Micro 4804
MZ / PZ / CZ / LZ

Intelligent Servo Drive for Step, DC, Brushless DC and AC Motors

TECHNOSOFT

Intelligent Servo Drives

Technical Reference

P091.020.Micro 4804 MZ.PZ.CZ.LZ.UM.0424

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Read This First

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About This Manual

This book is a technical reference manual for:

Product Name	Part Number	Description	Nominal current	Peak Current	Communication
Micro 4804 MZ-CAT	P020.002.E122	Pins Version	$3A_{RMS}$ / 4.2A	$10.6A_{RMS}$ / 15A	RS232, USB, EtherCAT®
Micro 4804 MZ-CAN	P020.002.E102				RS232; USB; CAN
Micro 4804 PZ-CAT	P020.002.E322	Enhanced Pins Version	$4A_{RMS}$ / 5.6A[1]	$10.6A_{RMS}$ / 15A	RS232, USB, EtherCAT®
Micro 4804 PZ-CAN	P020.002.E302				RS232; USB; CAN
Micro 4804 CZ-CAT	P020.802.E222	Standalone Version	$4A_{RMS}$ / 5.6A	$10.6A_{RMS}$ / 15A	RS232, USB, EtherCAT®
Micro 4804 CZ-CAN	P020.802.E202				RS232; USB; CAN
Micro 4804 LZ-CAT	P020.022.E122	Lite Version	$3A_{RMS}$ / 4.2A	$10.6A_{RMS}$ / 15A	USB; EtherCAT®
Micro 4804 LZ-CAN	P020.022.E102				USB; CAN

In order to operate the **Micro 4804** drives, you need to pass through 3 steps:

- ❑ **Step 1 Hardware installation**
- ❑ **Step 2 Drive setup** using Technosoft **EasyMotion Studio II** software for drive commissioning
- ❑ **Step 3 Motion programming** using one of the options:
  - ❑ **CANopen master**[2] or an **EtherCAT® master**[3]
  - ❑ The drives **built-in motion controller** executing a Technosoft Motion Language (**TML**) program developed using Technosoft **EasyMotion Studio II** software
  - ❑ A TML_LIB motion library for PCs (Windows or Linux)[4]
  - ❑ A TML_LIB motion library for PLCs[4]
  - ❑ A **distributed control** approach which combines the above options, like for example a host calling motion functions programmed on the drives in TML

This manual covers **Step 1** in detail. It describes the **Micro 4804** hardware including the technical data, the connectors and the wiring diagrams needed for installation.

For **Step 2 and 3**, please consult the document ***EasyMotion Studio II – Quick Setup and Programming Guide.*** For detailed information regarding the next steps, refer to the related documentation.

Notational Conventions

This document uses the following conventions:

- **Micro 4804**– all products described in this manual
- **IU** units – Internal units of the drive
- **SI** units – International standard units (meter for length, seconds for time, etc.)
- **STO** – Safe Torque Off
- **TML** – Technosoft Motion Language
- **CANopen** – Standard communication protocol that uses 11-bit message identifiers over CAN-bus
- **TMLCAN** – Technosoft communication protocol for exchanging TML commands via CAN-bus, using 29bit message identifiers
- **CoE** – CAN application protocol over EtherCAT

[1] Limited to $3A_{RMS}$ / 4.2A amplitude nominal using the recommended mating connectors. For current values >$3A_{RMS}$ pins needs to be soldered.

[2] When Micro 4804x CAN drive is set in CANopen mode

[3] When Micro 4804x CAT drive is used

[4] Available for Micro 4804x CAN

Trademarks

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Related Documentation

Micro 4804 MZ-CAT Datasheet (P020.002.E122.DSH) ***Micro 4804 CZ-CAT Datasheet (P020.802.E222.DSH)***
Micro 4804 MZ-CAN Datasheet (P020.002.E102.DSH) ***Micro 4804 CZ-CAN Datasheet (P020.802.E202.DSH)***
Micro 4804 PZ-CAT Datasheet (P020.002.E322.DSH) ***Micro 4804 LZ-CAT Datasheet (P020.022.E122.DSH)***
Micro 4804 PZ-CAN Datasheet (P020.002.E302.DSH) ***Micro 4804 LZ-CAN Datasheet (P020.022.E102.DSH)***

– describes the hardware connections of the Micro 4804 family of intelligent servo drives including the technical data and connectors.

