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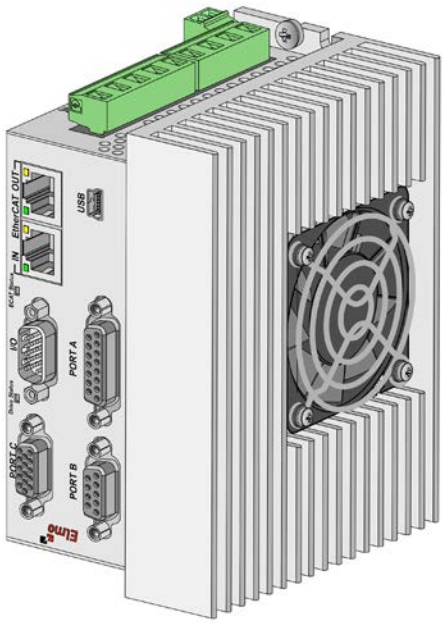
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Since 1988

Gold Oboe

Screwless Power Connectors

Digital Servo Drive Installation Guide

EtherCAT and CAN



June 2025 (Ver. 2.007)

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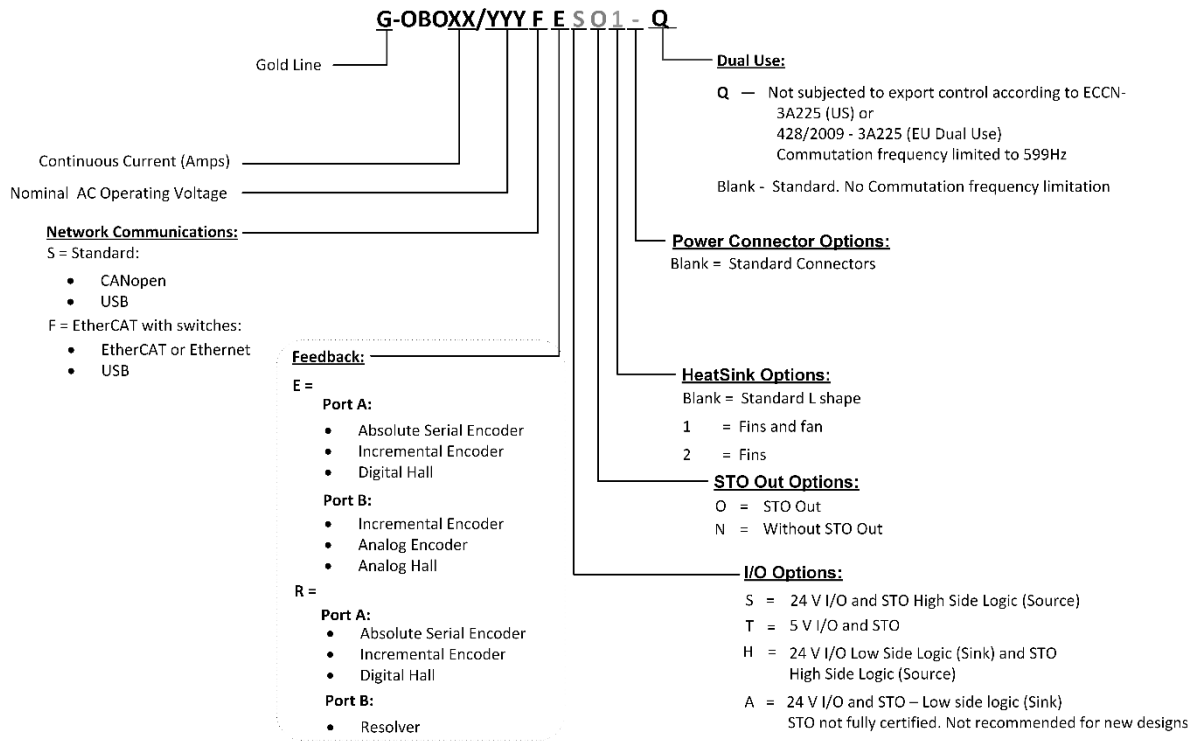
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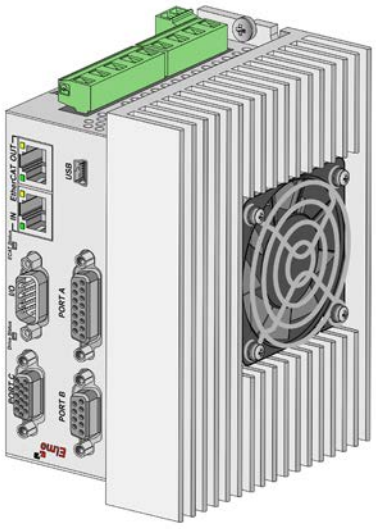
- This guide contains proprietary information belonging to Elmo Motion Control Ltd. Such information is supplied solely for the purpose of assisting users of the Gold Oboe servo drive in its installation.
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Catalog Number and Configurations



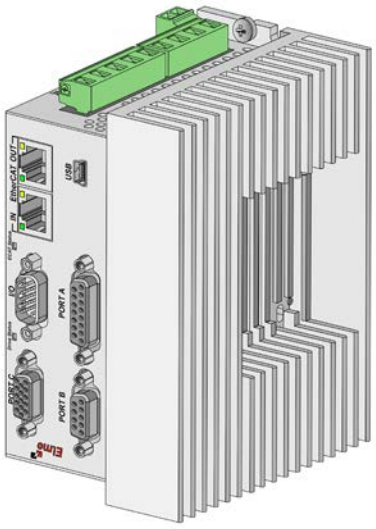
The Gold Oboe is presented in three standard heat-sink configurations:



G-OBO10/230____1

13/230, 6/480, 10/480

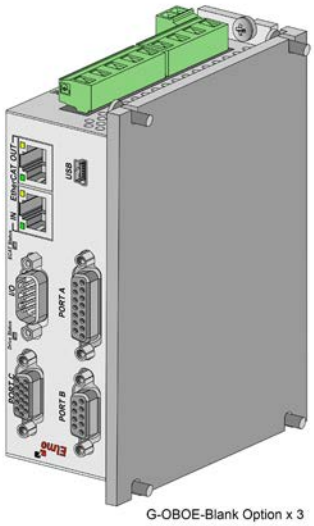
Fins and Fan



G-OBO6/230____2

3/480

Fins only



G-OBO3/230____(Blank)

L-Shaped Heat Sink

Consult Elmo for a non- standard Heat-Sink configuration.

Make sure that the configuration ordered defines your requirements.

Revision History

Version	Date	Version	Date	Updates
Ver. 1.000	Aug 2015	**Ver. 2.005**	Nov 2021	
Ver. 1.001	Oct 2015	**Ver. 2.006**	Jan 2023	
Ver. 1.002	Feb 2016	**Ver. 2.007**	Jun 2025	New P/N, Removed the Screw-Locked type, updated various drawings.
Ver. 1.003	Oct 2016			
Ver. 1.005	Aug. 2017			
Ver. 1.006	Nov 2018			
Ver. 2.000	Mar 2019			
Ver. 2.001	Jul 2019			
Ver. 2.002	Aug 2019			
Ver. 2.003	Jan 2021			
Ver. 2.004	Sept 2021			

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Chapter 1: This Installation Guide

This installation Guide details the technical data, pinouts, and power connectivity of the Gold Oboe. 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 Oboe, 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 Oboe 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 Oboe 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 Oboe 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 4 minutes before touching or disconnecting parts of the equipment that are normally loaded with electrical charges (such as capacitors or contacts). Measuring the electrical contact points with a meter, before touching the equipment, is recommended.



2.2 Cautions

- The maximum AC power supply connected to the instrument must comply with the parameters outlined in this guide.
- When connecting the Gold Oboe to an approved isolated 24V control power supply, connect it through a line that is separated from hazardous live voltages using reinforced or double insulation in accordance with approved safety standards.
- Before switching on the Gold Oboe, verify that all safety precautions have been observed and that the installation procedures in this manual have been followed.
- Make sure that the Safe Torque Off is operational.

2.3 Warranty Information

The products covered in this manual are warranted to be free of defects in material and workmanship and conform to the specifications stated either within this document or in the product catalog description. All Elmo drives are warranted for a period of 12 months from the 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 Oboe series of digital servo drives are highly resilient and designed to deliver the highest density of power and intelligence. The Gold Oboe delivers up to **5.7 kW of maximum power** in a compact package.

The Gold Oboe series are part of Elmo's advanced Gold Line. They operate from an AC 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 Oboe 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 drives are easily set up and tuned using Elmo Application Studio software tools. This Windows-based application enables users to configure the servo drive quickly and simply for optimal use with their motor. The Gold Oboe, as part of the Gold Line, is fully programmable with Elmo's motion control language.

Power to the drives is provided by an AC power source, either directly from the mains or via a transformer.

An isolated control 24 VDC power supply is required as the Gold Oboe does not operate without one. In addition, the control 24 VDC also powers the heat cooling fan. This smart fan is activated only "when required", significantly prolonging the fan's life-time. The control 24 VDC power supply also serves as a backup functionality, for preserving programs and parameters and maintaining communication when either the AC Mains supply is turned off or due to a Mains fault.

Chapter 4: Technical Information

4.1 Physical Specifications

Feature	Units	Model	Details
Weight	Kg (oz)	L-Shape	0.68 Kg (24.0 oz)
		Fins Heat-Sink	1.05 Kg (37.0 oz)
		Fins Heat-Sink + Fan	1.10 Kg (38.8 oz)
Dimensions	mm (in)	L-Shape	47.0 x 140 x 109 (1.85" x 5.52" x 4.29")
		Fins Heat-Sink	72.3 x 140 x 109 (2.82" x 5.52" x 4.29")
		Fins Heat-Sink + Fan	73.5 x 140 x 109 (2.89" x 5.52" x 4.29")
Mounting method			Panel / Wall Mounted
IP			IP30

Table 1: Physical Specifications

4.2 230V Technical Data

Feature	Units	3/230	6/230	10/230	13/230
Minimum supply voltage	VAC DC-500 Hz	1 x 50 or 3 x 50 Single Phase Input current is limited to I_{Phase_VAC} ≤ 10A (2KW- 3KW motor at 230VAC)			
Nominal supply voltage	VAC DC-500 Hz	1 x 230 N-L or 3 x 230 L-L Single Phase Input current is limited to I_{Phase_VAC} ≤ 10A (2KW- 3KW motor at 230VAC)			
Maximum supply voltage	VAC DC-500 Hz	1 x 270 N-L or 3 x 270 L-L Single Phase Input current is limited to I_{Phase_VAC} ≤ 10A (2KW- 3KW motor at 230VAC)			
Maximum continuous power output	kW	0.8	1.6	2.7	3.6
Efficiency at rated power (at nominal conditions)	%	> 98			
Control supply voltage	VDC	Without Fan: 18 to 30 VDC With Fan: 24VDC± 10%			
Control supply power	VA	Without Fan: 6 With Fan: 6 (Control) + 10 (for fan) = 16			
Continuous current limit (Ic) Amplitude sinusoidal/DC trapezoidal commutation	A	3	6	10	13
Continuous RMS sinusoidal commutation current limit (Ic)	A	2.1	4.2	7.1	9.2
Peak Current	A	6	12	20	26
Built In Shunt (peak Power)	W	3000			

Table 2: Technical Data - 230V

4.3 480V Technical Data

Feature	Units	3/480	6/480	10/480
Minimum supply voltage	VAC DC-500 Hz	3 x 140		
Nominal supply voltage	VAC DC-500 Hz	3 x 480		
Maximum supply voltage	VAC DC-500 Hz	3 x 528		
Maximum continuous power output	kW	1.7	3.5	5.7
Efficiency at rated power (at nominal conditions)	%	> 98		
Control supply voltage	VDC	Without Fan: 18 to 30 VDC With Fan: 24VDC± 10%		
Control supply power	VA	Without Fan: 6 With Fan: 6 (Control) + 10 (for fan) = 16		
Continuous current limit (Ic) Amplitude sinusoidal/DC trapezoidal commutation	A	3	6	10
Continuous RMS sinusoidal commutation current limit (Ic)	A	2.1	4.2	7.1
Peak Current	A	6	12	20
Built In Shunt (peak Power)	W	2800		

Table 3: Technical Data - 480V

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

4.4 Control Supply

Feature	Unit	Details
Control power supply		***Isolated DC source using reinforced insulation***
Input range	VDC	Without Fan: 18 to 30 With Fan: 24 ± 10%
24V Control supply input power consumption with encoder up to 200mA@5V	W	Without Fan: 6 With Fan: 16

Table 4: Control Supply

4.5 Product Features

Main Feature	Details	Presence and No.
STO	TTL *or*	**√**
	PLC Source *or*	**√**
	PLC Sink (is not fully certified, and not recommended for new designs)	**√**
Digital Input Option	TTL *or*	6 (5 with STO output model)
	PLC Source *or*	6 (5 with STO output model)
	PLC Sink	6 (5 with STO output model)
Digital Output Option	TTL *or*	4 (3 with STO output model)
	PLC Source *or*	4 (3 with STO output model)
	PLC Sink	4 (3 with STO output model)
Analog Input	Differential Voltage Input ±10VDC	1
Feedback	Standard Port A, B, & C	**√**
Communication Option	USB	**√**
	EtherCAT with switches *or*	**√**
	CAN	**√**
Other	STO Output Status	Available for STO option O

Table 5: Product Features

4.6 Environmental Conditions

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





Warning: During operation the Gold Oboe becomes too hot to touch (the heatsink and wires may heat up). Care should be taken when handling it.



Caution:
The Gold Oboe dissipates its heat by convection or by conduction. The maximum ambient operating temperature of 40°C (104°F) must not be exceeded.

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

Table 6: Environmental Conditions

Chapter 5: Standards and Certifications

5.1 Functional Safety

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

Table 7: Functional Safety

5.2 Electrical Safety

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

Table 8: Electrical Safety

5.3 Electromagnetic Compatibility

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

Table 9: Electromagnetic Compatibility

5.4 Environmental

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

Table 10: Environment

5.5 Other Compliant Standards

For other compliant standards refer to the
MAN-G-Board Level Modules Hardware Manual section 17.7 or refer to the Elmo website:

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

5.6 CE Declaration

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

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

5.7 Dual Use

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

The operating frequency of the Gold Line products is “factory limited” to ≤ 599 Hz, and therefore complies with the EU Dual Use Regulation 428/2009, 3A225, and the US Dual Use regulation EAR ECCN# 3A225.

This statement applies to all identical specimens and will become invalid if a change is made in the firmware.

Chapter 6: Installation

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

6.1 Hardware Requirements

6.1.1 Recommended Electrical Safety Appliances

Circuit Breaker	Units	3/230	6/230	10/230	13/230	3/480	6/480	10/480
Rated Current for Single phase	A AC	6	10	13	16			
Rated Current for Three phase	A AC	3	6	10	13	3	6	10
Rated Operational Voltage (Frequency)	V AC	230 (50/60 Hz)				480 (50/60 Hz)		
Curve Code	-	B						

Table 11: Recommended Electrical Safety Appliances

The contactor (Commutation Appliance) must be selected according to the Rated Current and Rated Operational Voltage of the selected circuit breaker (Electrical Safety Appliance).

6.1.2 Recommended Wire Cross-Sections

Feature	Connection	Details	
		Minimum Wire Gauge	**Maximum Terminal Capability**
AC input	AC1, AC2, AC3	16 AWG (1.5 mm^2)	12 AWG (2.5 mm^2)
Earth Connection	PE	16 AWG (1.5 mm^2)	12 AWG (2.5 mm^2)

Table 12: Recommended Wire Cross-Sections

Note: The actual size is determined by the specific drive's current consumption and wire length.

6.2 Unpacking the Drive Components

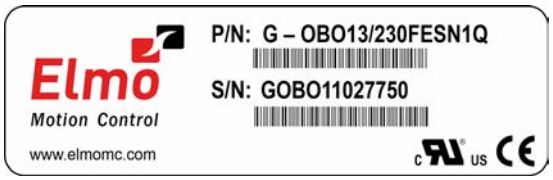
Before you begin working with the Gold Oboe, verify that you have all of its components, as follows:

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

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

To unpack the Gold Oboe:

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

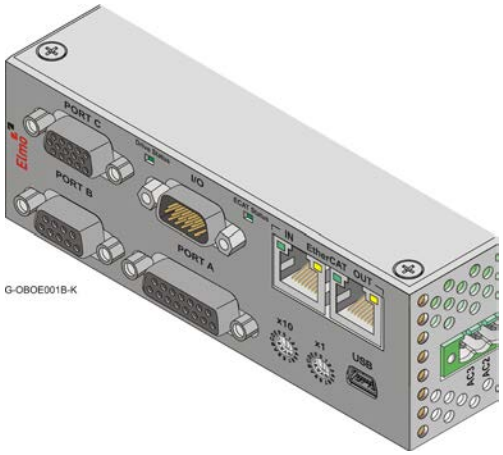
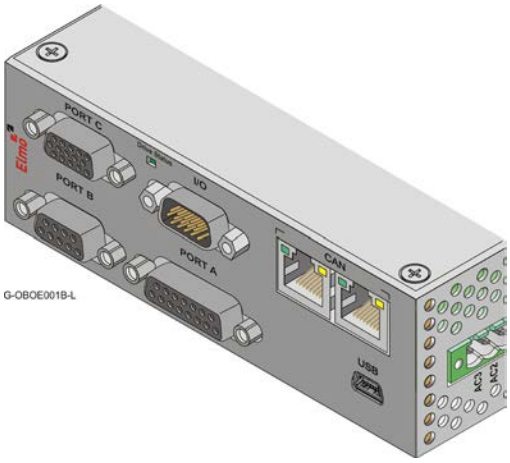


4. Verify that the Gold Oboe type is the one that you ordered and ensure that the voltage meets your specific requirements.

