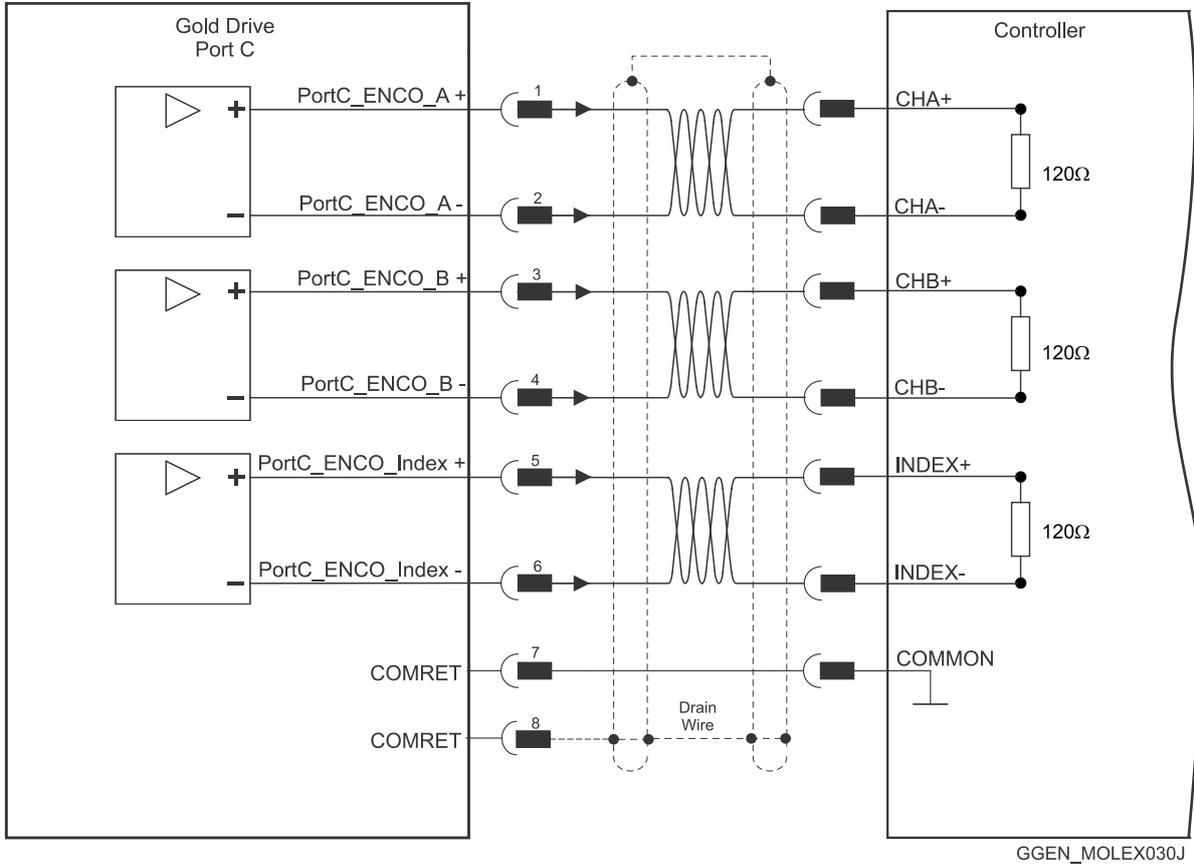
**24-Pin Molex Plug**

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

**Table 10: Port C Feedback Out and I/O**

### 6.8.1. Port C – Emulated Encoder Output

Refer to Sections 10.5 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details. The following figure describes the connections at Port C for the Emulated Encoder Differential.



**Figure 26: Emulated Encoder Differential Output – Recommended Connection Diagram**

Note that the user is required to connect a 120 Ω termination at the end of each differential line.

### 6.8.2. Analog Input

See Section 11.2 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details.

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

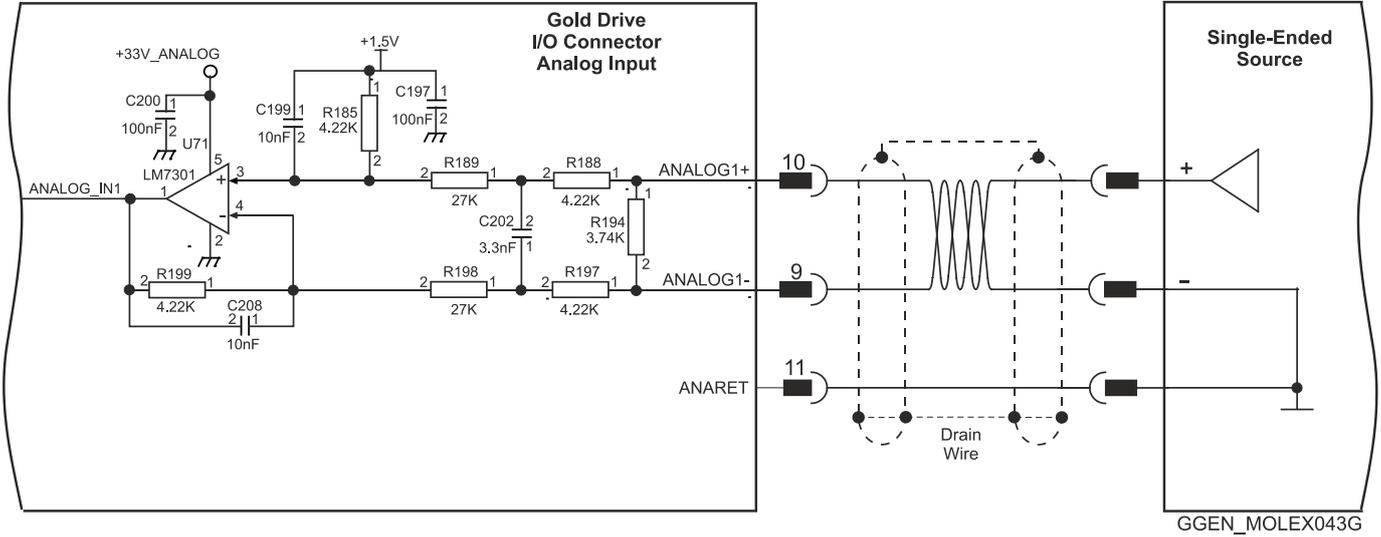


Figure 27: Differential Analog Input



### 6.8.3. Digital Input and Output TTL Mode

Refer to Chapter 11 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details. The following figure describes the connections at the I/O Port for the Digital Input and Output TTL Mode.