EasyMotion Studio II – Quick Setup and Programming Guide (P091.034.ESM II - Quick.Setup.and.Programming.Guide.xxxx) – describes the compatible software installation, drive software setup commissioning, introduction to TML motion programming and motion evaluation tools.

Help of the EasyMotion Studio II software – **EasyMotion Studio II** simplifies the setup process for any Technosoft drive, enabling quick configuration. The software generates setup data that can be downloaded into the drive's EEPROM or saved as a file on a PC. Upon power-up, the drive initializes with the setup data read from its EEPROM. Additionally, EasyMotion Studio II allows retrieval of complete setup information from a previously programmed drive. The **LITE version of EasyMotion Studio II** is available for free download from the Technosoft website.

Motion Programming using EasyMotion Studio (part no. P091.034.ESM.UM.xxxx) – describes how to use the EasyMotion Studio to create motion programs using in Technosoft Motion Language (TML). EasyMotion Studio platform includes **EasySetUp** for the drive/motor setup, and a **Motion Wizard** for the motion programming. The Motion Wizard provides a simple, graphical way of creating motion programs and automatically generates all the TML instructions. *With EasyMotion Studio you can fully benefit from a key advantage of Technosoft drives – their capability to execute complex motions without requiring an external motion controller, thanks to their built-in motion controller.* **A demo version of EasyMotion Studio (with EasySetUp part fully functional) can be downloaded free of charge from the Technosoft web page**

iPOS CANopen Programming **(part no. P091.063.iPOS.UM.xxxx)** – explains how to program the iPOS family of intelligent drives using **CANopen** protocol and describes the associated object dictionary for **CiA 301 v.4.2** application layer and communication profile, **CiA WD 305 v.2.2.13** layer settings services and protocols and **CiA DSP 402 v3.0** device profile for drives and motion control now included in IEC 61800-7-1 Annex A, IEC 61800-7-201 and IEC 61800-7-301 standards

iPOS CoE Programming (part no. P091.064.UM.0919) – describes how to program the Technosoft intelligent drives equipped with EtherCAT® communication interface. These drives support CAN application protocol over EtherCAT® (CoE) in conformance with CiA 402 device profile. The manual presents the object dictionary associated with this profile. The manual also explains how to combine the Technosoft Motion Language and the CoE commands in order to distribute the application between the EtherCAT® master and the Technosoft drives.

TML_LIB v2.0 **(part no. P091.040.v20.UM.xxxx)** – explains how to program in **C, C++,C#, Visual Basic or Delphi Pascal** a motion application for the Technosoft intelligent drives using TML_LIB v2.0 motion control library for PCs. The TML_lib includes ready-to-run examples that can be executed on **Windows** or **Linux** (x86 and x64).

TML_LIB_LabVIEW v2.0 **(part no. P091.040.LABVIEW.v20.UM.xxxx)** – explains how to program in **LabVIEW** a motion application for the Technosoft intelligent drives using TML_LIB_LabVIEW v2.0 motion control library for PCs. The TML_Lib_LabVIEW includes over 40 ready-to-run examples.

TML_LIB_S7 **(part no. P091.040.S7.UM.xxxx)** – explains how to program in a PLC **Siemens series S7-300 or S7-400** a motion application for the Technosoft intelligent drives using TML_LIB_S7 motion control library. The TML_LIB_S7 library is **IEC61131-3 compatible**.

TML_LIB_CJ1 **(part no. P091.040.CJ1.UM.xxxx)** – explains how to program in a PLC **Omron series CJ1** a motion application for the Technosoft intelligent drives using TML_LIB_CJ1 motion control library for PLCs. The TML_LIB_CJ1 library is **IEC61131-3 compatible**.