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

6.3 Connector Types

The Gold Oboe has the following connectors:

Type	Pins	Function		Port
Control Connectors				
 **Control Connectors – EtherCAT**		 **Control Connectors – CAN**		
RJ-45	8	Ethernet/EtherCAT IN communication		
RJ-45	8	EtherCAT OUT communication		
RJ-45	8	CAN communication		
RJ-45	8	CAN communication		
USB	4	USB communication		USB port
Socket D-Type	15	Feedback		Port A
15-Pin High Density D-Type Male	15	Digital Input/Digital Output		I/O
Socket D-Type	9	Feedback		Port B
Socket High Density D-Type	15	Feedback Output, Analog Input		Port C
		1	Safe Torque Off Signal Input 1	STO1
		1	Safe Torque Off Signal Input 2	STO2
		2	STO Signal Return	STORET

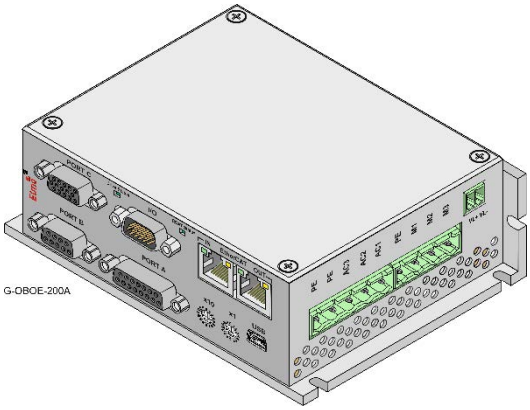
Type	Pins	Function	Port
Power Side Connectors			
			
7.62 mm pitch	2	Protective Earth	PE
	1	Mains AC Input Phase 3	AC3
	1	Mains AC Input Phase 2	AC2
	1	Mains AC Input Phase 1	AC1
7.62 mm pitch	1	Protective Earth	PE
	1	Motor power output 1	M1
	1	Motor power output 2	M2
	1	Motor power output 3	M3
3.81 mm pitch	1	+24 V Control Supply Input Positive	VL+
	1	24 V RET Control Supply Input Return	VL-

Table 13: Connector Types

6.4 Mating Connector Types

Mating Pin Connector	Function	Manufacturing P/N (Phoenix Contact)
2 Pin	Control power supply	MC 1,5/2-ST-3,81 (1736638)
5 Pin	AC Input Power	GMSTB 2,5 HCV/ 5-ST-7,62 (1714304)
4 Pin	Motor Connection	GMSTB 2,5 HCV/ 4-ST-7,62 (1714294)

Table 14: Mating Connector Types

6.5 Mounting the Gold Oboe

For optimum heat dissipation, the Gold Oboe should be installed with the heat sink's flat-side attached to the machine's chassis. It is recommended to mount the Gold Oboe in the vertical position.

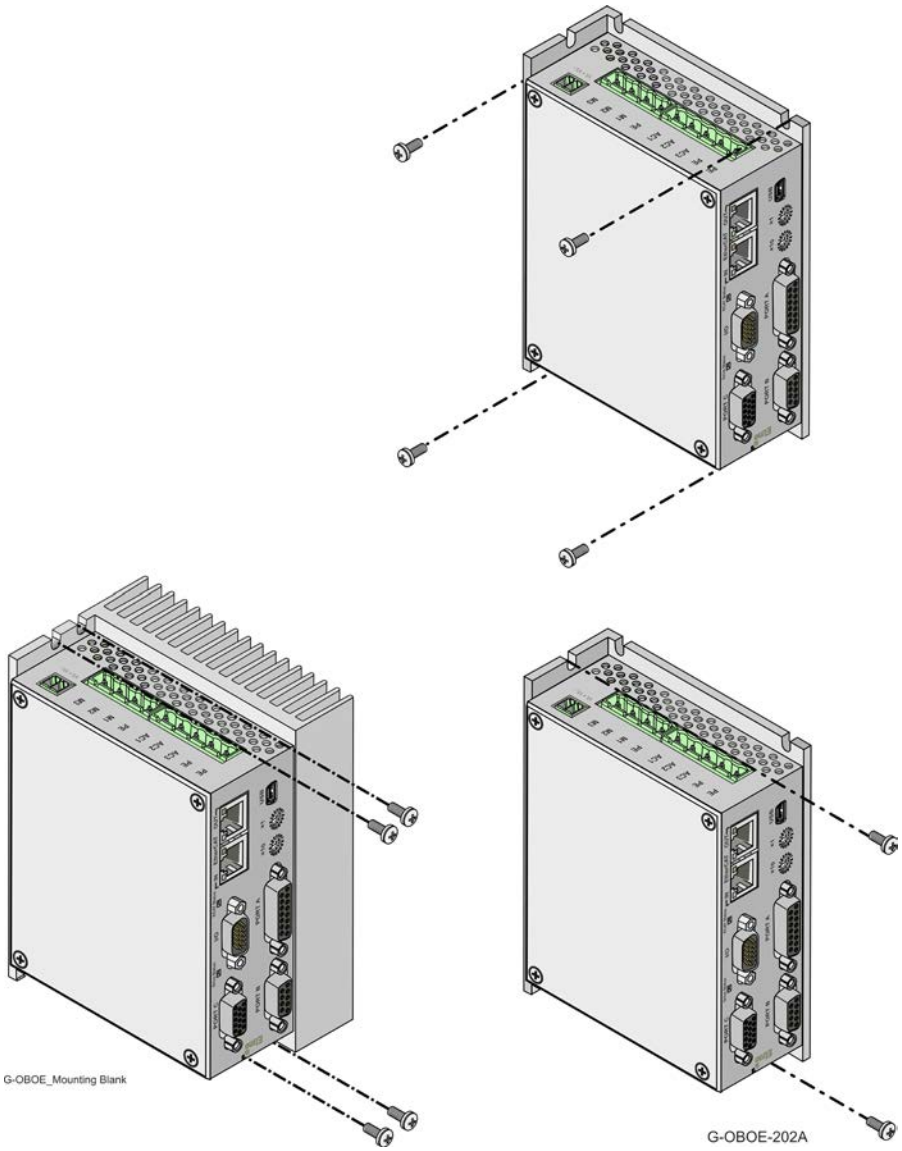


Figure 1: Mounting Options for the Gold Oboe

Use M4 round head screws, one through each opening in the heat sink, to mount the Gold Oboe (see Figure 1).

For the model with the fins heatsink, although four screws are shown, it is sufficient to mount the Gold Oboe with two screws, one at the top and the other at the lower side.

However, if the flat heatsink is used, all four screws should be used to secure the servo drive to the chassis surface.

Note: Whichever mounting method is preferred, make sure to leave 2.54 cm (1 ") from the product's surroundings in any direction for uninterrupted heat dissipation.

6.6 Connection Diagrams

The Gold Oboe Screwless Power Connector models have 2 options: EtherCAT and CAN.

6.6.1 EtherCAT Version

The following describes the connection diagrams for the EtherCAT version.

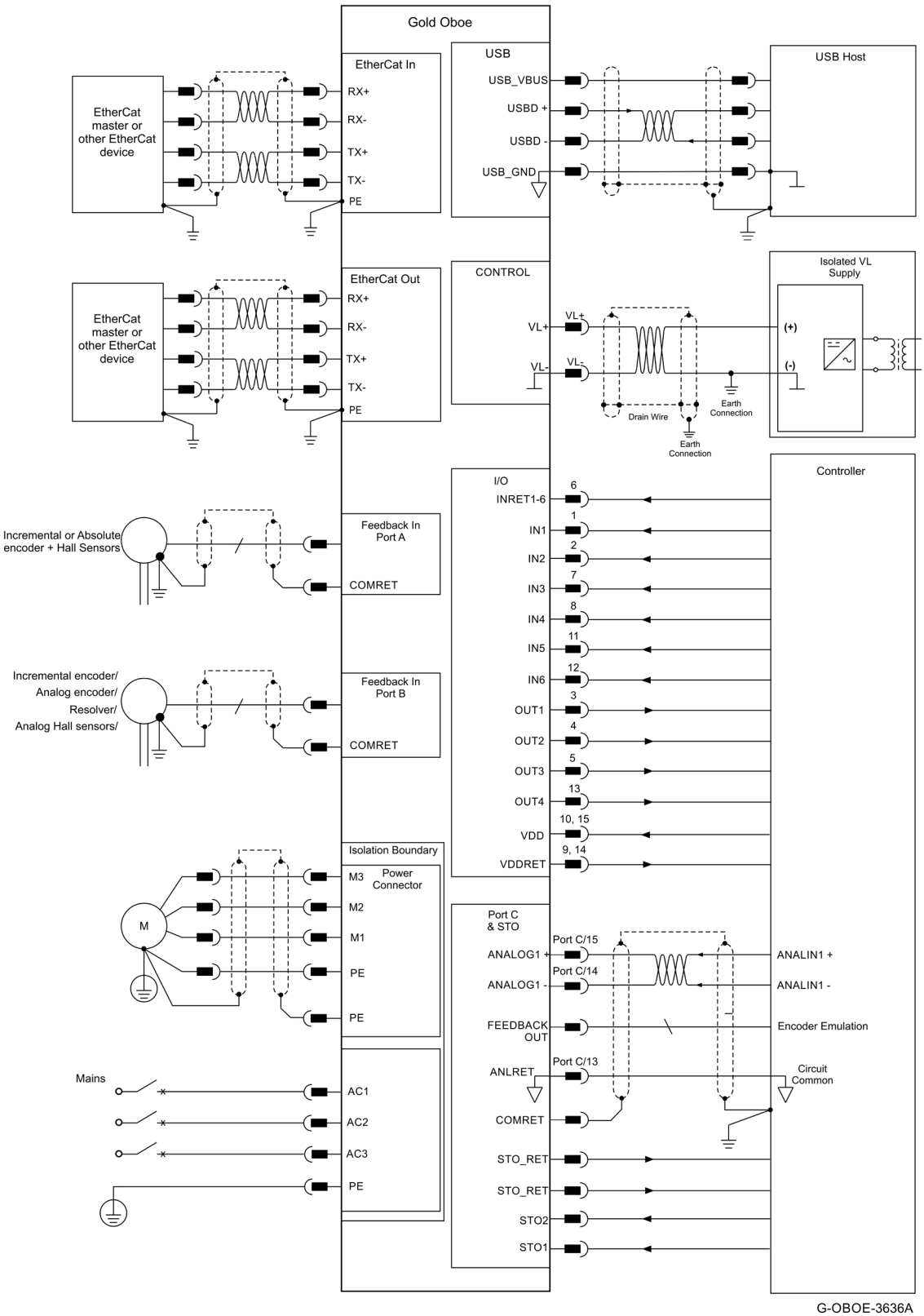


Figure 2: Gold Oboe Connection Diagram for EtherCAT

6.6.2 CAN Version

The following describes the connection diagrams for the CAN version.

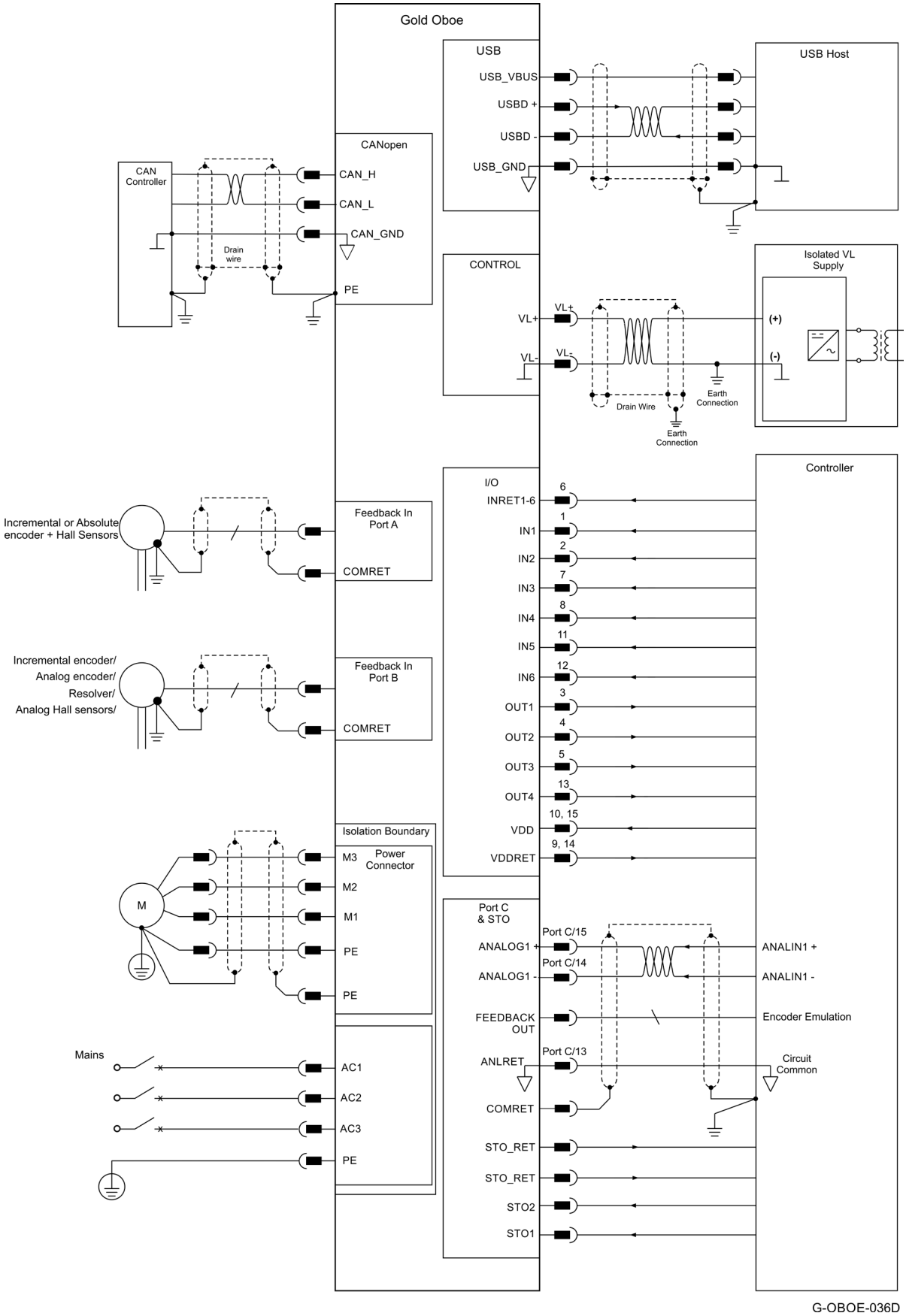
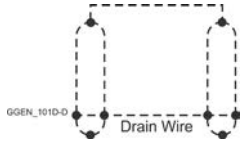
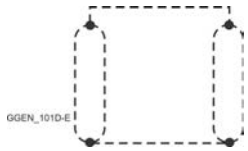
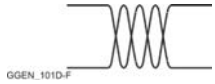
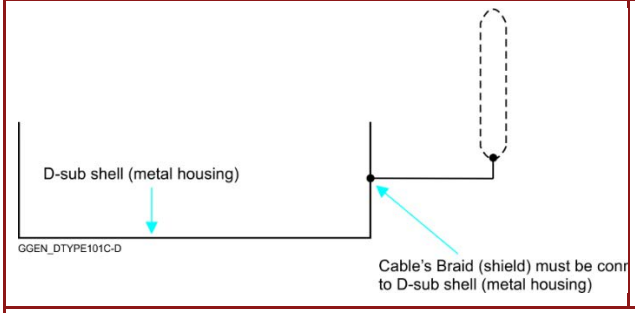
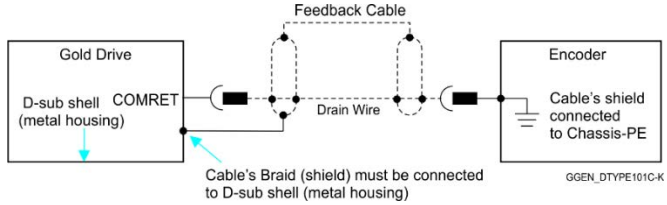


Figure 3: Gold Oboe Connection Diagram for CAN

Chapter 7: 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
	Earth connection (PE)
	Protective Earth Connection
	Common at the Controller
	Shielded cable with drain wire. The drain wire is a non-insulated wire that is in direct contact with the braid (shielding). Shielded cable with drain wire significantly simplifies the wiring and earthing.
	Shielded cable braid only, without drain wire.
	Twisted-pair wires
	D-type Connector: The cable`s braid (Shield) must be connected to the D-sub shell (metal housing)
	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.

7.1 Basic Recommendations

7.1.1 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.

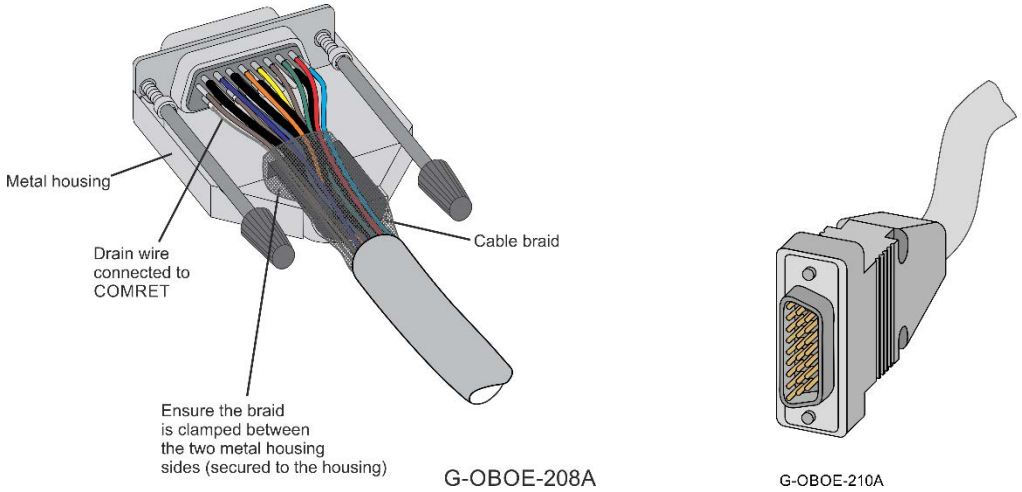


Figure 4: D-Type Cable Assemblies

5. Use only a D-Sub connector with a **metal housing** (Figure 4).
6. Make sure the braid shield is in tight contact with the metal housing of the D-type connector (Figure 4).

7.1.2 Feedback Cable Port A and Port B Connector

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

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

   a. At the drive, connect the feedback drain wire to one of the COMRET terminals in the D-Type feedback connector (Figure 5).

   b. At the motor, connect the feedback cable drain wire to the GND motor chassis terminal of the feedback connector.

   The drawings below display two earth connections.