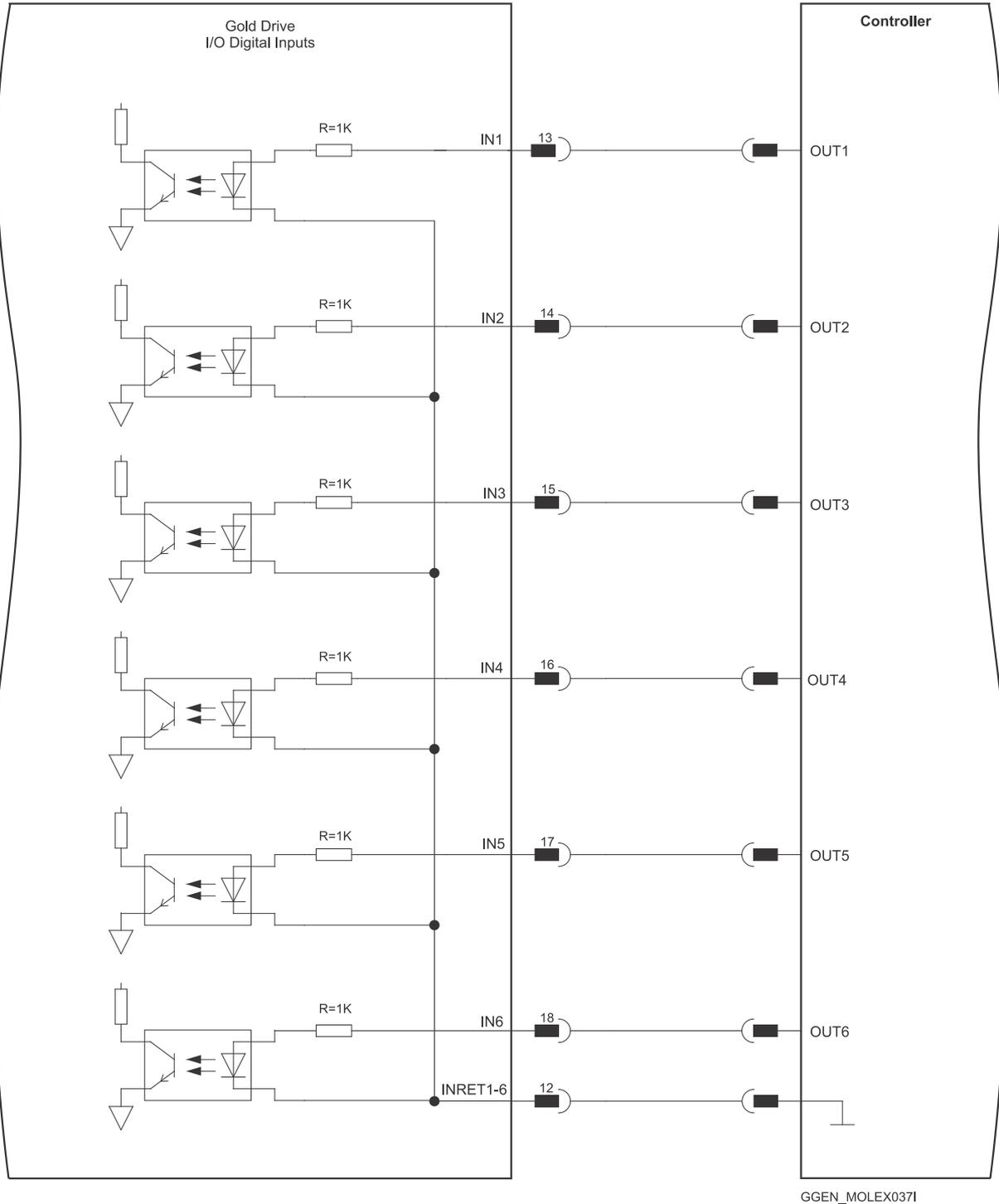


Figure 28: Digital Input TTL Mode Connection Diagram

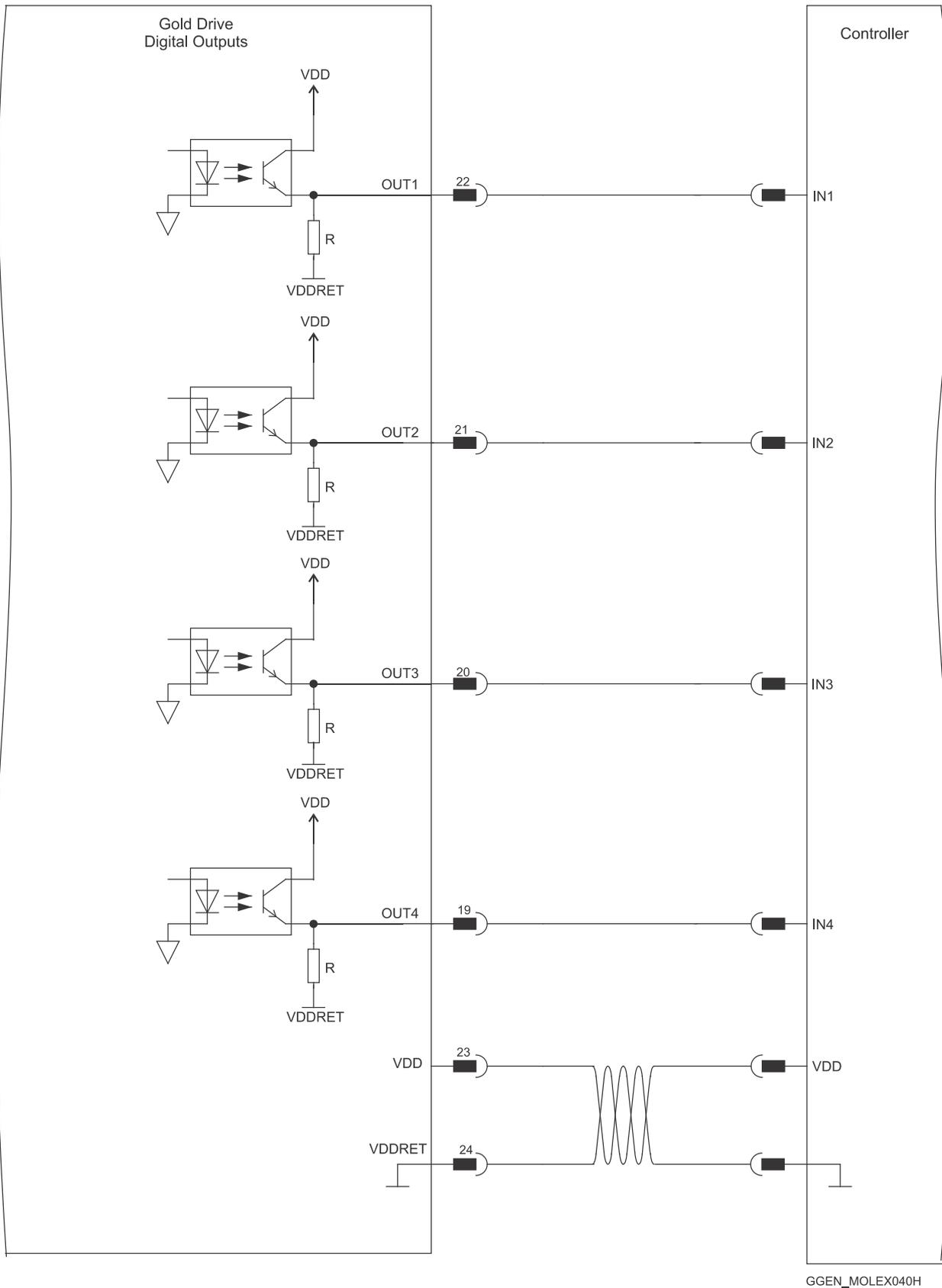


Figure 29: Digital Output Connection Diagram – TTL Option

### 6.8.4. Digital Input and Output PLC Source Mode

Refer to Chapter 11 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details. The following figure describes the connections at the I/O Port for the Digital Input and Output PLC Mode.