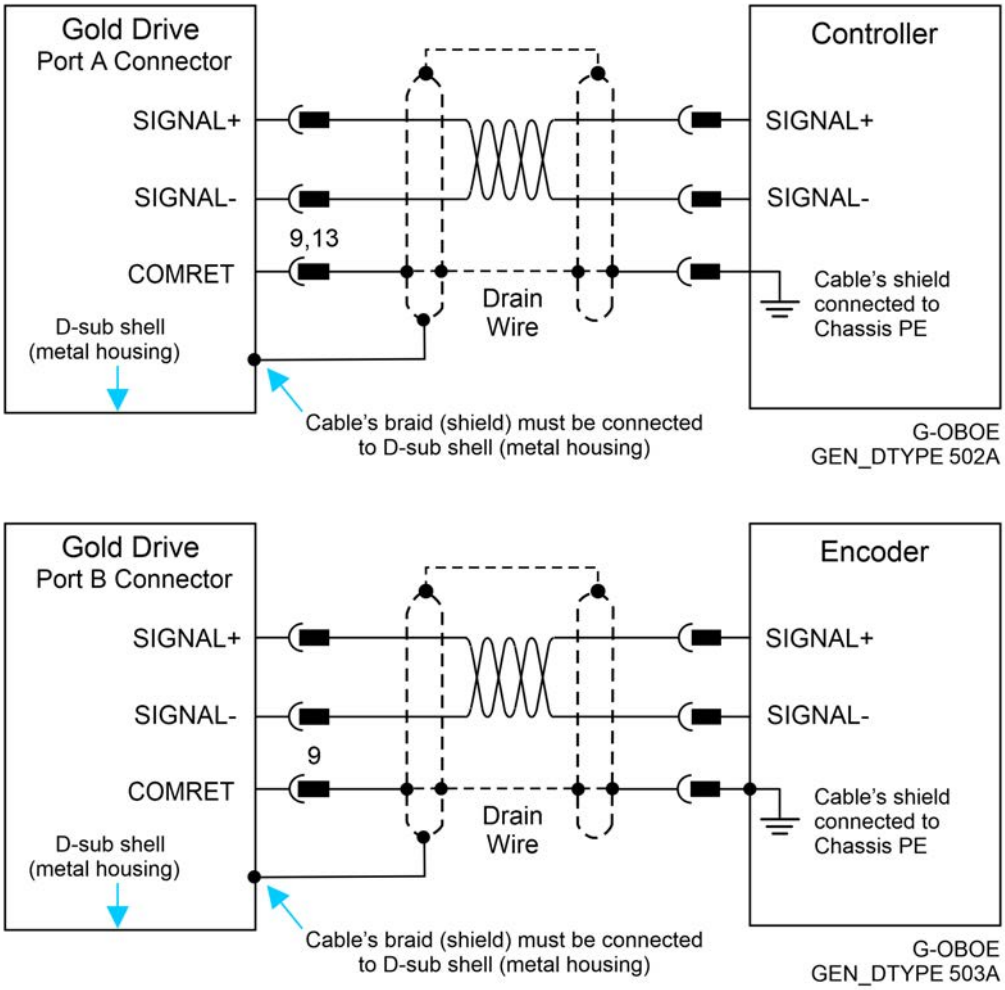


Figure 5: Feedback Port A and B Cable Assemblies

7.1.3 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 mandatory.

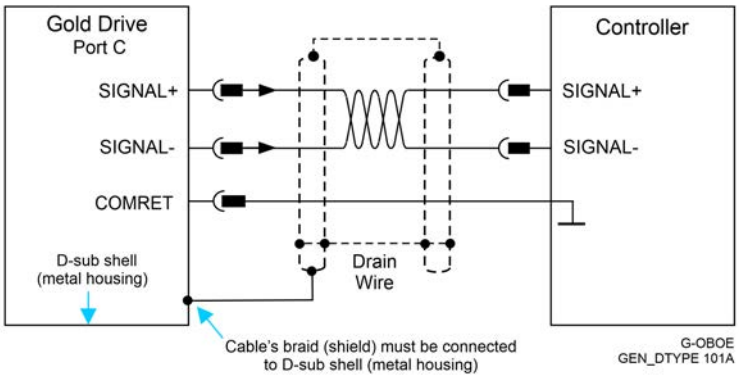


Figure 6: Feedback Port C Cable Assemblies

7.1.4 IO Cable Connector

It is recommended to use a shielded cable but it is not mandatory.

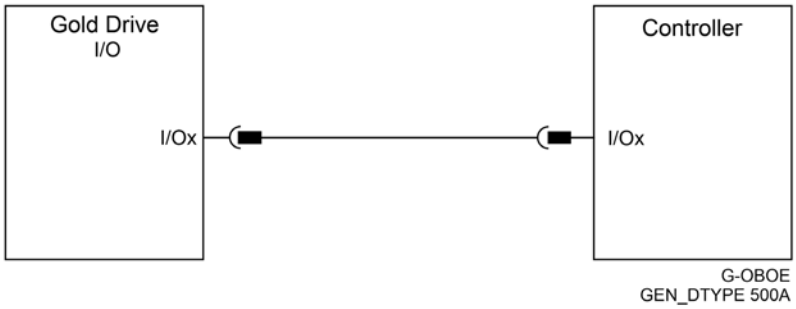


Figure 7: Feedback IO Cable Assemblies

7.1.5 STO Cable Connector

It is recommended to use a shielded cable but it is not mandatory.

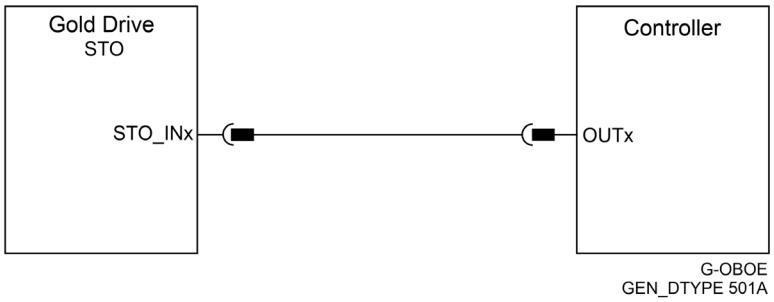


Figure 8: STO Cable Assemblies

7.2 Motor Power Connector Pinouts

See Chapter 8 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/.

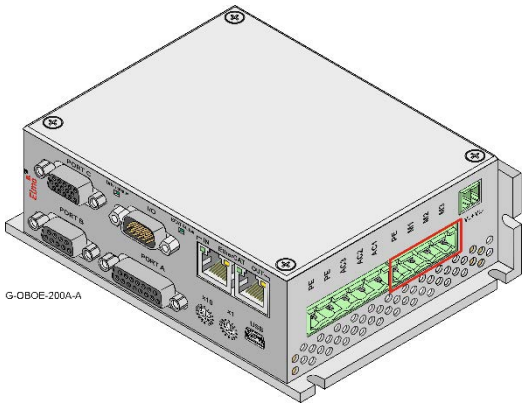
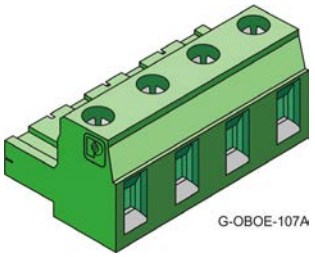
Pin	Function	Cable	
		Brushless Motor	**Brushed DC Motor**
M1	Motor phase M1	Motor	N/C
M2	Motor phase M2	Motor	Motor
M3	Motor phase M3	Motor	Motor
PE	Protective Earth Motor Chassis	Motor Chassis	Motor Chassis
	Protective Earth Motor Chassis	Braid Wire (Recommended but not mandatory)	Braid Wire (Recommended but not mandatory)
Pin Positions			
			 **4-Pin Pluggable 7.62 mm Phoenix Flange Connector**

Table 15: Motor Connector

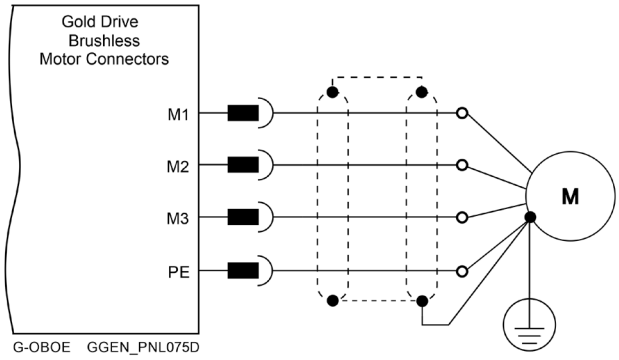


Figure 9: Brushless Motor Power Connection Diagram

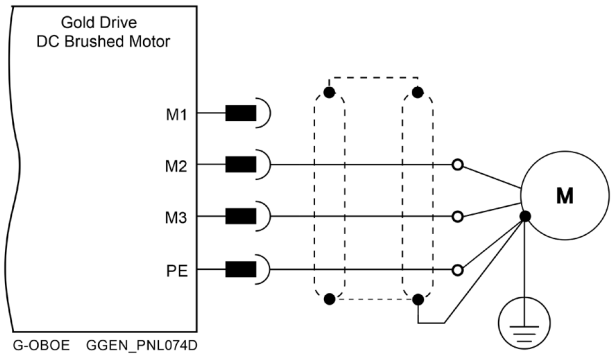


Figure 10: DC Brushed Motor Power Connection Diagram

7.2.1 Motor Power

To power the drive, connect the motor to the drive, and connect the M1, M2, M3, and PE pins on the Gold Oboe. The phase connection is arbitrary as Elmo Application Studio (EASII) will establish the proper commutation automatically during setup. When tuning a number of drives, you can copy the setup file to the other drives and thus avoid tuning each drive separately. In this case the motor-phase order must be the same as on the first drive.

- For best immunity, it is highly recommended to use a 4-wire shielded (not twisted) cable for the motor connection. The gauge is determined by the actual current consumption of the motor.
- Connect the cable shield to the closest ground connection at the motor end.
- For better EMI performance, the shield should be connected to Protective Earth (PE terminal). Connect the Braid wire to the PE terminal on the drive connector.
- Ensure that the motor chassis is properly grounded to PE.

7.3 Main Power

The Gold Oboe receives AC power directly from the mains.

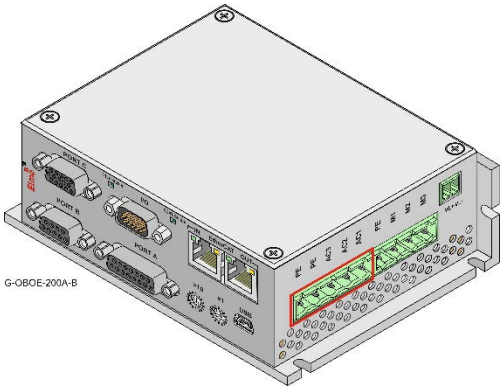
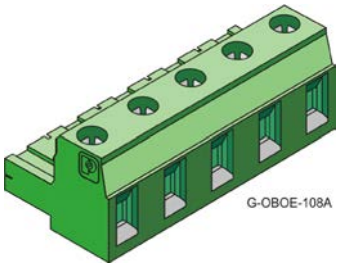
Pin	Function	Cable
PE	Protective Earth	AC Power
PE	Protective Earth	AC Power
AC3	Mains AC input Phase 3	AC Power
AC2	Mains AC input Phase 2	AC Power
AC1	Mains AC input Phase 1	AC Power
Pin Positions		
		 **5-Pin Pluggable 7.62 mm Phoenix Flange Connector**

Table 16: Main Power Connector

The AC power for the Gold Oboe can be delivered from either directly from the mains or from a single or three-phase isolated transformer. The following sections contain topology recommendations for implementing three-phase and a single-phase supply chains.

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

This isolation allows the Gold Oboe to operate with a non-isolated source (a direct-to-mains connection) which eliminates the need for a bulky and expensive isolation transformer.

As well as operating from a non-isolated/direct-to-mains AC supply, the Gold Oboe can also operate from an isolated transformer.



Warning:
The AC voltage level must be limited up to 270 VAC L-L in the 230 VAC version, and up to 528 VAC L-L in the 480 VAC version, so as not to exceed the maximum allowed supply voltage to the drive.

7.3.1 Direct-to-Mains Power Source (Non-Isolated)

This section relates to the configuration of the drive, which is 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 AC input cable.
2. A 4-wire shielded cable should be used:
   a. Connect the 3-phase leads of the main input cable to the AC1, AC2 and AC3 terminals of the main input connector.
   b. For safety requirements, the green/yellow-wire must be connected to the protective earth (PE terminal). Connect the Protective Earth wire to the PE terminal on the main AC connector.
   c. For better EMI performance, the shield should be connected to Protective Earth (PE).
3. The gauge of the cable strands is determined by the actual current of the drive.

Caution For all the following Topologies:

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.

7.3.1.1 Three-Phase Direct-to-Mains Connection Topology

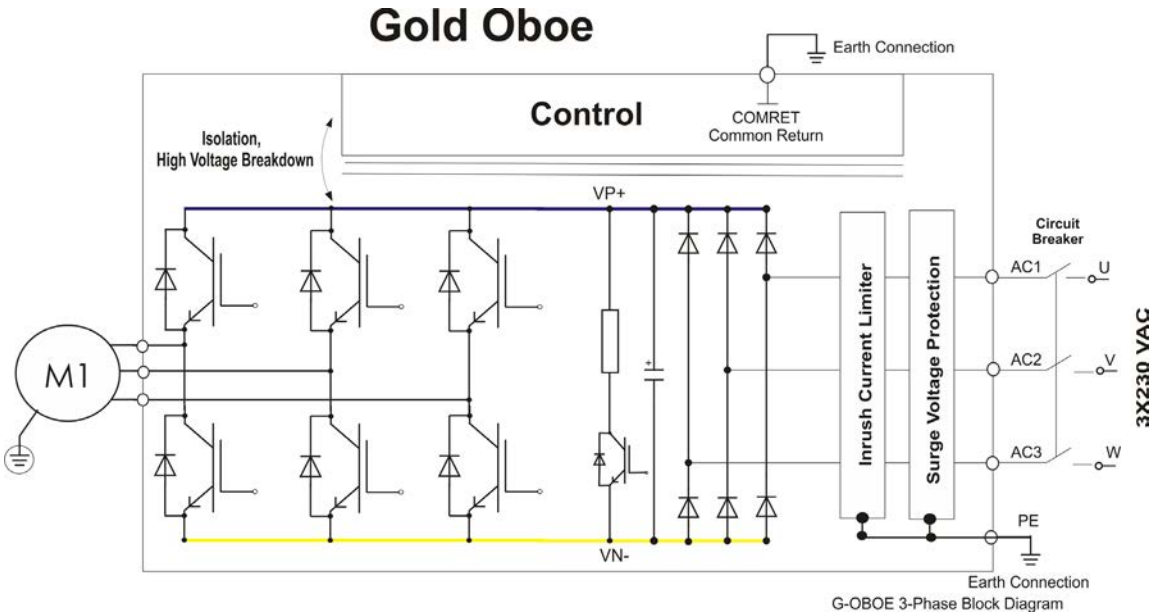


Figure 11: Non-Isolated Three-Phase Source - Connection Topology

7.3.1.2 Single-Phase Direct-to-Mains Connection Topology

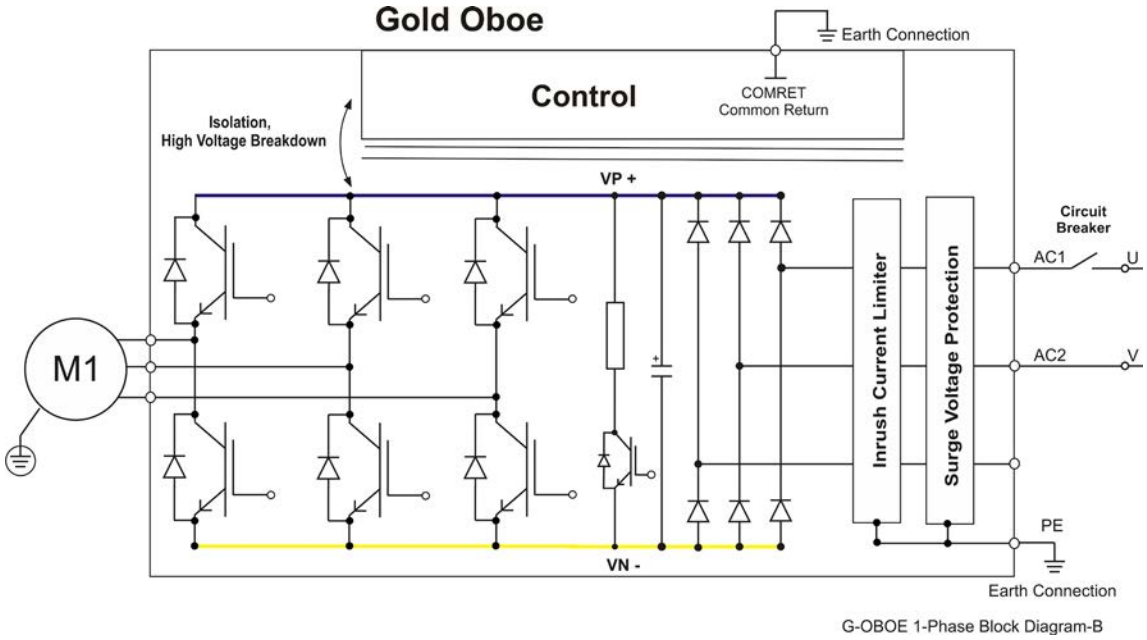


Figure 12: Non-Isolated Single-Phase Source - Connection Topology

7.3.2 Shunt Regulator

A shunt regulator is included in the Gold Oboe. The shunt regulator is a switching type, wherein the dissipative element (power resistor) is switched across the DC bus, whenever the voltage reaches a predetermined level. The function of the shunt regulator is to regulate the voltage of the DC bus during the period of motor deceleration, when there is a net energy outflow from the motor to the servo drive, to prevent the servo drive from disabling itself as a result of an “over-voltage” type reason.

When the capacitors charge-up reaches the predetermined shunt threshold level, the shunt regulator begins its regulating action. The bus is regulated to 385 VDC (for 230VAC models), or 750 VDC (for 480VAC models) until the regeneration-energy is dissipated.

7.3.3 Shunt Protection

The shunt system of the Gold Oboe includes a duty cycle limiter, which inhibits shunt whenever the shunt ON time exceeds 2% of the complete motion profile time. This feature protects the shunt regulator when high-inertia loads are driven by the servo drive(s) or when too high AC voltage is applied to the power supply (i.e. DC output is already above the threshold of the shunt).

7.4 Control Power

The Gold Oboe always requires an external 24 VDC power supply, regardless of whether or not backup functionality is required.

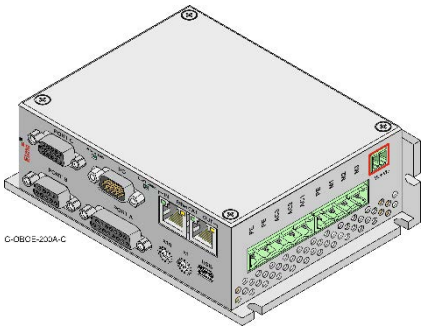
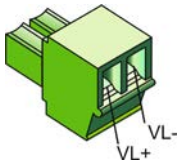
Pin#	Function	Cable
VL+	+24 V Control Supply Input Positive	Control Power
VL-	24 V RET Control Supply Input Return	Control Power
Pin Positions		
		 **2-Pin Pluggable 3.81 mm Phoenix Flange Connector**

Table 17: Control 24 VDC Power Supply Pins and Polarity

Connect the control 24 VDC power supply as described below.

To connect the 24 VDC power supply:

1. Use a 24 AWG twisted pair shielded cable. The shield should have copper braid.
2. The source of the 24 VDC power supply must be isolated from the mains.
3. For safety and EMI reasons, connect the return of the 24 VDC power supply to the closest ground (PE) in the power supply side.
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.

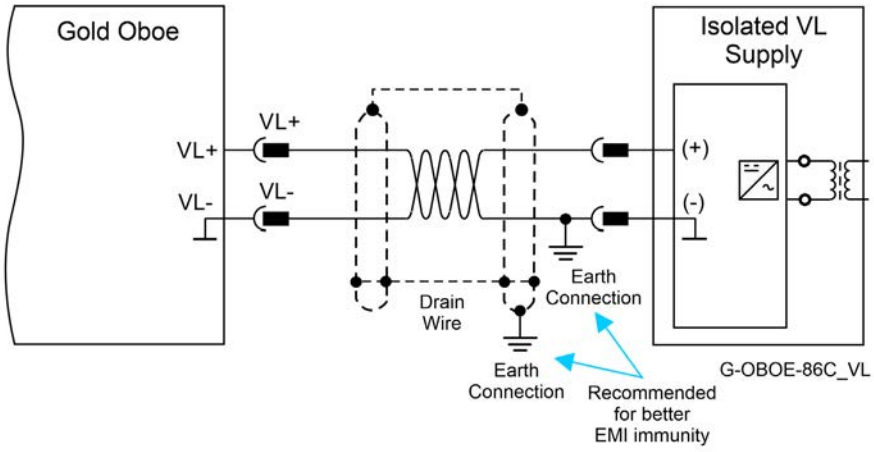
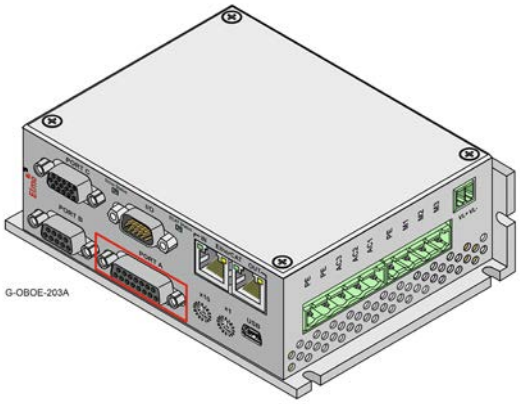


Figure 13: Control 24 VDC Power Supply Connection Diagram

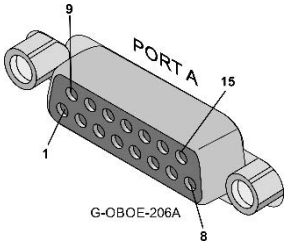
7.5 Port A

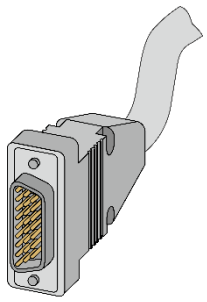
See Section 10.3 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/.

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



15-Socket D-Type Connector





15-Pin D-Type Male Connector

Table 18: Port A Pin Assignments

7.5.1 Incremental Encoder

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

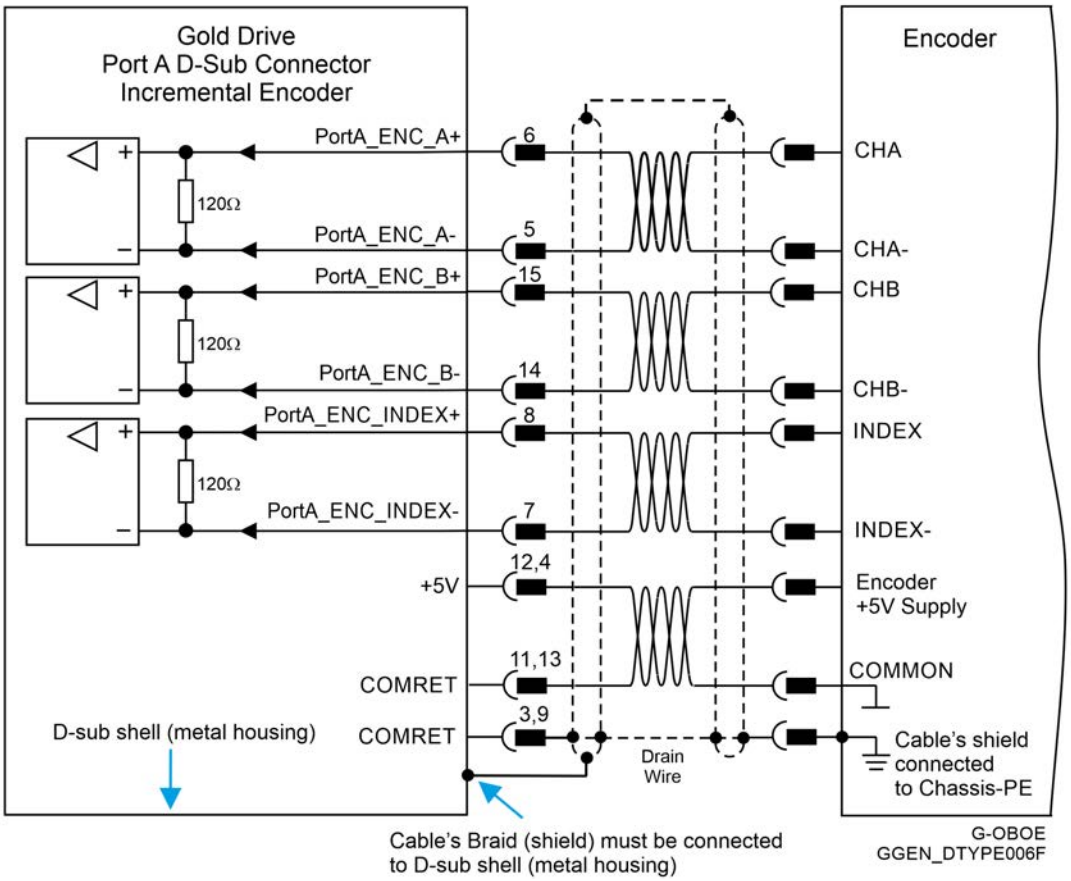


Figure 14: Port A D-Type Incremental Encoder Input – Recommended Connection Diagram

7.5.2 Hall Sensor

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

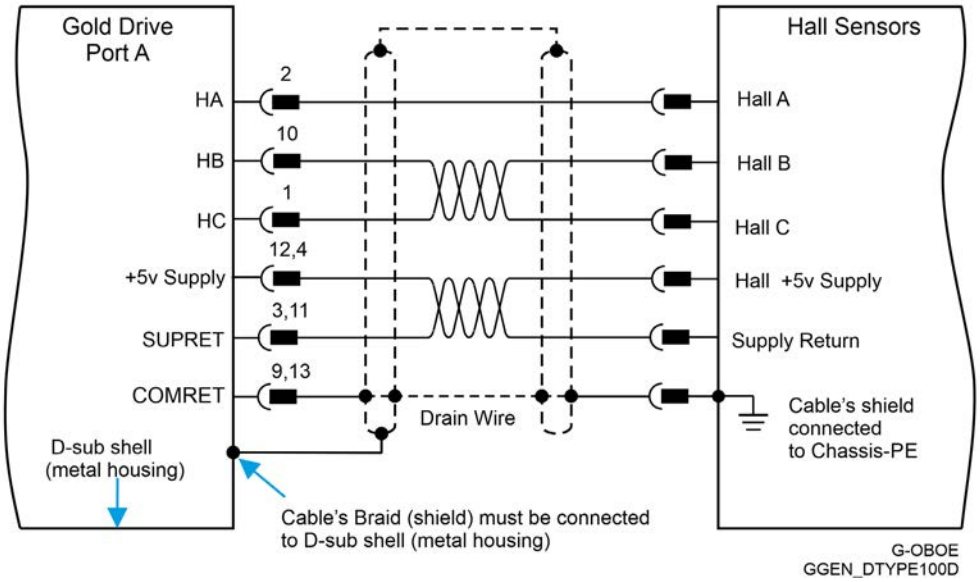


Figure 15: Hall Sensor Connection Diagram

7.5.3 Absolute Serial Type Encoder

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

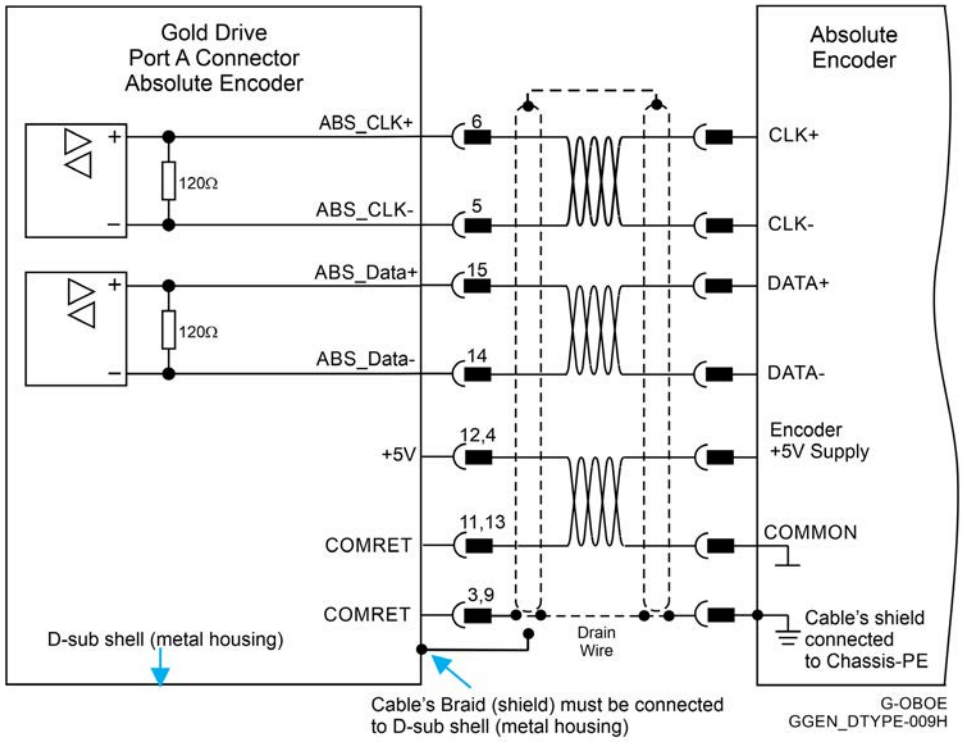


Figure 16: Absolute Serial Encoder – Recommended D-Type Connection Diagram for EnDAT, Biss, and SSI

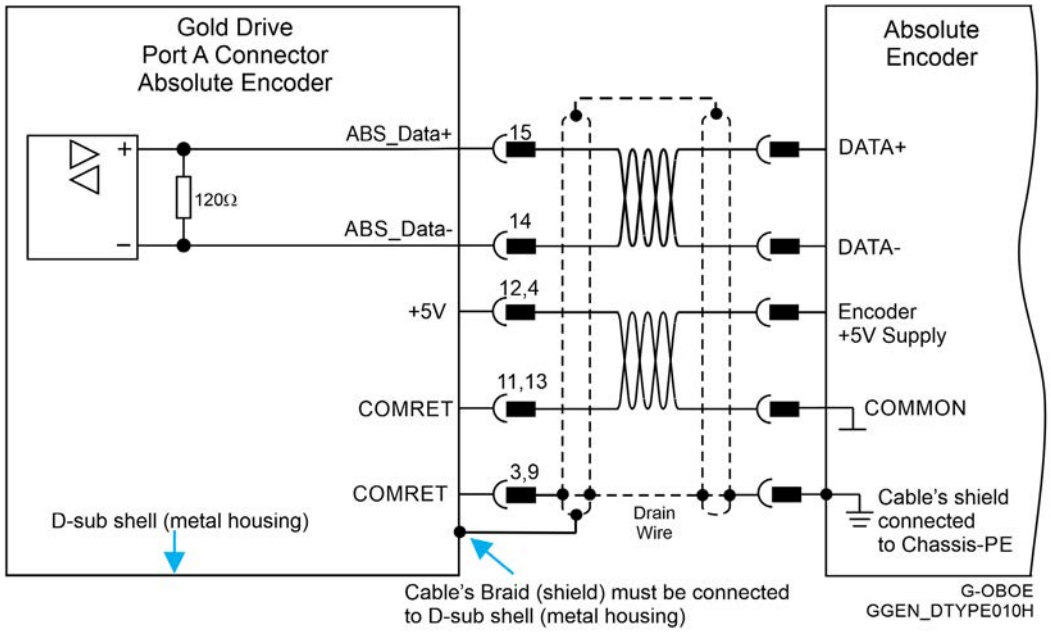


Figure 17: Absolute Serial Encoder – Recommended D-Type Connection Diagram for Sensors Supporting Data Line Only (NRZ types, e.g., Panasonic / Mitutoyo / Sanyo Danki / Tamagawa)

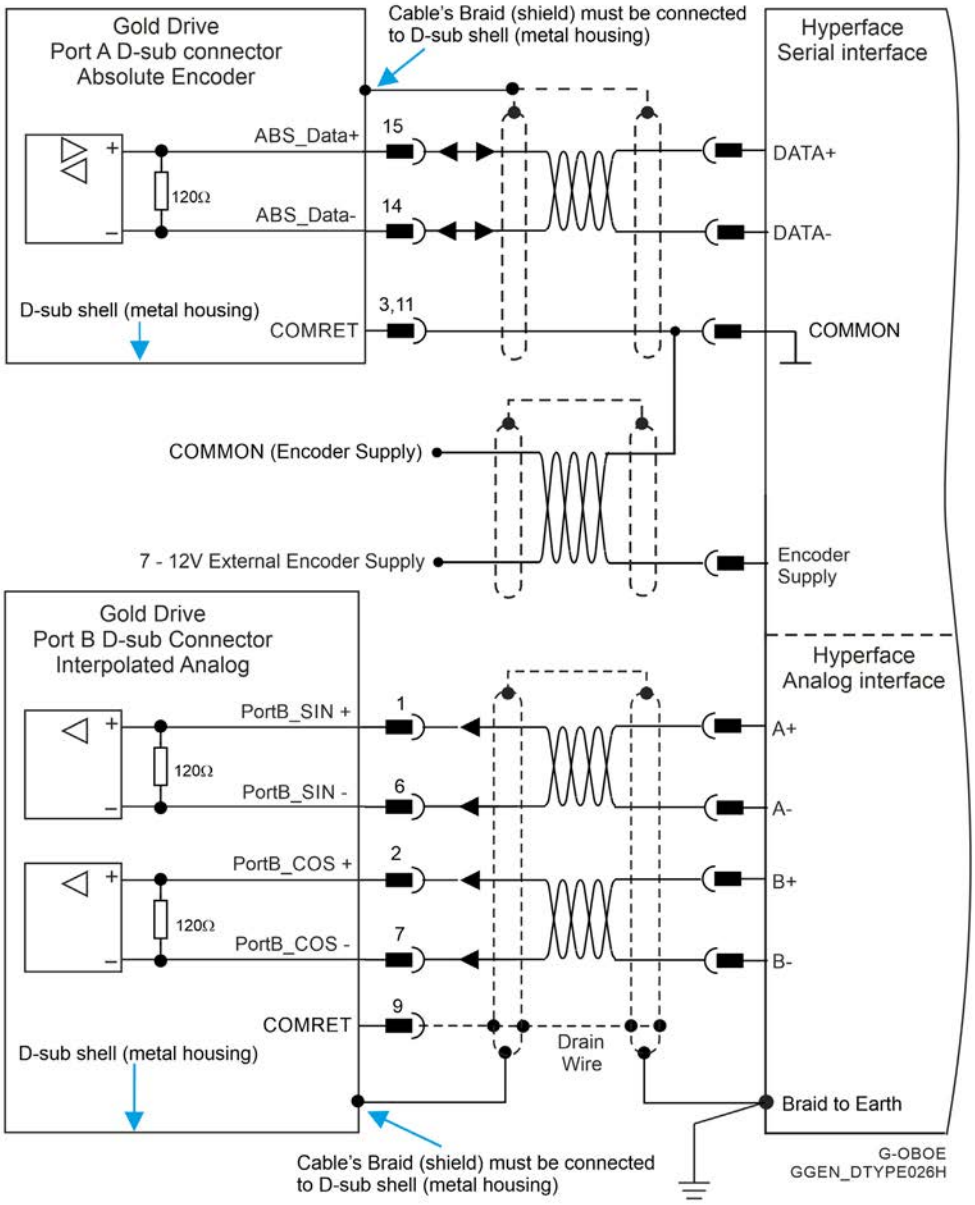
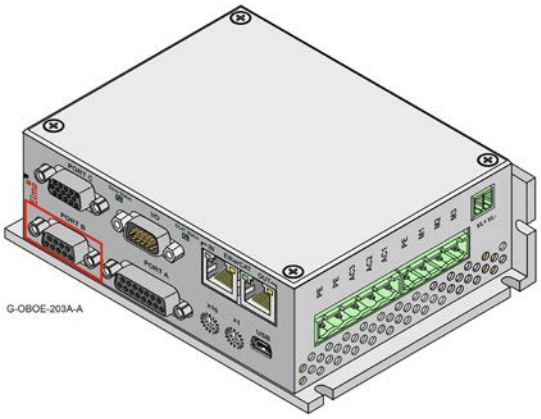


Figure 18: Absolute Serial Encoder – Recommended D-Type Connection Diagram for Stegmann Hiperface

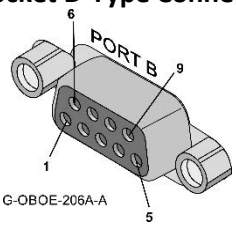
7.6 Port B

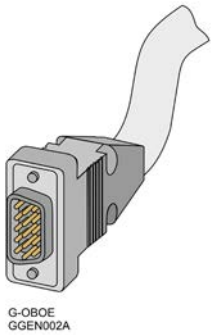
See Section 10.4 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/.