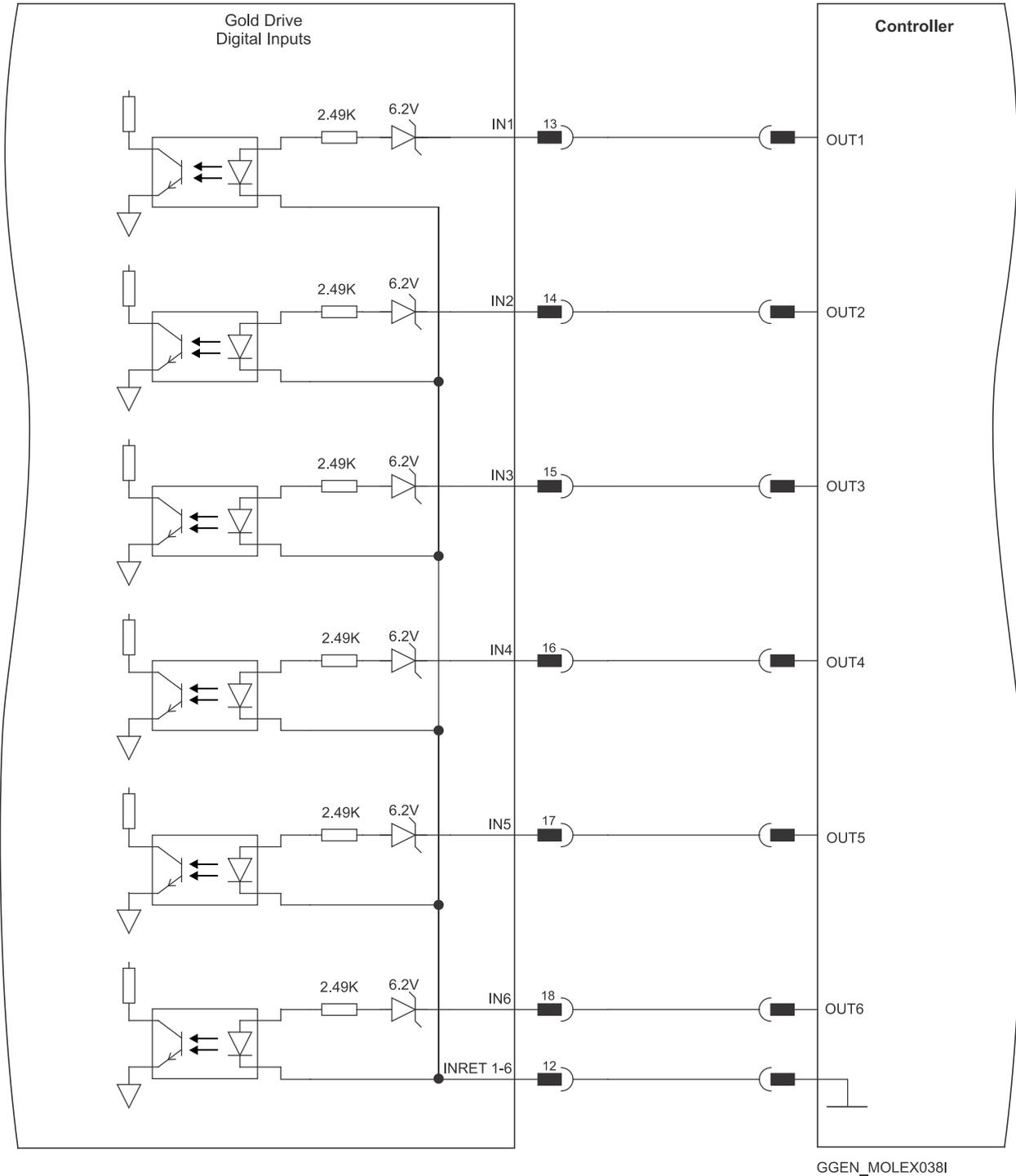
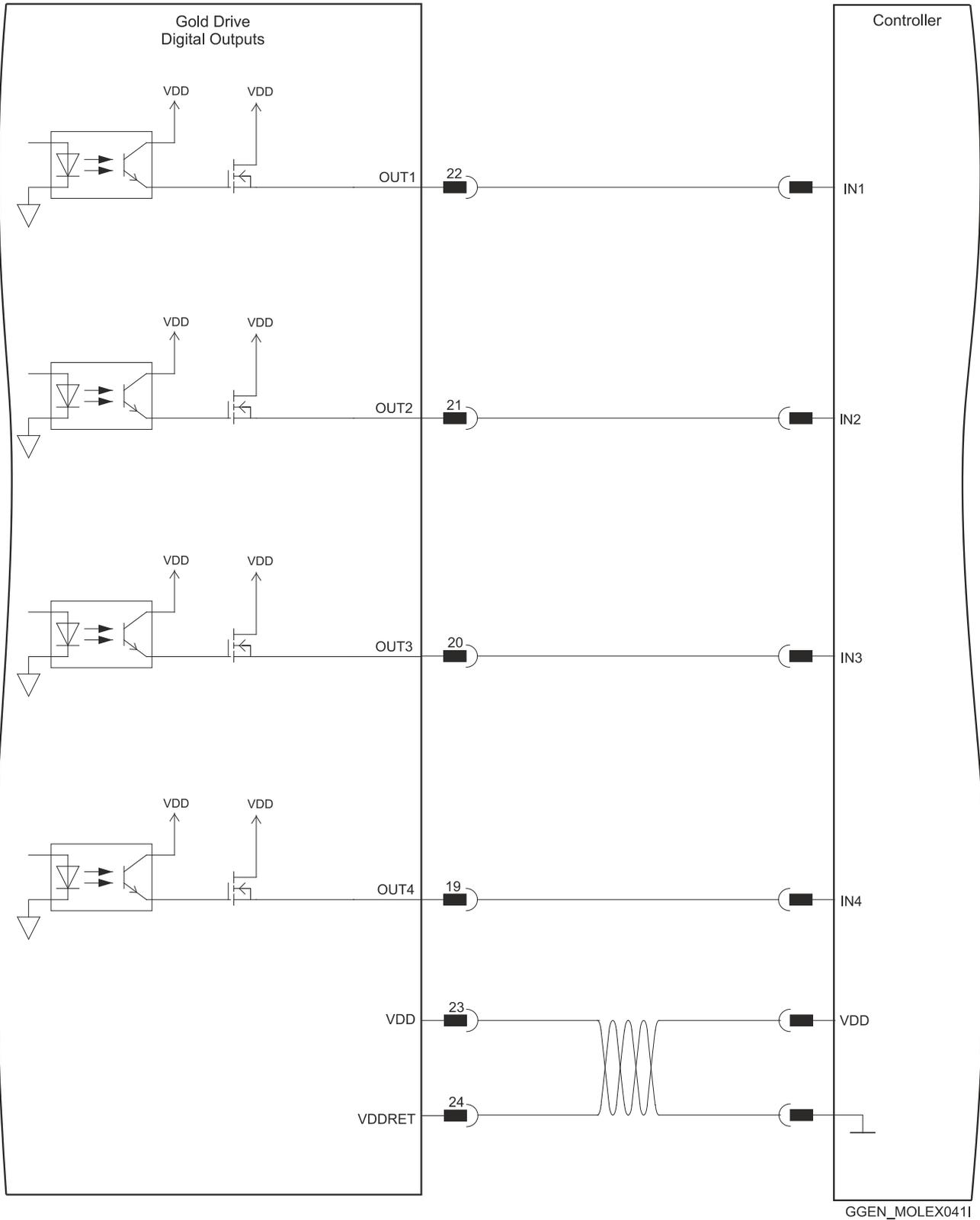


Figure 30: Digital Input Connection Diagram – Source PLC Option



**Figure 31: Digital Output Connection Diagram – Source PLC Option**



### 6.8.5. Digital Input and Output Sink Mode

Refer to Chapter 11 in the in the MAN-G-Panel Mounted Drives Hardware manual for full details. The following figure describes the connections at the I/O Port for the Digital Input and Output Sink Mode.