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



9-Socket D-Type Connector





9-Pin D-Type Male Connector

Table 19: Port B Pin Assignments

7.6.1 Incremental Encoder

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

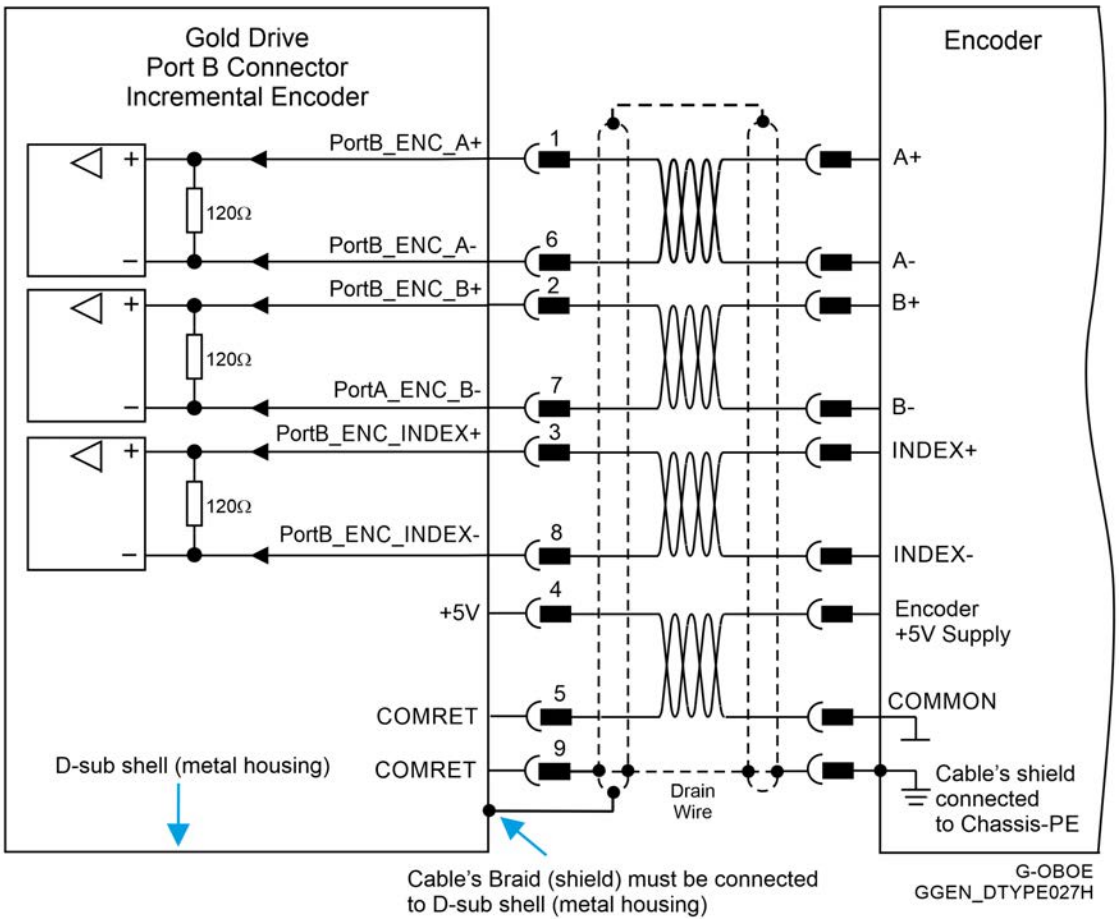


Figure 19: Port B Incremental Encoder Input – Recommended D-Type Connection Diagram

7.6.2 Interpolated Analog Encoder

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

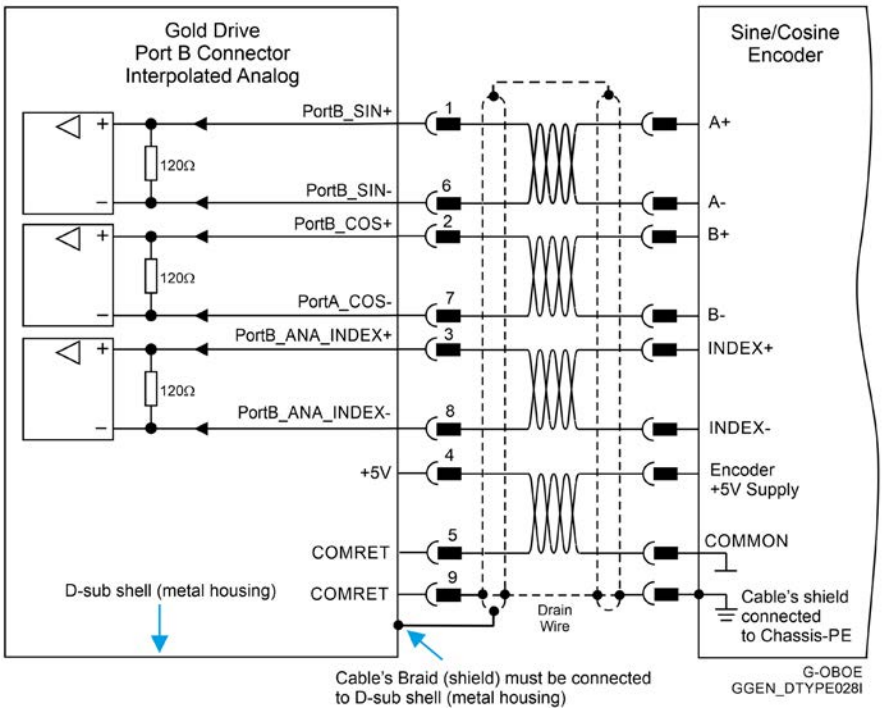


Figure 20: Port B - Interpolated Analog Encoder D-Type Connection Diagram

7.6.3 Resolver

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

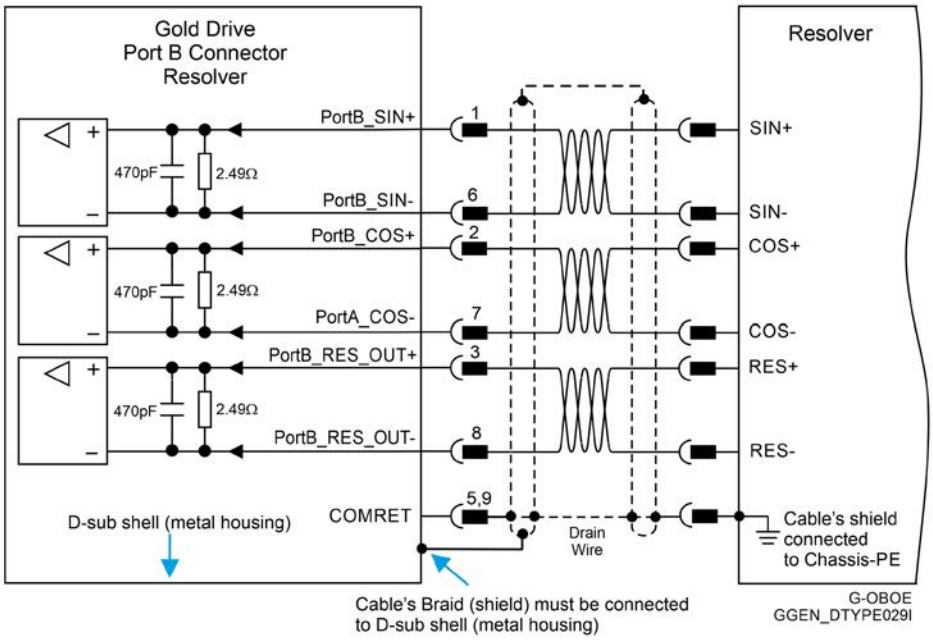


Figure 21: Port B – Resolver D-Type Connection Diagram

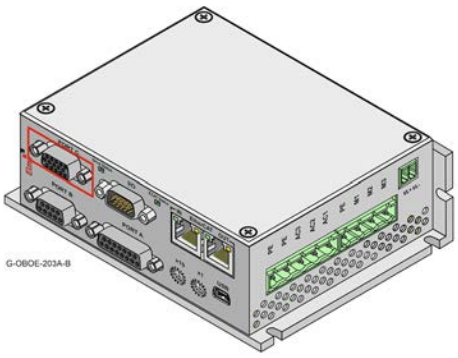
7.7 Port C, Analog Input, and STO

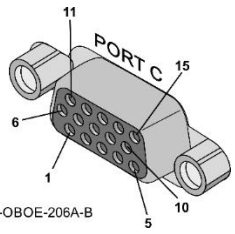
The Port C connector includes the following functions:

- Port C: Refer to Sections 10.5 in the MAN-G-Panel Mounted Drives Hardware manual for full details
- Analog input: See Section 11.2 in the MAN-G-Panel Mounted Drives Hardware manual for full details.
- STO (For details of the STO connections refer to section 7.7.3.)

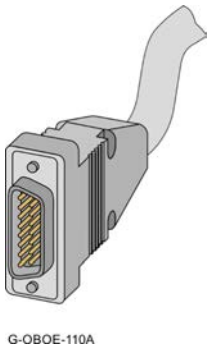
The MAN-G-Panel Mounted Drives Hardware manual is available from https://www.elmomc.com/download/4195/.

Pin # Port C	Signal	Function
1	PortC_ENCO_A+	Buffered Channel A+/Pulse+/PWM+ output
2	PortC_ENCO_A-	Buffered Channel A-/Pulse-/PWM- output
3	PortC_ENCO_B+	Buffered Channel B+/Dir+ output
4	PortC_ENCO_B-	Buffered Channel B-/Dir- output
5	PortC_ENCO_Index+	Buffered Channel INDEX+ output
6	STO1	STO1 Input
7, 12	STO Return Signal	STO Return Signal
8	N/C	N/C
9	COMRET	Common return
10	PortC_ENCO_Index-	Buffered Channel INDEX- output
11	STO2	STO2 Input
13	ANALRET	Analog Input Return
14	ANALOG1-	Analog input 1-
15	ANALOG1+	Analog input 1+
Pin Positions		





15-Socket High Density D-Type Connector



15-Pin High Density D-Type Male Connector

Table 20: Port C Pin Assignments

7.7.1 Port C

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

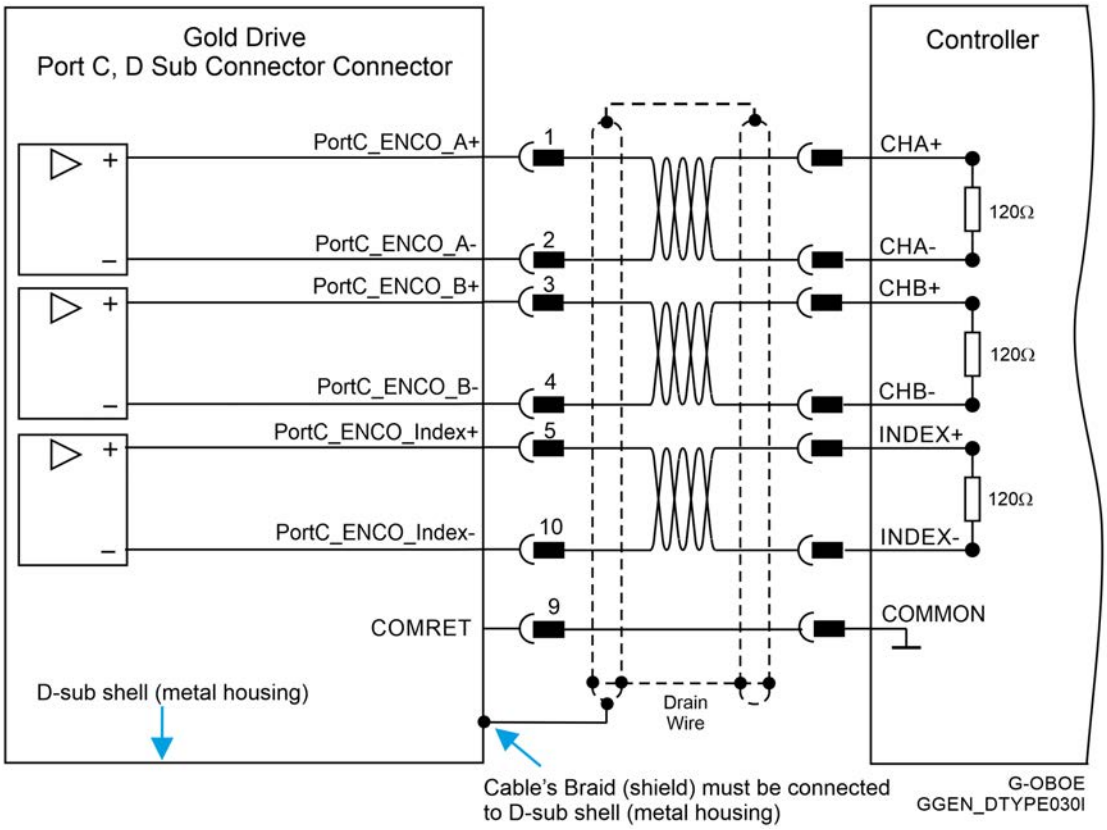


Figure 22: Encoder Differential Output – Recommended D-Type Connection Diagram

7.7.2 Analog Input

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

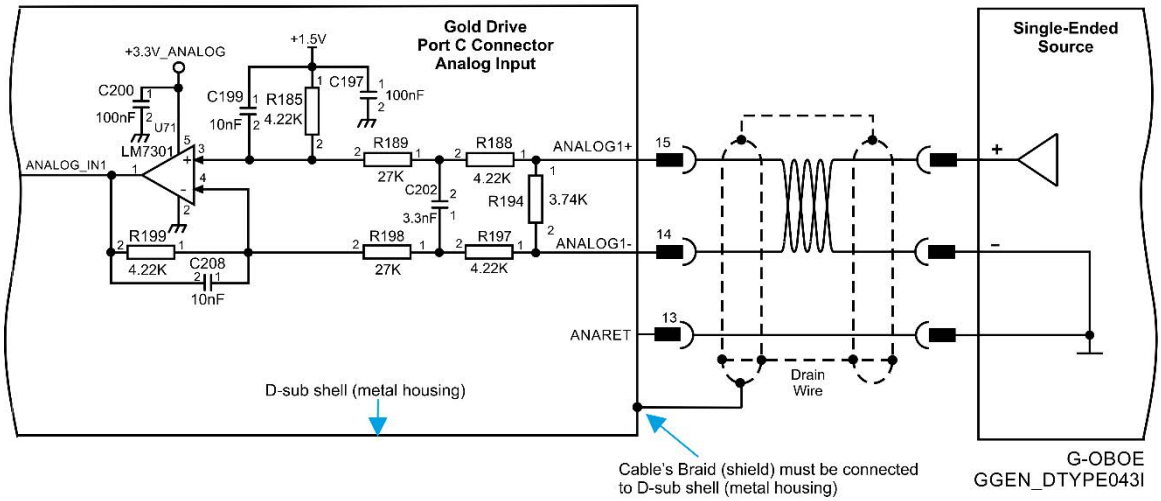


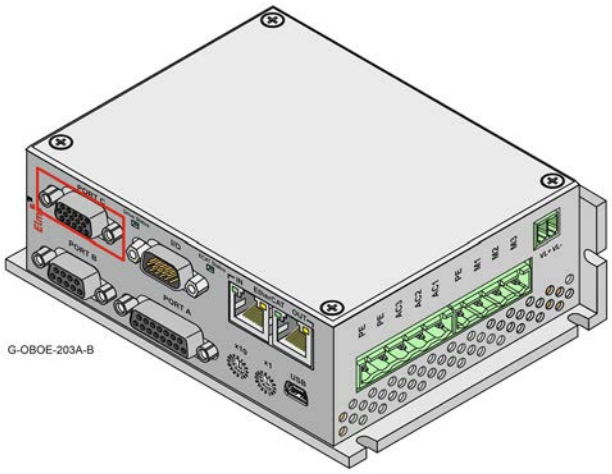
Figure 23: Differential Analog D-Type Input

7.7.3 STO

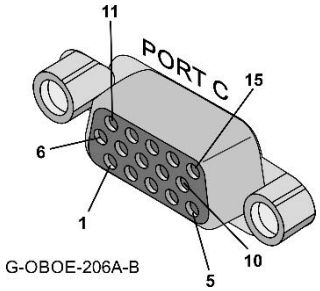
The Port C connector includes STO; See Chapter 9 in the MAN-G-Panel Mounted Drives Hardware manual for full details. The MAN-G-Panel Mounted Drives Hardware manual is available from https://www.elmomc.com/download/4195/.

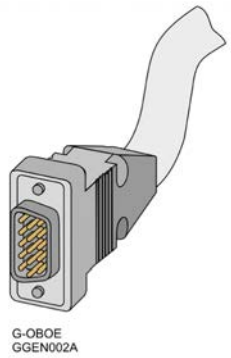
The STO Pinouts on the Port C connector are as follows:

Pin on Port C	Signal	Function
6	STO1	STO1 Input
7, 12	STO Return Signal	STO Return Signal
11	STO2	STO2 Input
Pin Positions		



15-Socket High Density D-Type Connector





15-Pin High Density D-Type Male Connector

Table 21: STO as part of Port C Pin Assignments

7.7.3.1 STO Wiring Options

The following circuits describe the STO wiring options.

7.7.3.1.a Source Mode PLC Voltage Level

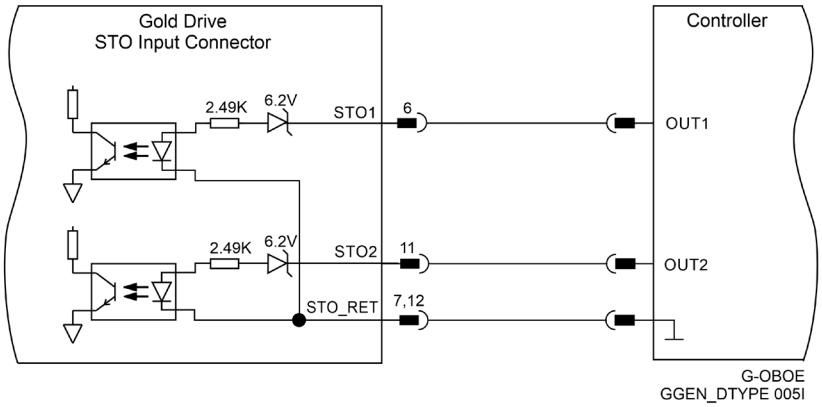


Figure 24: STO Input Connection – PLC Source Option

7.7.3.1.b TTL Mode TTL Voltage Level

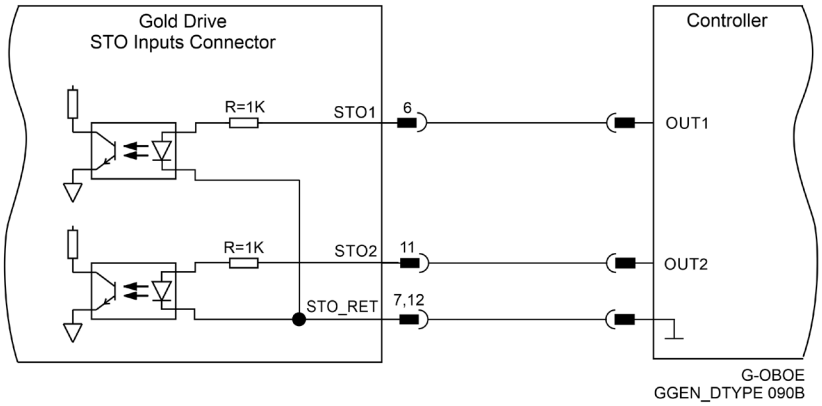


Figure 25: STO Input Connection – TTL Option

7.7.3.1.c STO Output through the I/O connector

There are two available options, as preordered according the customer request (Cat. Number):

- I/O and STO type without STO STATUS OUT
- I/O and STO type with STO STATUS OUT

If the STO STATUS OUT is configured, then OUT4 and IN6 will not be available. Refer to Figure 26 below for details of the connections. **Refer to Chapter 9 in the MAN-G-Panel Mounted Drives Hardware manual for full details.**

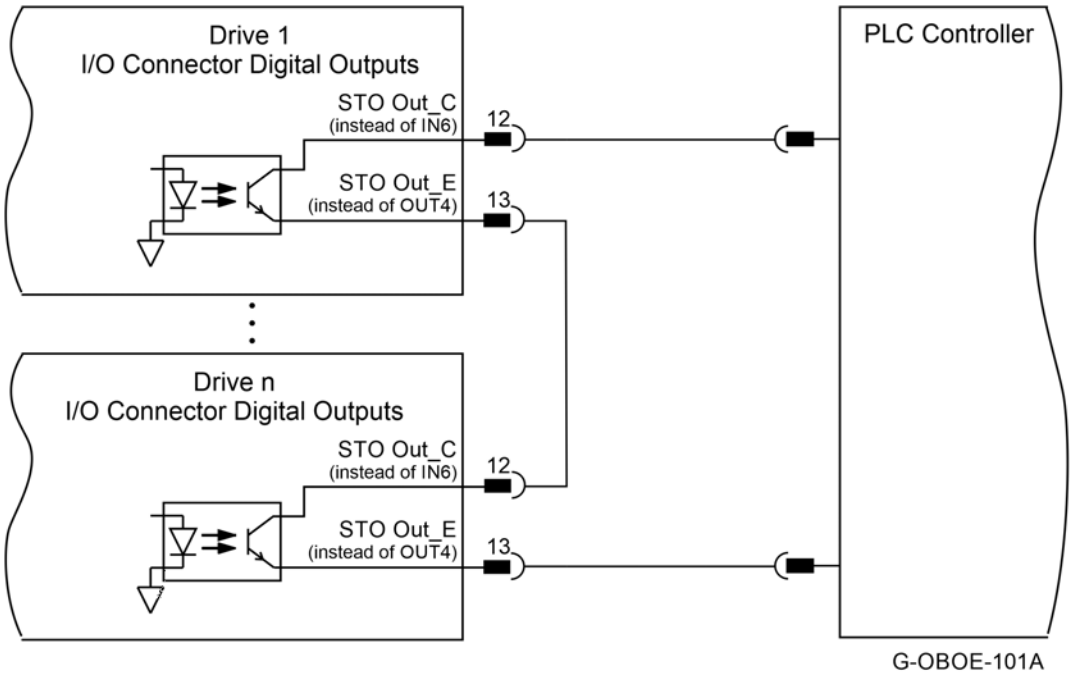
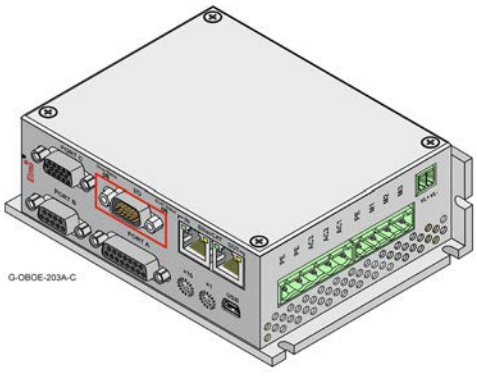


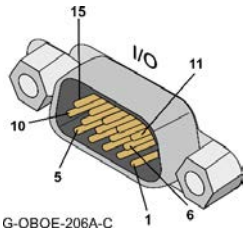
Figure 26: STO Output through the I/O connector

7.8 I/O – Digital Inputs and Outputs

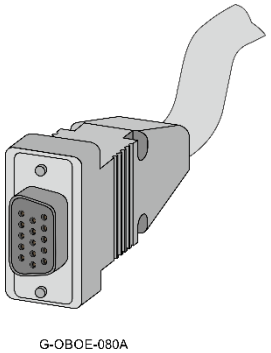
Refer to Chapter 11 in the in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/. for full details.

I/O Pins	Signal	Function
1	IN1	Programmable input 1
2	IN2	Programmable input 2
7	IN3	Programmable input 3
8	IN4	Programmable input 4
11	IN5	Programmable input 5
12	IN6	Programmable input 6
		or STO OUT Collector in the **O** version
6	INRET 1-6	Inputs 1 to 6 return for the **S/T** version
		Positive input 1 to 6 for the **H/A** version
3	OUT1	Programmable output 1
4	OUT2	Programmable output 2
5	OUT3	Programmable output 3
13	OUT4	Programmable output 4
		or STO OUT Emitter in the **O** version
10, 15	VDD	Supply for out 1-4
9, 14	VDDRET	Supply return for out 1-4
Pin Positions		