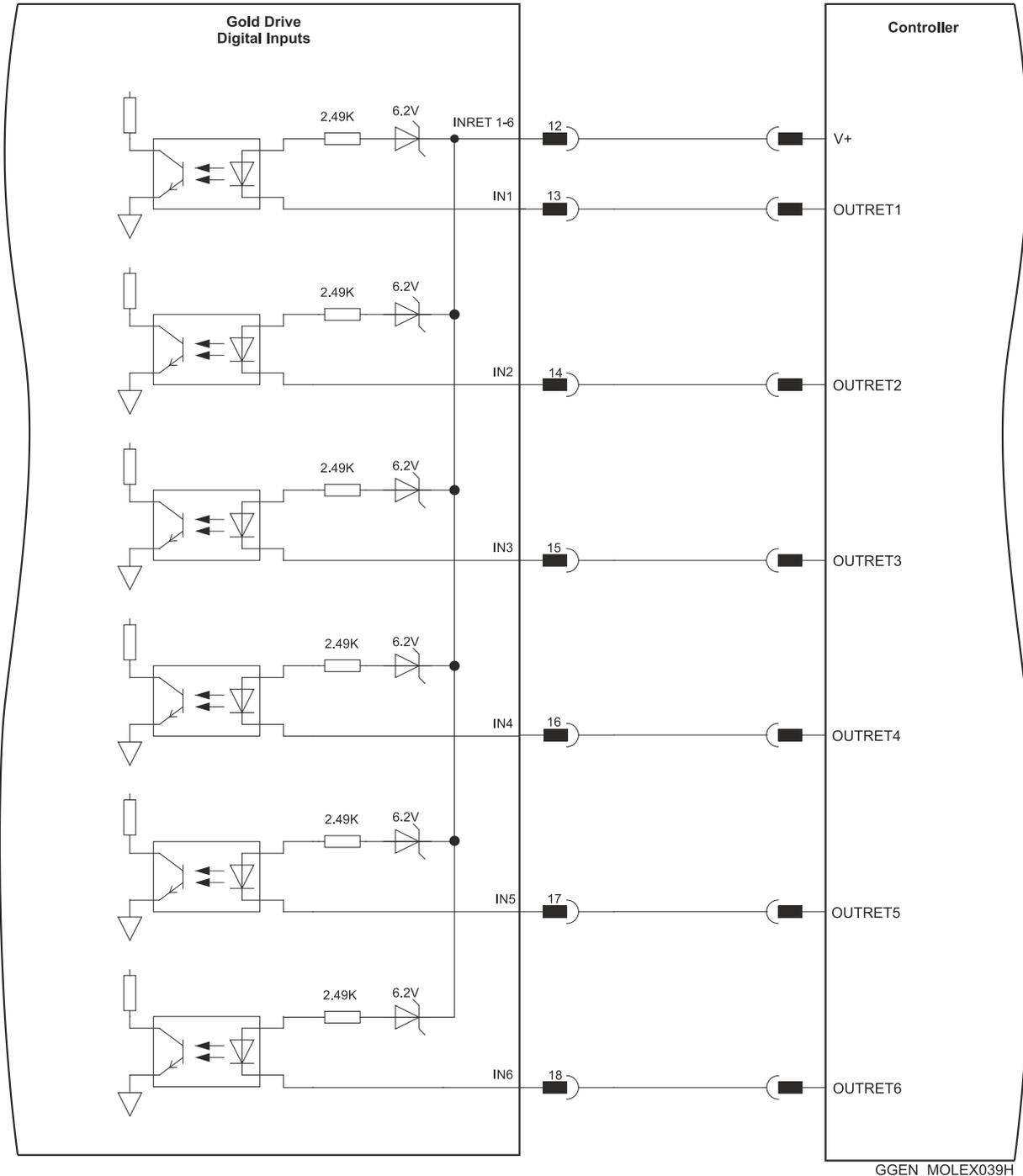
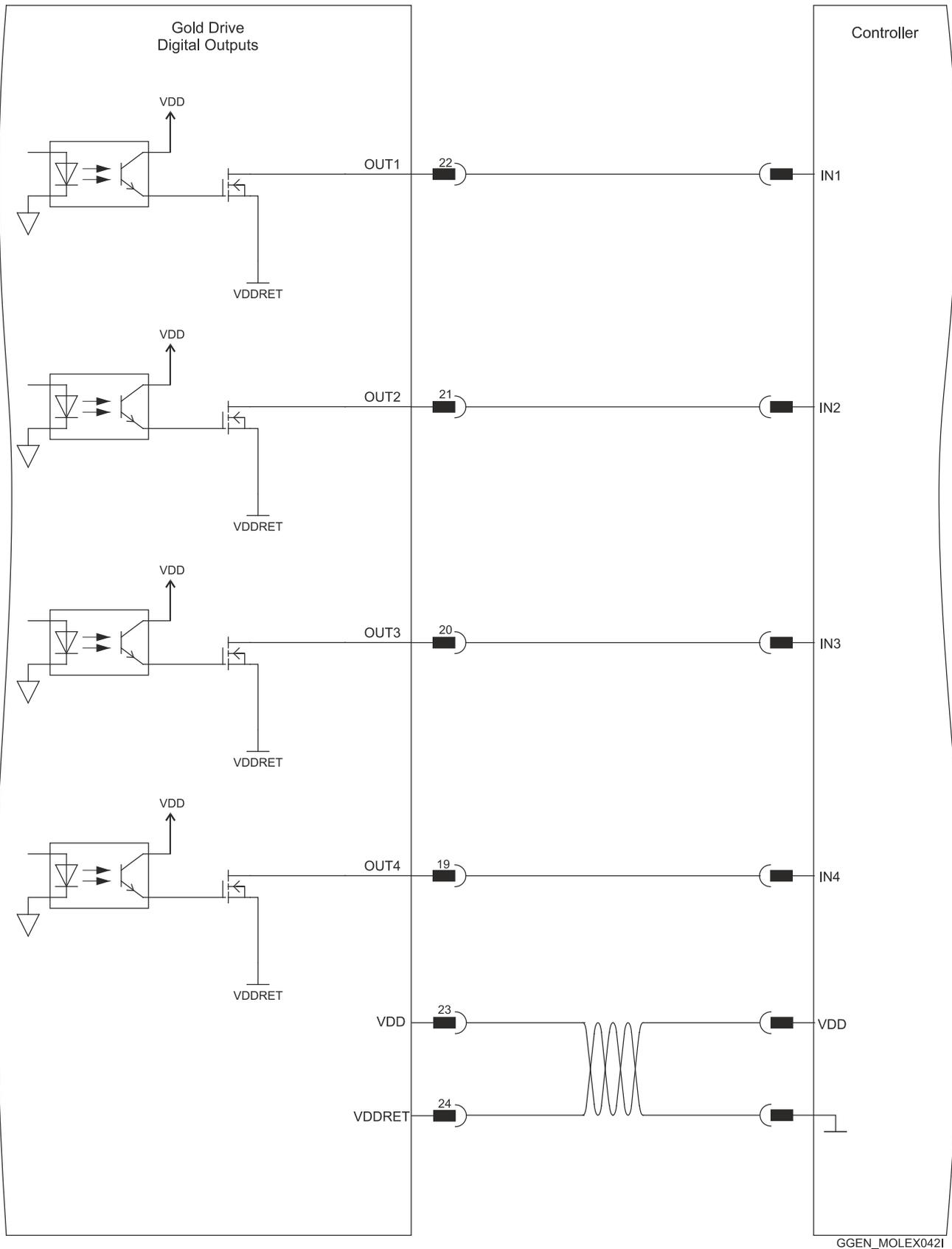