15-Pin High Density D-Type Male Connector



15-Pin High Density D-Type Female Connector

Table 22: I/O Connector Pin Assignments

7.8.1 Digital Input and Output TTL Mode

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

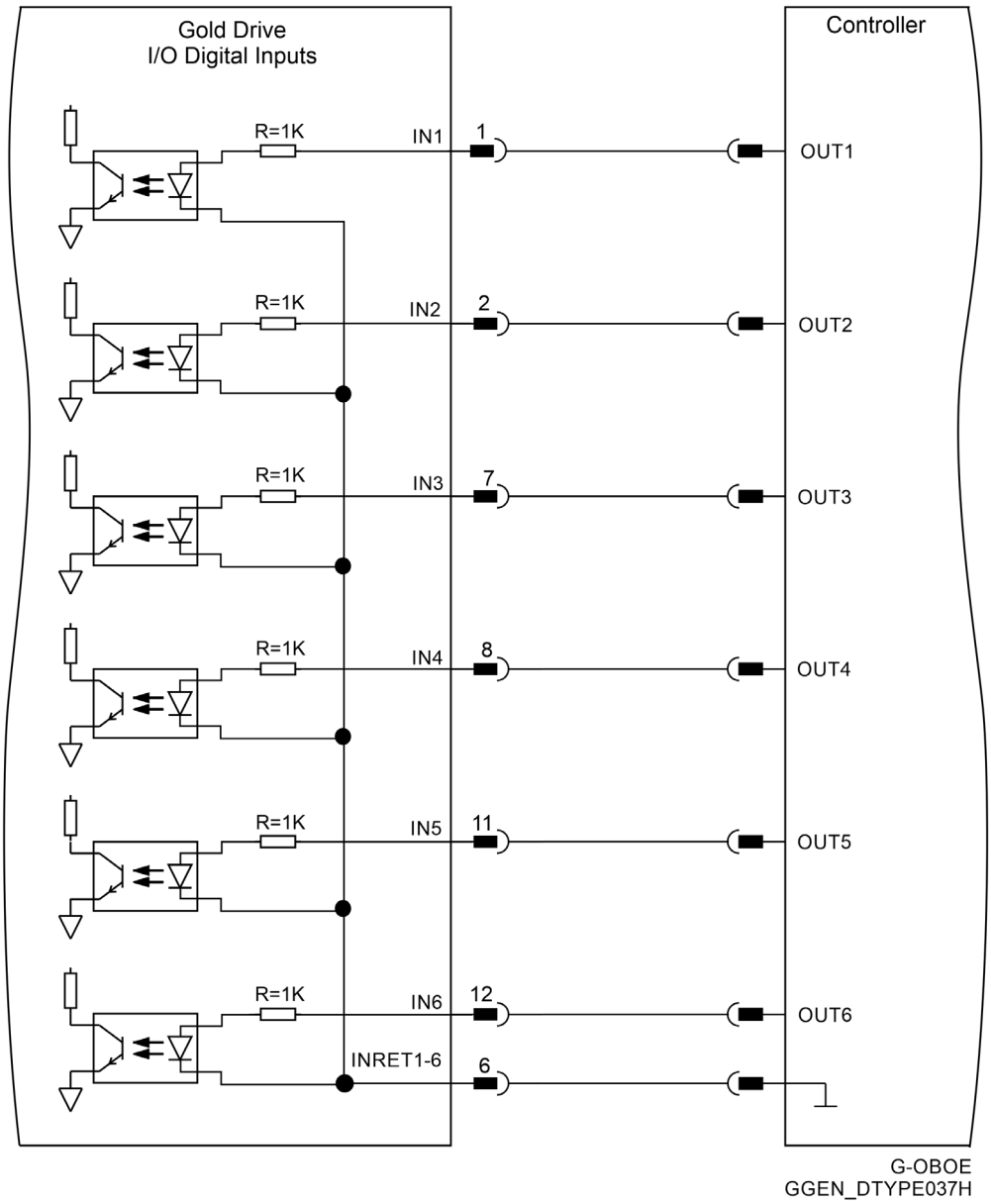


Figure 27: Digital Input D-Type Connection Diagram – TTL Option

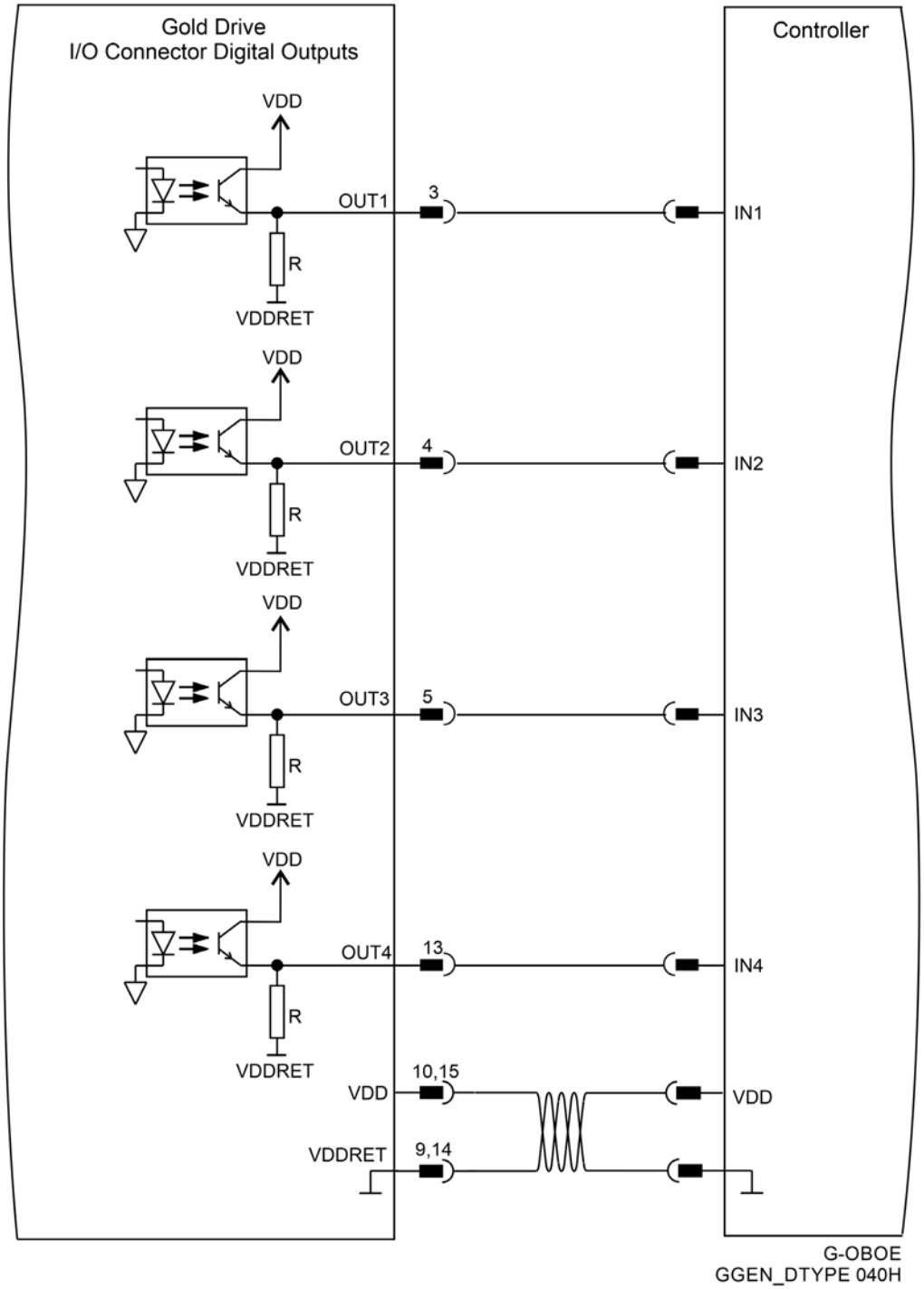


Figure 28: Digital Output D-Type Connection Diagram – TTL Option

7.8.2 Digital Input and Output PLC Source Mode

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

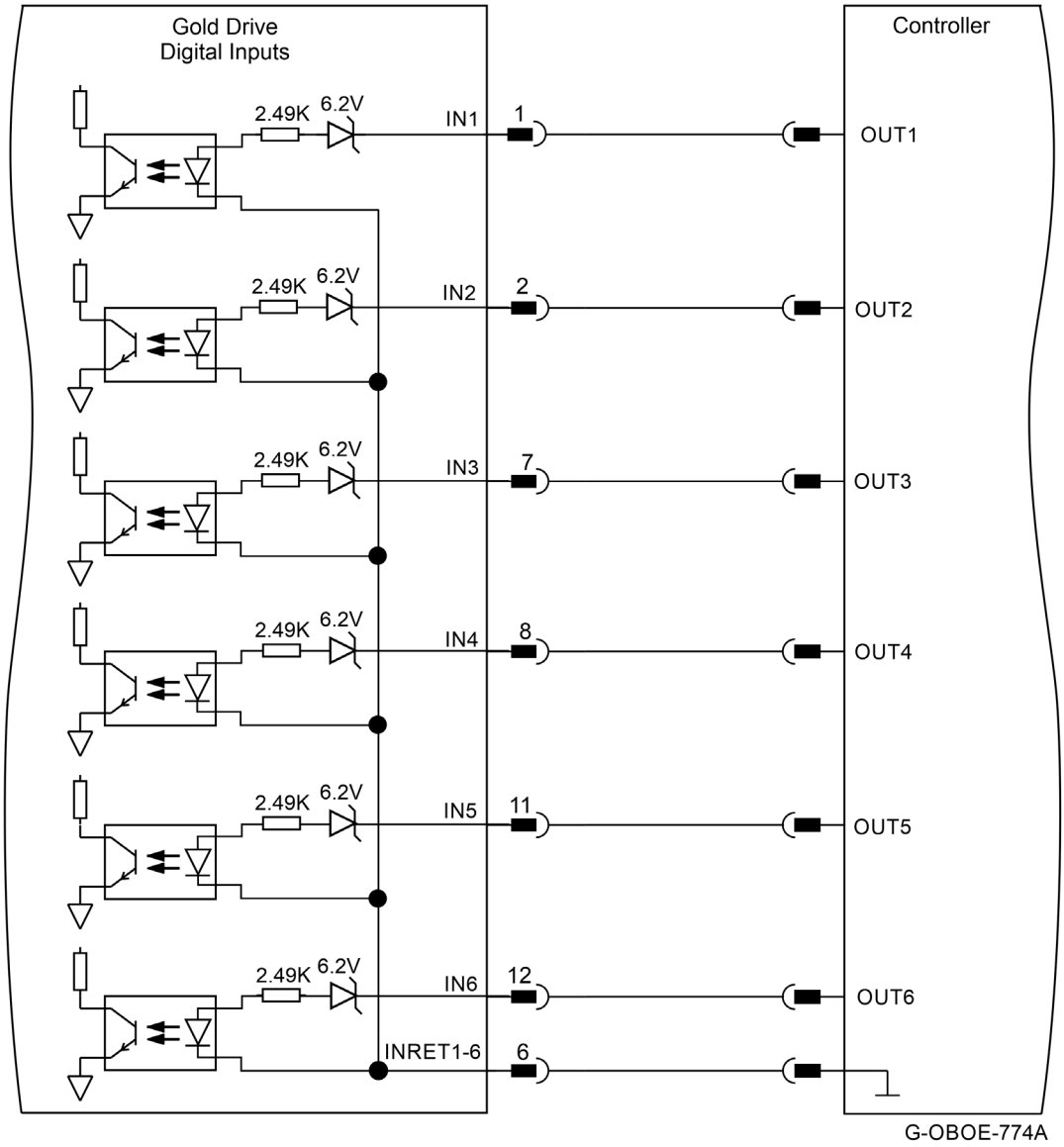


Figure 29: Digital Input D-Type Connection Diagram – Source PLC Option

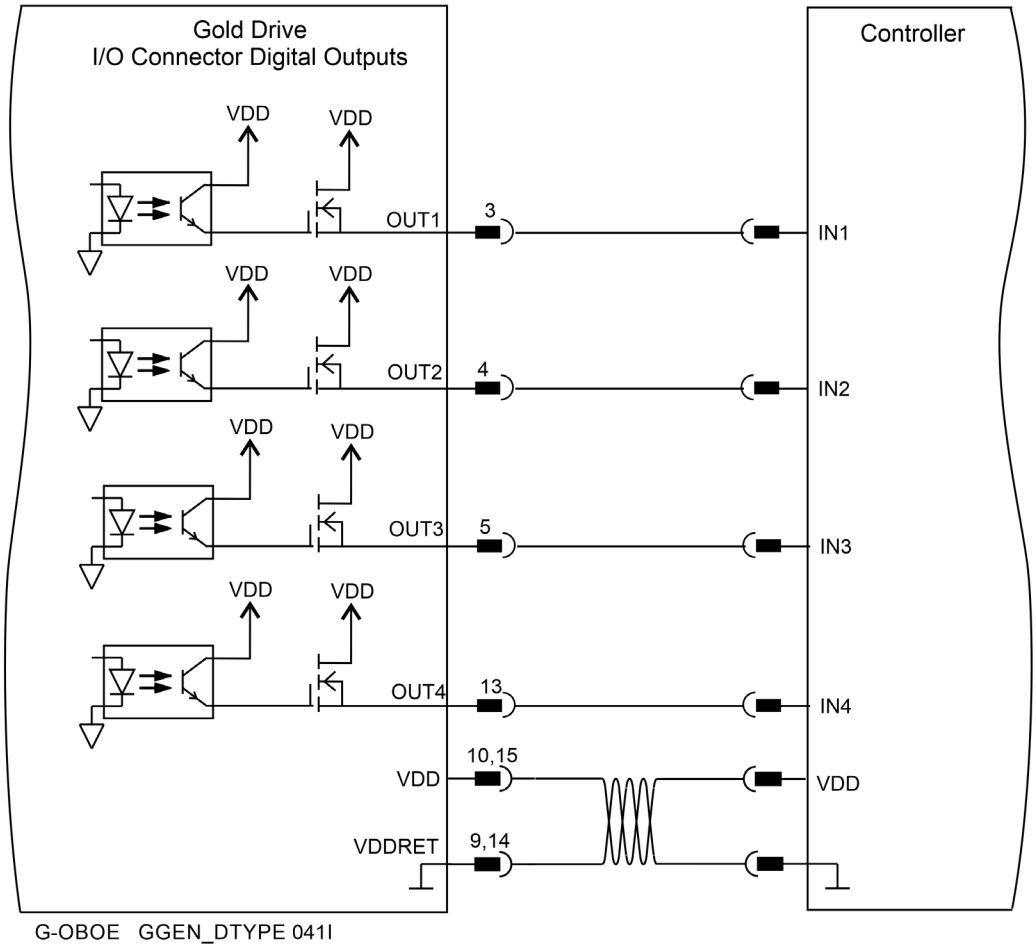


Figure 30: Digital Output D-Type Connection Diagram – Source PLC Option

7.8.3 Digital Input and Output Sink Mode

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

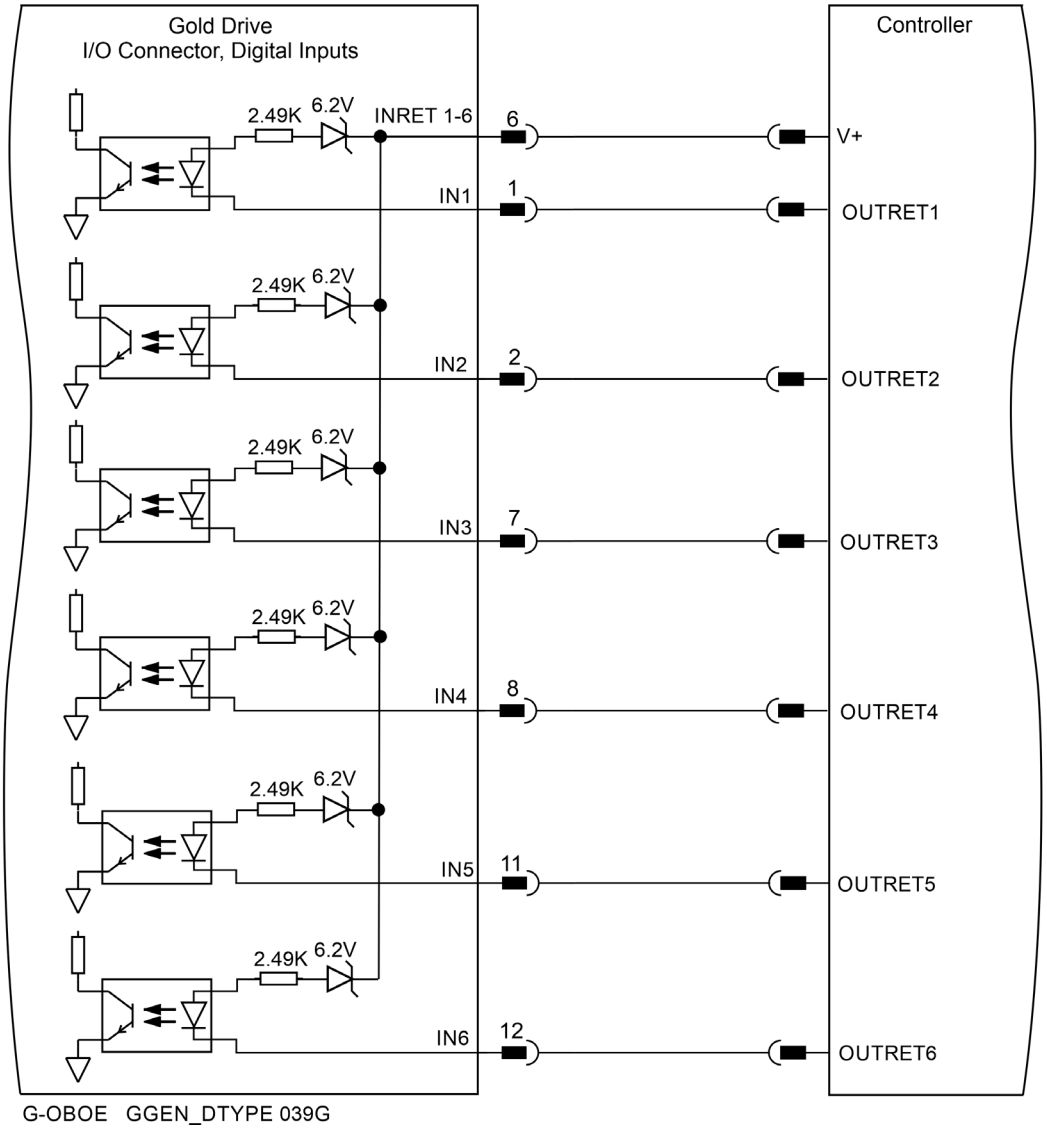


Figure 31: Digital Input D-Type Connection Diagram - Sink PLC Mode

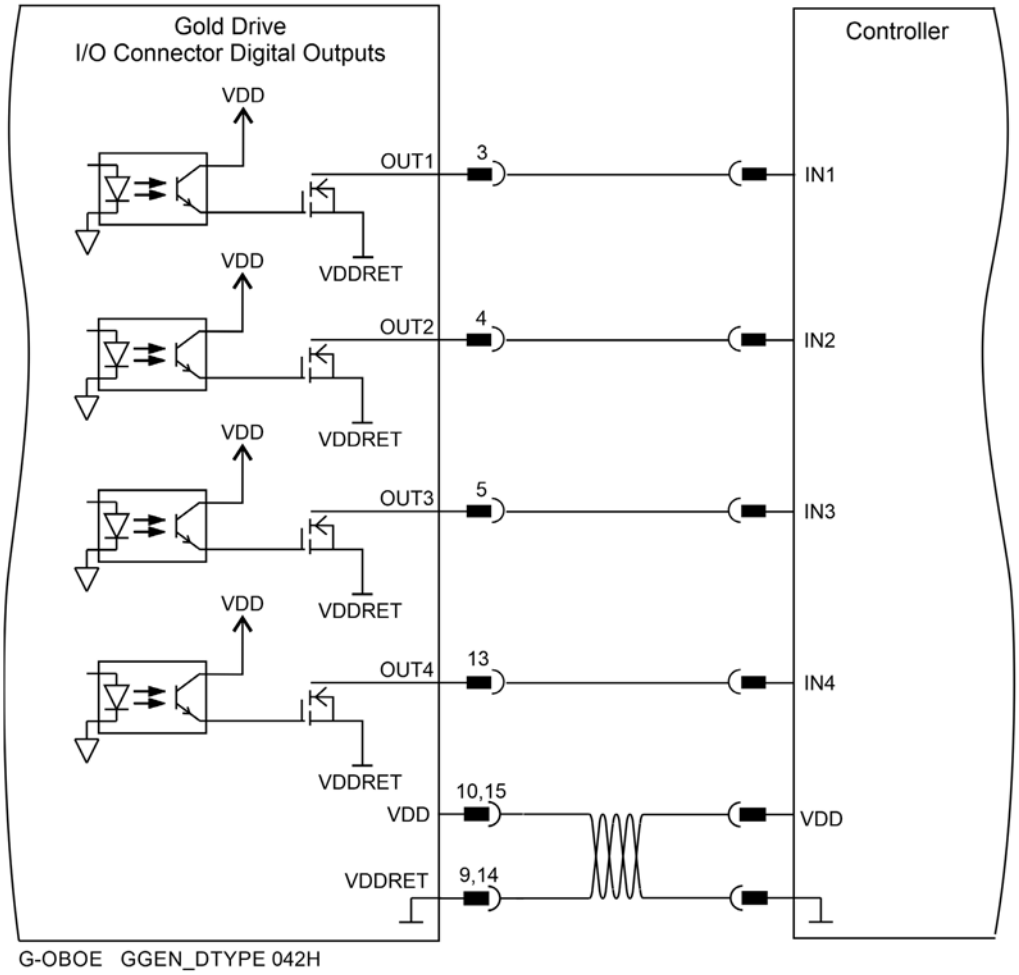


Figure 32: Digital Output D-Type Connection Diagram - Sink Mode

7.9 USB 2.0

Refer to Section 12.1 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/. for full details.

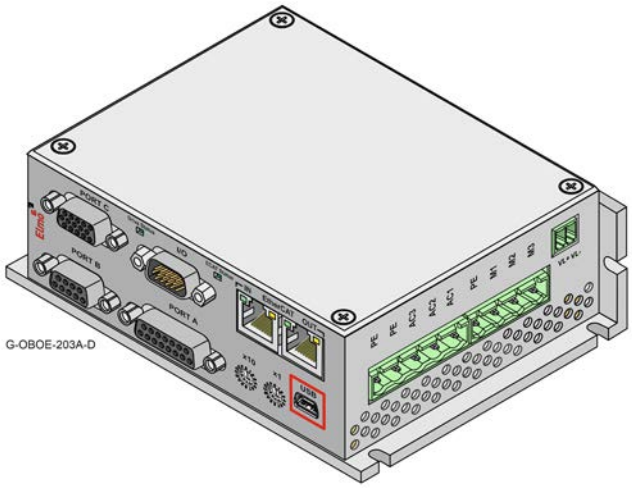
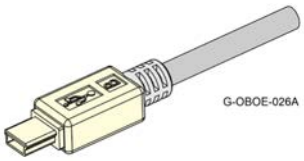
Pin on USB	Signal	Function
1	USB VBUS	USB VBUS 5V Detector
2	USBD-	USB _N line
3	USBD+	USB _P line
5	USB COMRET	USB communication return
Pin Positions		
 **USB Mini B Connecter**		 **USB Device Mini B Plug**

Table 23: USB 2.0 Pin Assignments

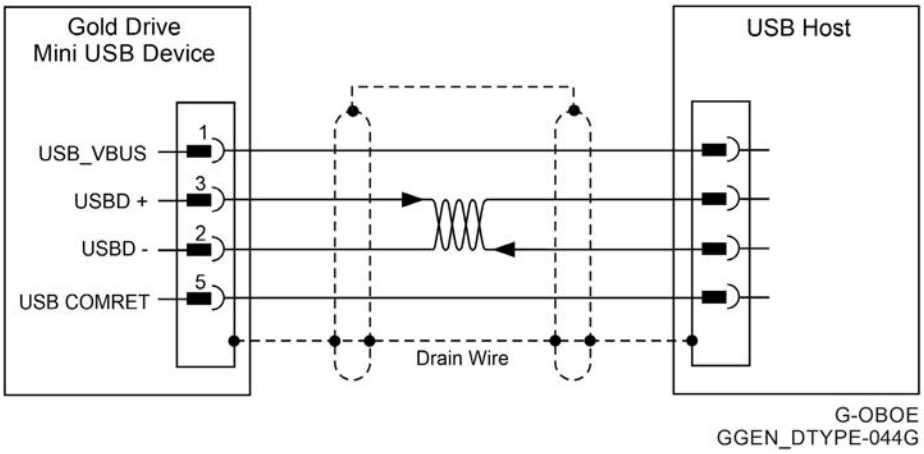
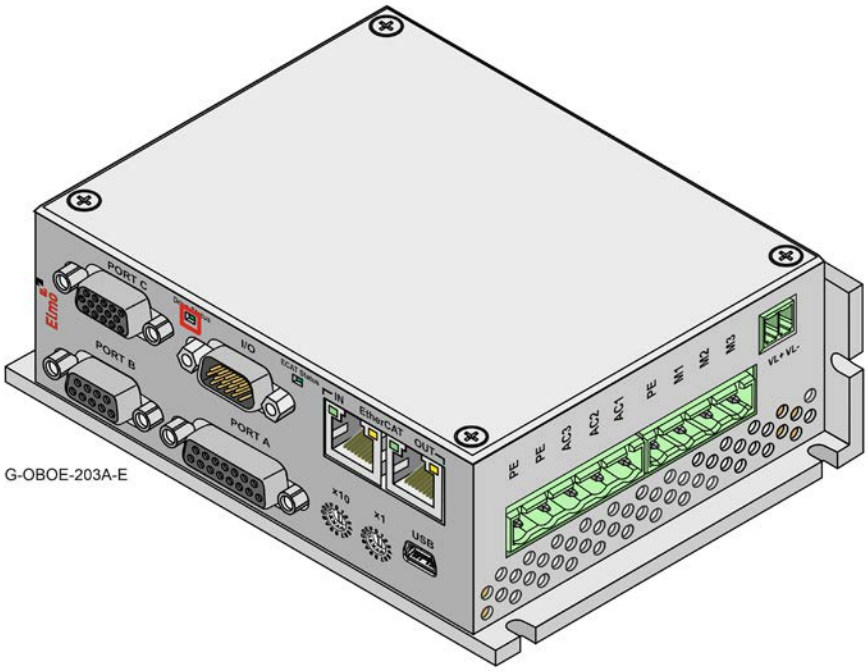


Figure 33: USB Network Diagram

7.10 Drive Status Indicator

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



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).

7.11 EtherCAT Communications Version

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

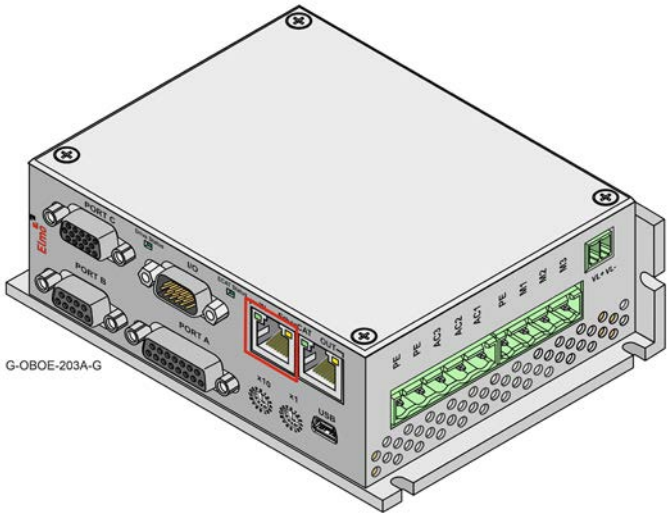
Fieldbus Type	Product Number
EtherCAT + Switches	G-OBOXX/YYYFXXXX

Table 24: EtherCAT Fieldbus Type

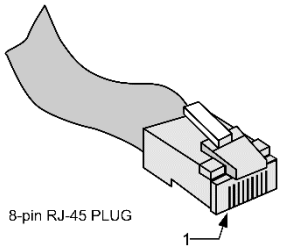
7.11.1 EtherCAT IN/Ethernet Pinouts

Refer to section 12.2 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/. for more details.

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



EtherCAT IN RJ-45 Connector



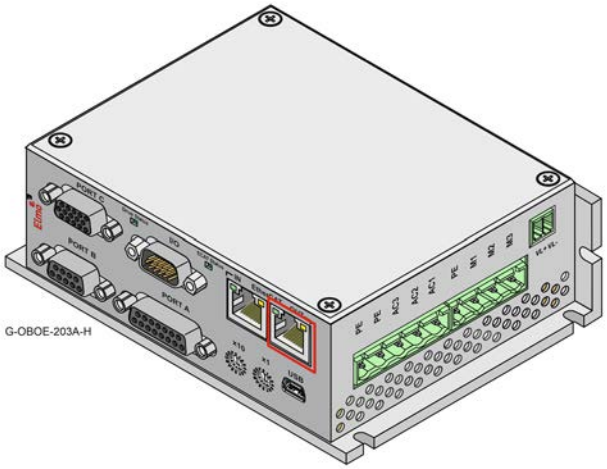
Standard CAT5e Ethernet Cable

Table 25: EtherCAT In/Ethernet Connector Pin Assignments

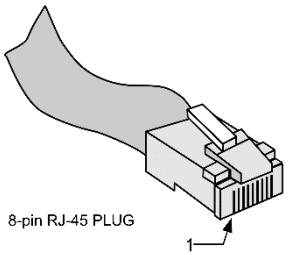
7.11.2 EtherCAT OUT Pinouts

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

Pin# EtherCAT OUT	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	
Pin Positions		



EtherCAT OUT RJ-45 Connector



Standard CAT5e Ethernet Cable

Table 26: EtherCAT Out Connector Pin Assignments

7.11.3 EtherCAT Wiring

Figure 34 is the wiring diagram for the EtherCAT connections.

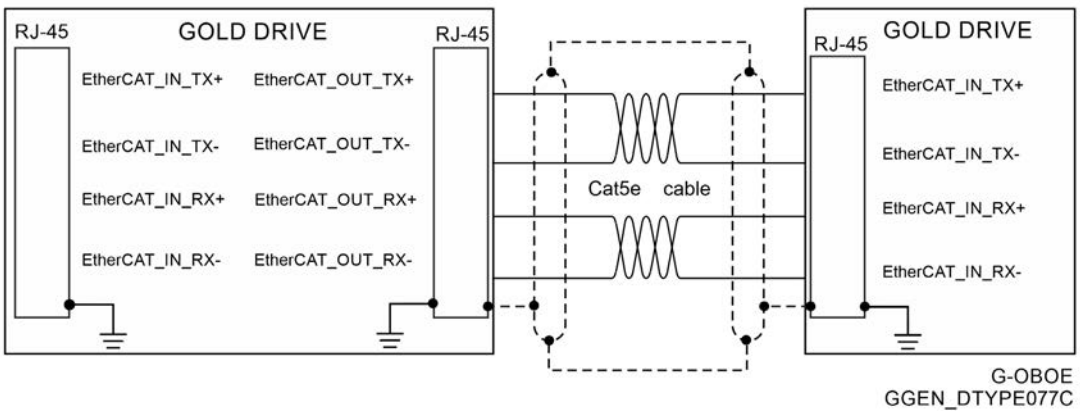


Figure 34: EtherCAT RJ-45 Connections

7.11.4 EtherCAT Link Indicators

The Gold Oboe 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 35.

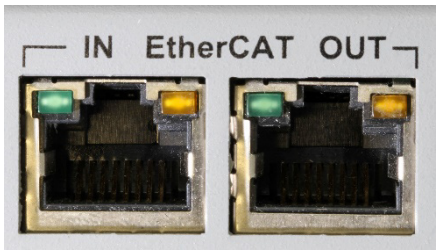


Figure 35: Ethernet Connector LEDs

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 12.2.2 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/.

7.11.5 EtherCAT Status Indicator

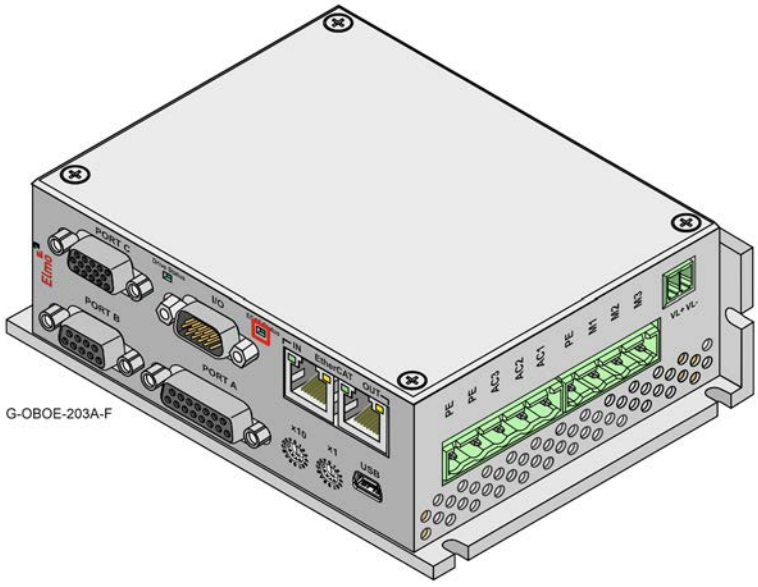


Figure 36: EtherCAT Link Status Indication

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.

7.11.6 EtherCAT Switches

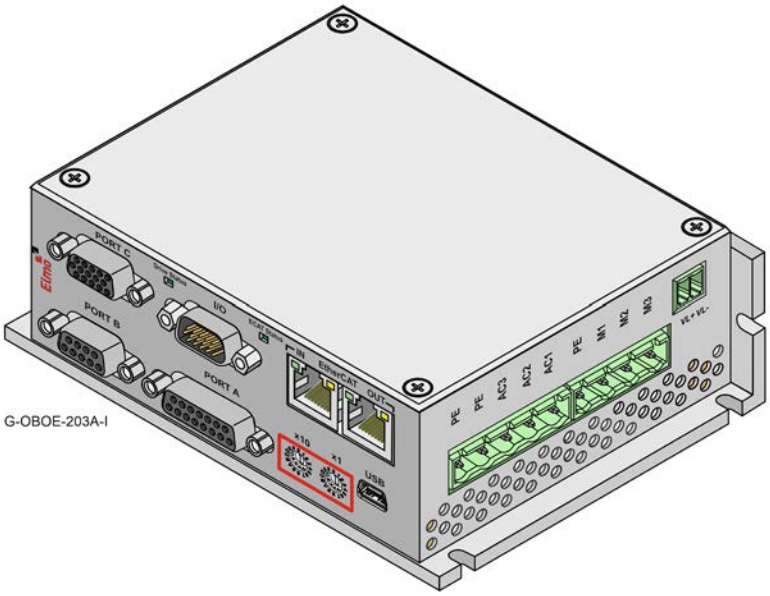


Figure 37: EtherCAT Switches

Note: The EtherCAT address of each axis is specified by the two EtherCAT switches. **For full details, see Section 6.8.2.4 in the MAN-G-Panel Mounted Drives Hardware manual available from https://www.elmomc.com/download/4195/**

7.12 CAN Communications Version

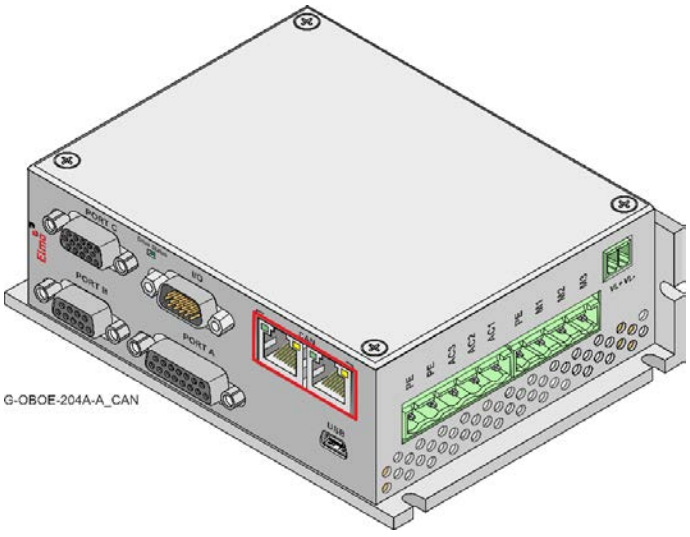
Fieldbus communications are industrial network protocols for real-time distributed control that allows connection of servo drives. The Gold Oboe supports the following CAN fieldbus type industrial network protocol.

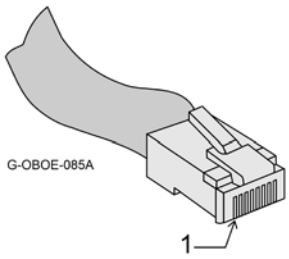
Fieldbus Type	Product Number
CAN	**G-OBO**XX/YYY**S**XXXX

Table 27: CAN Fieldbus Type

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

Pin# CAN IN	Pin# CAN OUT	Signal	Function
1	1	CAN_H	CAN_H bus line (dominant high)
2	2	CAN_L	CAN_L bus line (dominant low)
3	3	CAN_RET	CAN Return
4, 5	4, 5	N/A	—
6	6	CAN_SHLD	Shield, connected to the RJ plug cover
7	7	CAN_RET	CAN Return
8	8	N/A	—
Pin Positions			



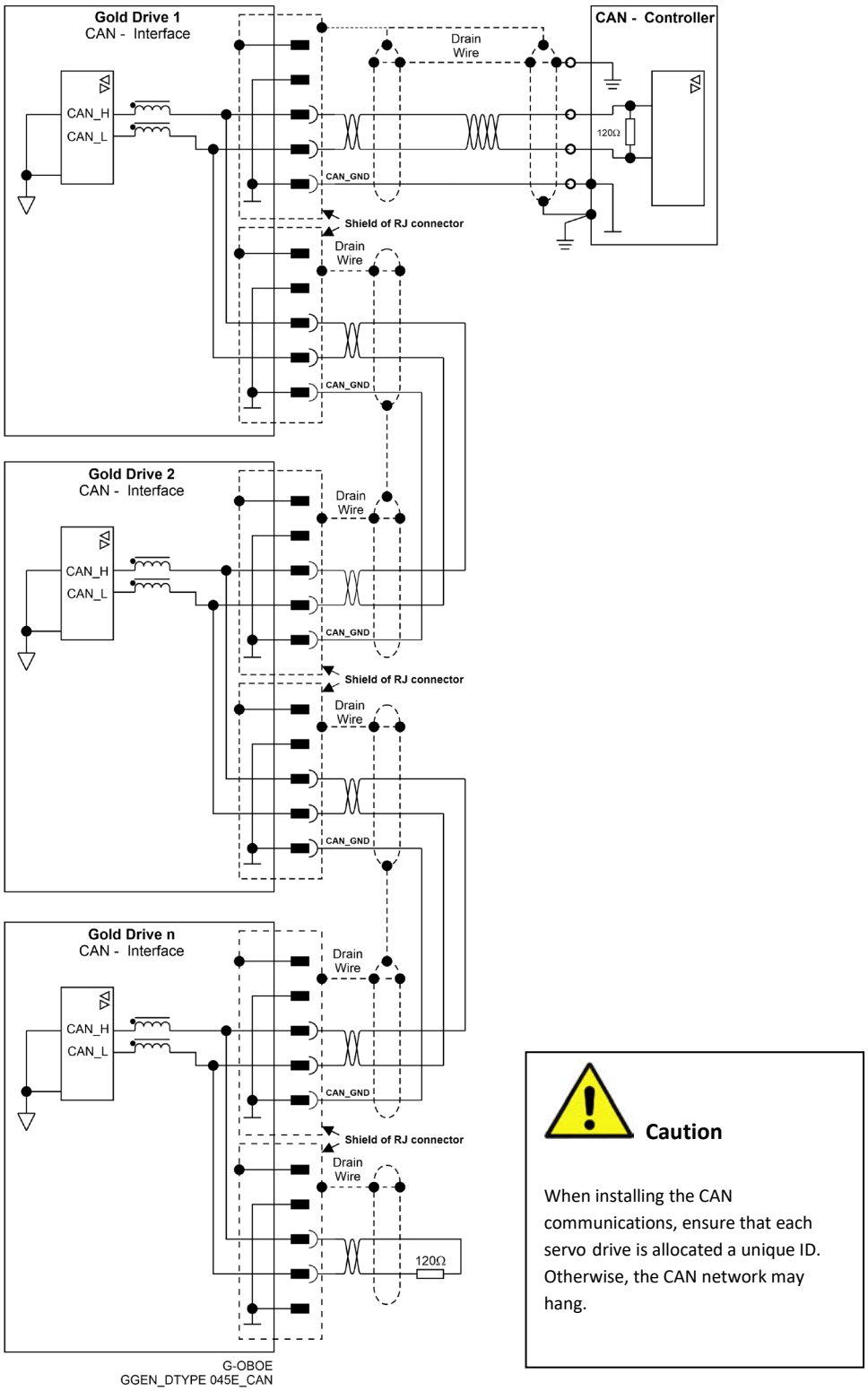


Standard CAT5e Ethernet Cable

Table 28: CAN In/Out Connector Pin Assignments

7.12.1 CAN Wiring

Figure 38 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.

Figure 38: Gold Oboe Connection Diagram – CAN

Chapter 8: Gold Oboe Heat Dissipation

Typical Servo Drive operation is characterized by high power peaks with relatively low average power consumption. In most cases, the average power is less than 15% - 25% of the consumed peak power.

When delivering power to the motor, the Servo Drive creates heat that must be carefully controlled to enable smooth and reliable enduring operation.

Proper selection of the heat dissipation device can contribute significantly to the efficiency of the overall application, space and costs savings.

8.1 Power Dissipation

The integral heat sink of the Gold Oboe can dissipate around 18W – 22W, depending on the mounting method. Due to the nature of servo drive operation, whose high power peaks with very low average power consumption, mounting the Gold Oboe on an external heat dissipating device can be very efficient and beneficial.

Chapter 9: Powering Up

After the Gold Oboe is connected to its device, it is ready to be powered up.



Caution:
Before applying power, ensure that the AC supply is within the specified range.

9.1 Initializing the System

After the Gold Oboe 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 10: Gold Oboe Dimensions

This chapter provides detailed technical dimensions regarding the Gold Oboe.

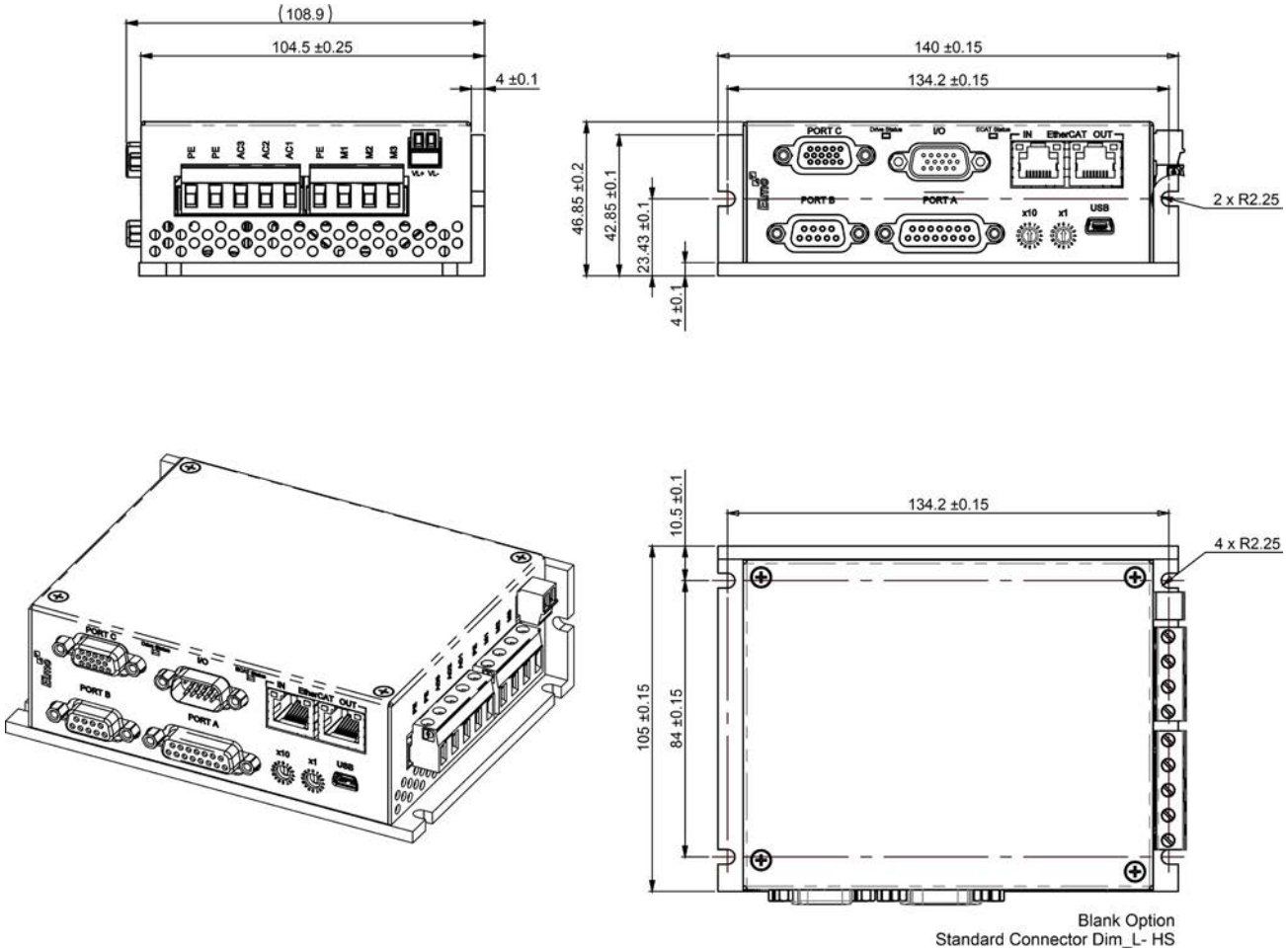


Figure 39: Gold Oboe with L-Shaped Heat-Sink

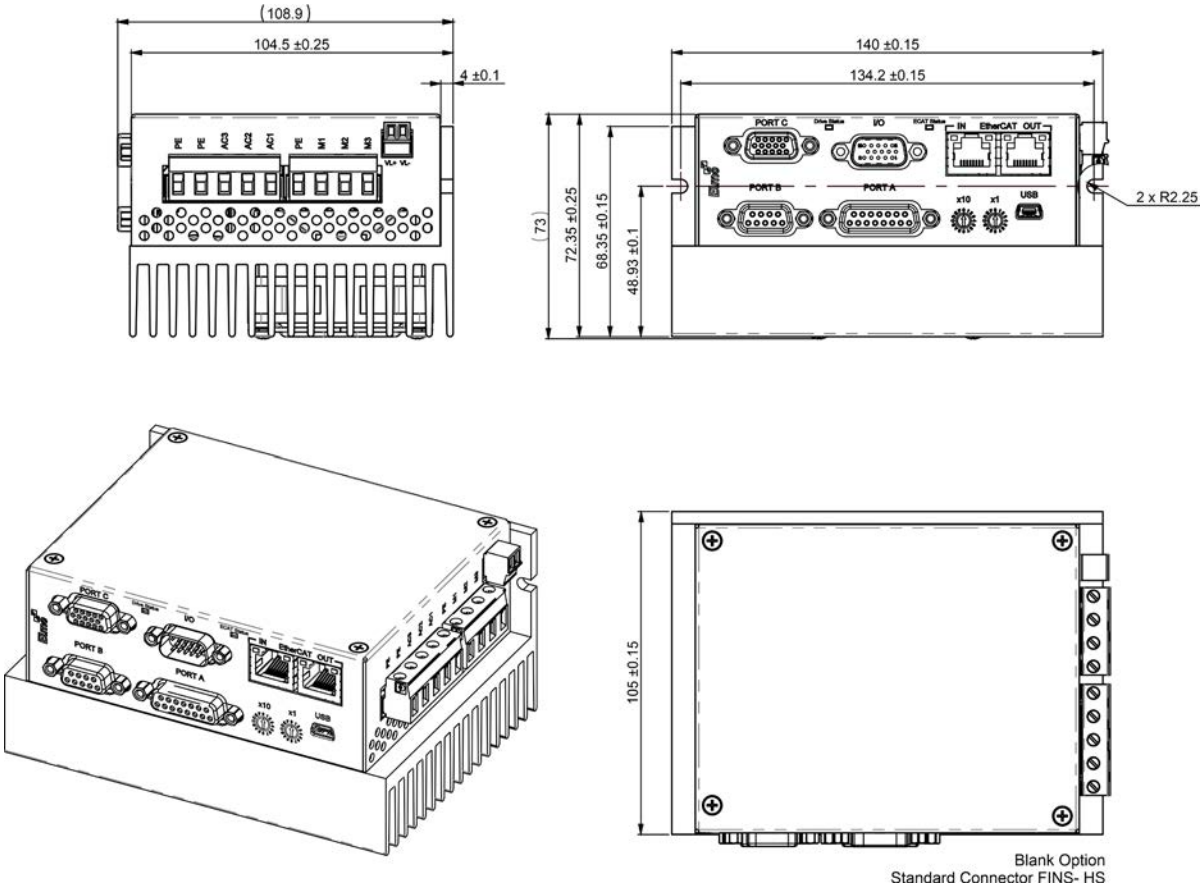


Figure 40: Gold Oboe with Fins Heat-Sink


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