Figure 32: Digital Input Sink Mode – PLC voltage level Molex Type Connection Diagram



GGEN\_MOLEX042I

**Figure 33: Digital Output as Sink Configuration Molex Type Connection Diagram**

## 6.9. USB 2.0 Communication per Axis

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

Pin (A-2, A-1)	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

### Connectors

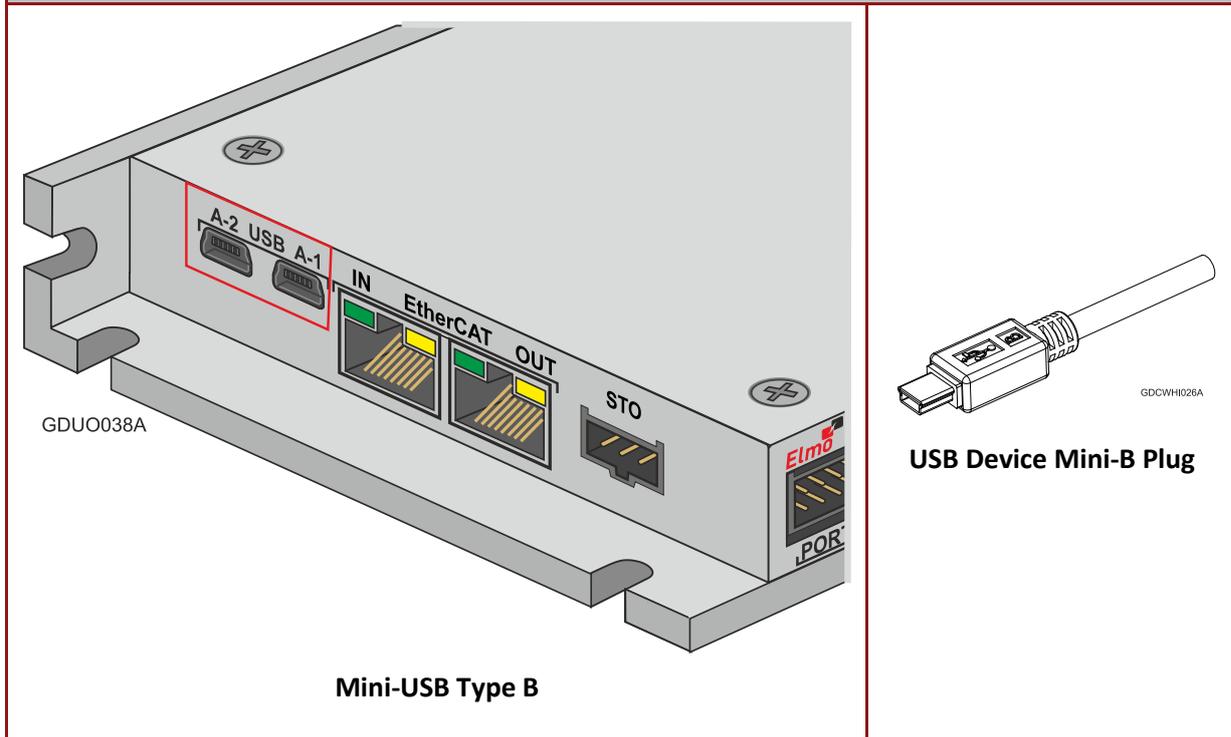


Table 11: USB 2.0 Pin Assignments

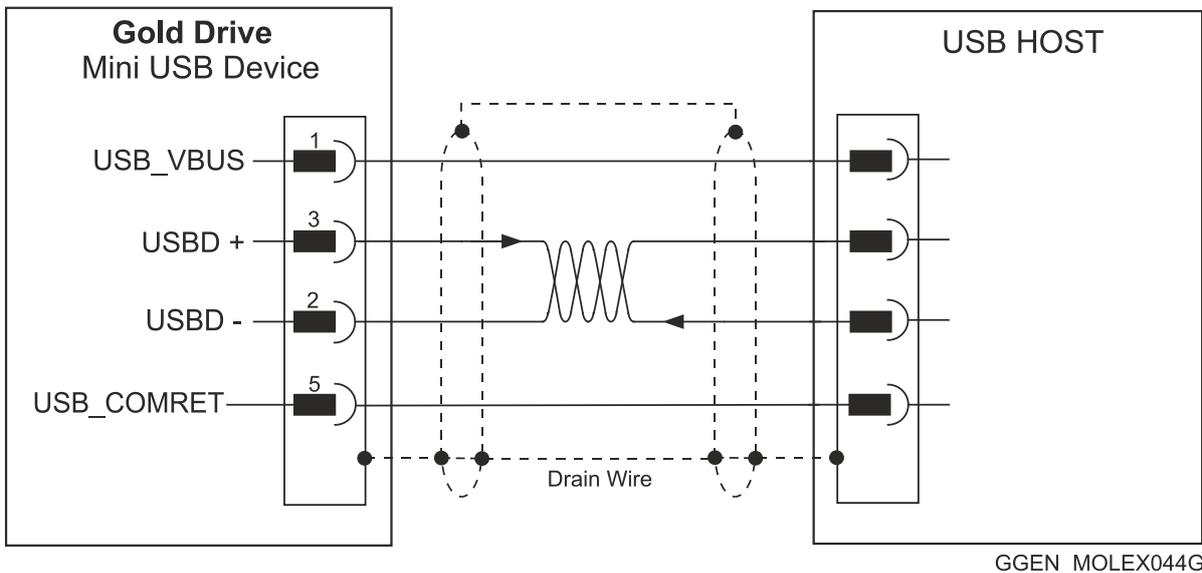


Figure 34: USB Network Diagram

## 6.10. EtherCAT Communication Version

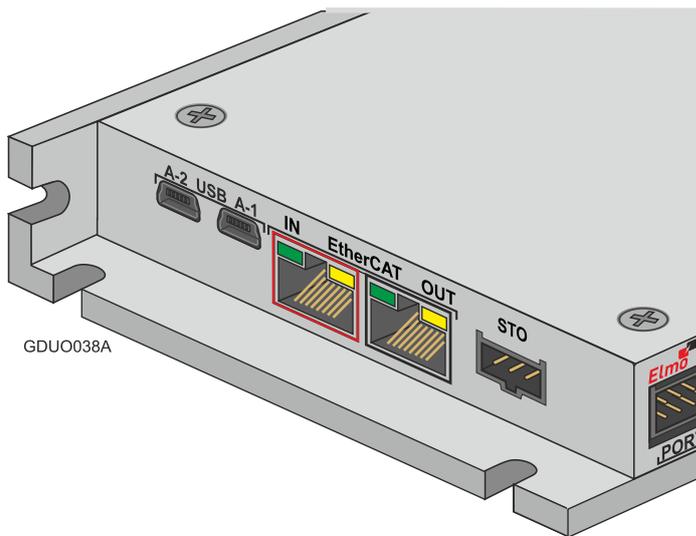
Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives.

### 6.10.1. EtherCAT IN Pin Assignments

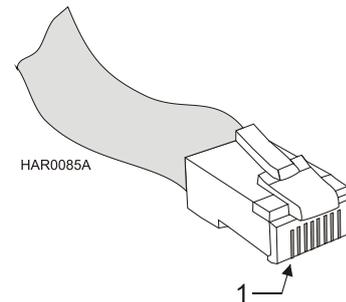
Refer to section 12.2 in the MAN-G-Panel Mounted Drives Hardware manual for more details.

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

#### Connector Location



**8-Pin RJ-45**



**Standard CAT5e Ethernet Cable**

### 6.10.2. EtherCAT OUT Pin Assignments

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	

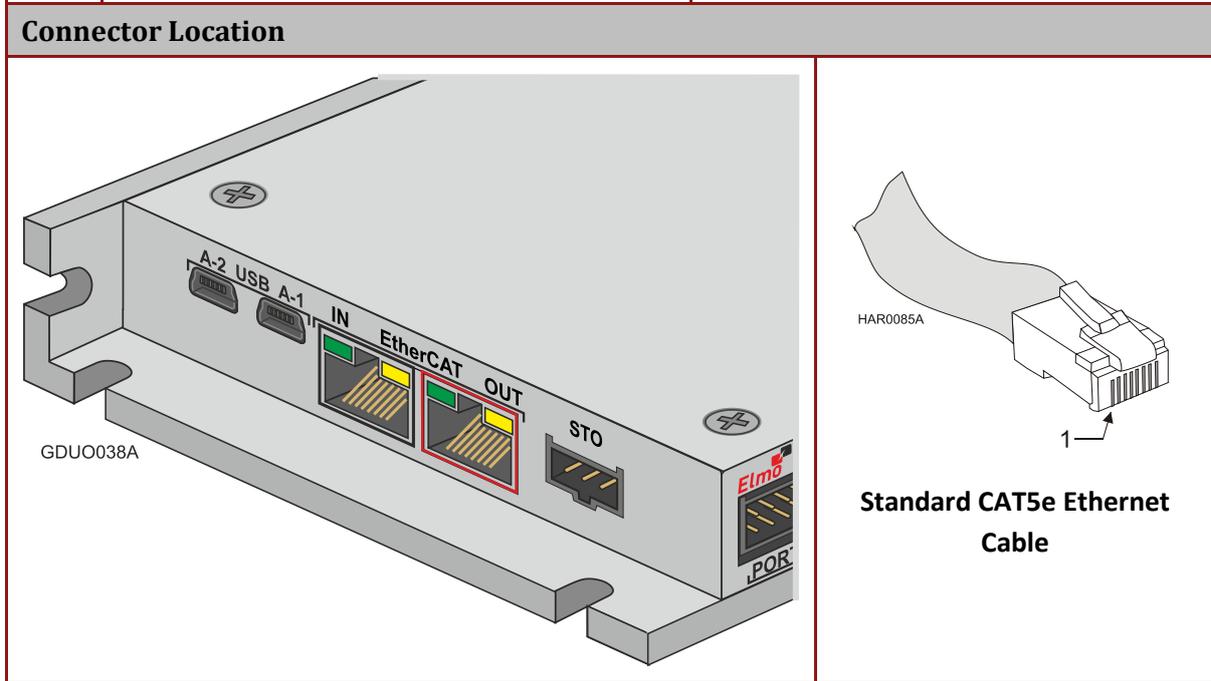


Table 12: EtherCAT Pin Assignments

### 6.10.3. EtherCAT Wiring

Figure 35 describes the wiring diagram for the EtherCAT connections.

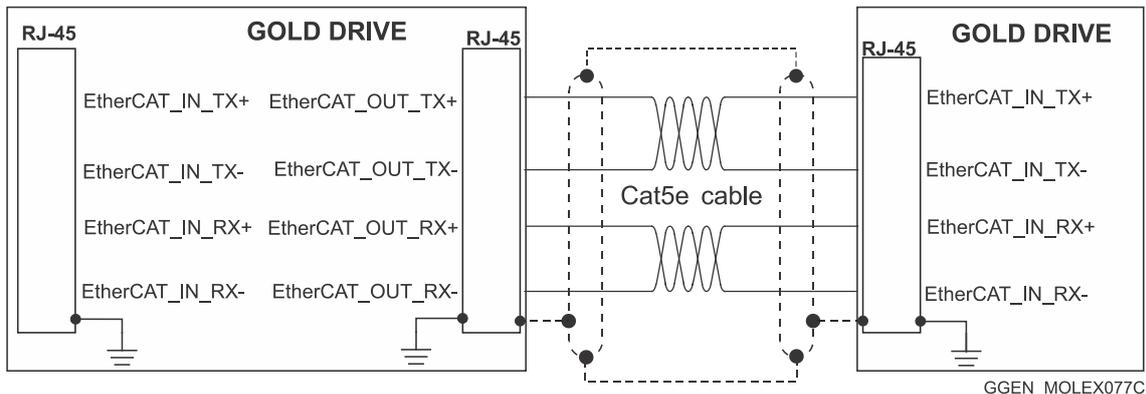
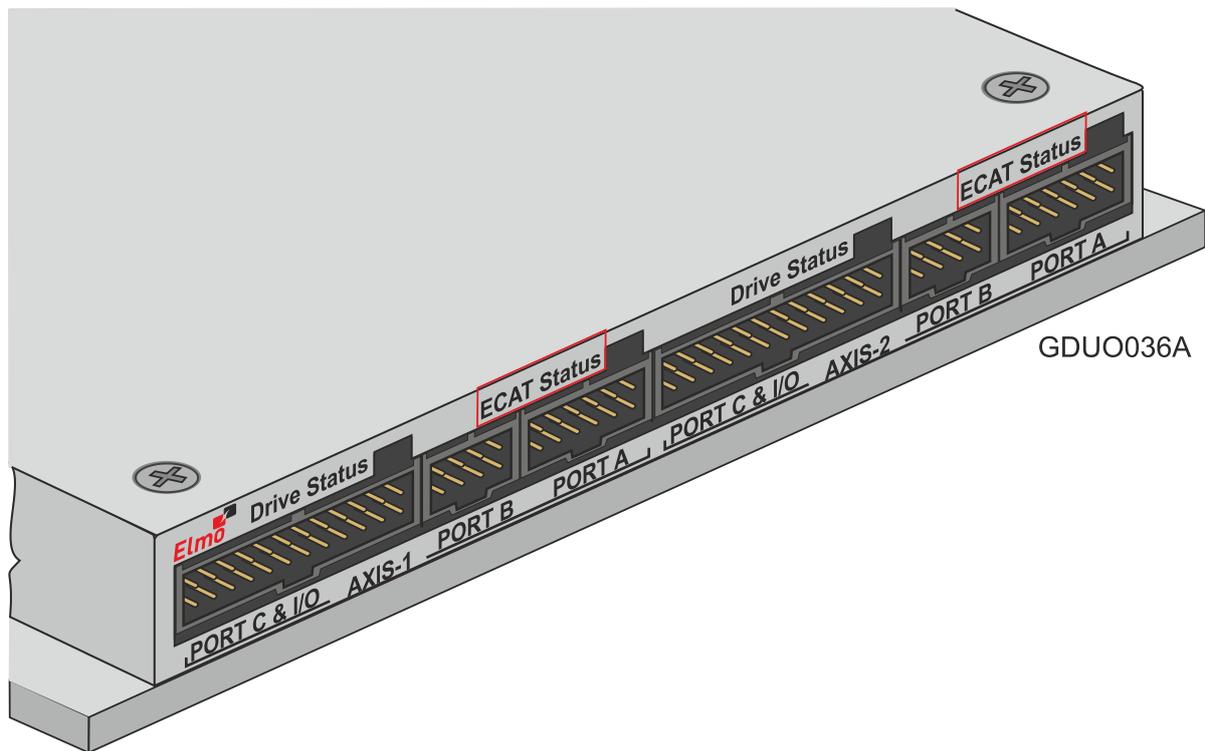


Figure 35: EtherCAT RJ-45 Connections

### 6.10.4. EtherCAT Status Indicator



**Figure 36: EtherCAT Status LED**

The EtherCAT status indicator is a single red/green dual bi-colored LED that combines the green RUN indicator and the red ERROR indicator of the EtherCAT state machine. For further details, see the EtherCAT Application Manual.



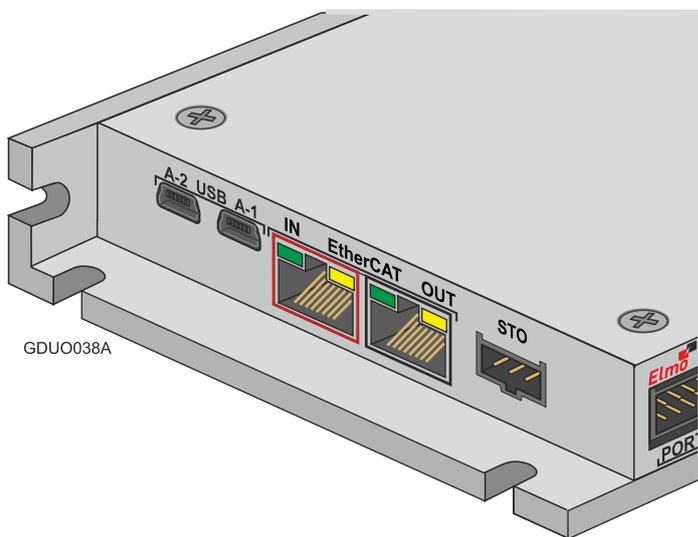
## 6.11. Ethernet Pin Assignments

Refer to section 12.3 in the MAN-G-Panel Mounted Drives Hardware manual for more details.

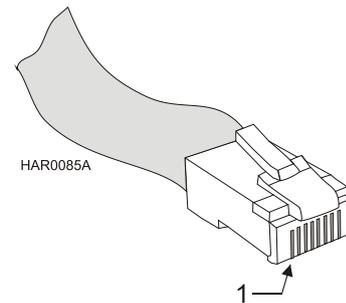
**Note:** It should be noted that only **AXIS 1** supports Ethernet Connectivity at the **ETHERCAT IN**.

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

### Connector Location



8-Pin RJ-45



Standard CAT5e Ethernet Cable



## 6.12. Powering Up

After the Gold Duo 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.

## 6.13. Initializing the System

After the Gold Duo 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: Dimensions

This chapter provides detailed technical information regarding the Gold Duo.