TML_LIB_X20 **(part no. P091.040.X20.UM.xxxx)** – explains how to program in a PLC **B&R series X20** a motion application for the Technosoft intelligent drives using TML_LIB_X20 motion control library for PLCs. The TML_LIB_X20 library is **IEC61131-3 compatible**.

If you Need Assistance …

If you want to …	Contact Technosoft at …
Visit Technosoft online	World Wide Web: http://www.technosoftmotion.com/
Receive general information or assistance (see Note)	World Wide Web: http://www.technosoftmotion.com/ Email: sales@technosoftmotion.com
Ask questions about product operation or report suspected problems (see Note)	Tel: +41 (0)32 732 5500 Email: support@technosoftmotion.com
Make suggestions about, or report errors in documentation.	Mail: Technosoft SA Avenue des Alpes 20 CH-2000 Neuchatel, NE Switzerland

1 Safety information

Read carefully the information presented in this chapter before carrying out the drive installation and setup! It is imperative to implement the safety instructions listed hereunder.
This information is intended to protect you, the drive and the accompanying equipment during the product operation. Incorrect handling of the drive can lead to personal injury or material damage.

The following safety symbols are used in this manual:

WARNING! ***SIGNALS A DANGER TO THE OPERATOR WHICH MIGHT CAUSE BODILY INJURY. MAY INCLUDE INSTRUCTIONS TO PREVENT THIS SITUATION***

CAUTION! ***SIGNALS A DANGER FOR THE DRIVE WHICH MIGHT DAMAGE THE PRODUCT OR OTHER EQUIPMENT. MAY INCLUDE INSTRUCTIONS TO AVOID THIS SITUATION***

CAUTION! ***Indicates areas SENSITIVE TO electrostatic discharges (ESD) WHICH REQUIRE HANDLING IN AN ESD PROTECTED ENVIRONMENT***

1.1 Warnings

WARNING! ***THE VOLTAGE USED IN THE DRIVE MIGHT CAUSE ELECTRICAL SHOCKS. DO NOT TOUCH LIVE PARTS WHILE THE POWER SUPPLIES ARE ON***

WARNING! ***TO AVOID ELECTRIC ARCING AND HAZARDS, NEVER CONNECT / DISCONNECT WIRES FROM THE DRIVE WHILE THE POWER SUPPLIES ARE ON***

WARNING! ***THE DRIVE MAY HAVE HOT SURFACES DURING OPERATION.***

WARNING! ***DURING DRIVE OPERATION, THE CONTROLLED MOTOR WILL MOVE. KEEP AWAY FROM ALL MOVING PARTS TO AVOID INJURY***

1.2 Cautions

CAUTION!	***THE POWER SUPPLIES CONNECTED TO THE DRIVE MUST COMPLY WITH THE PARAMETERS SPECIFIED IN THIS DOCUMENT***

CAUTION!	***TROUBLESHOOTING AND SERVICING ARE PERMITTED ONLY FOR PERSONNEL AUTHORISED BY TECHNOSOFT***

CAUTION!	***THE DRIVE CONTAINS ELECTROSTATICALLY SENSITIVE COMPONENTS WHICH MAY BE DAMAGED BY INCORRECT HANDLING. THEREFORE THE DRIVE SHALL BE REMOVED FROM ITS ORIGINAL PACKAGE ONLY IN AN ESD PROTECTED ENVIRONMENT***

To prevent electrostatic damage, avoid contact with insulating materials, such as synthetic fabrics or plastic surfaces. In order to discharge static electricity build-up, place the drive on a grounded conductive surface and also ground yourself.

1.3 Quality system, conformance and certifications

qualityaustria Succeed with Quality IQNet	**IQNet** and **Quality Austria** certification about the implementation and maintenance of the Quality Management System which fulfills the requirements of Standard **ISO 9001:2015**.
	Quality Austria Certificate about the application and further development of an effective **Quality Management System** complying with the requirements of Standard **ISO 9001:2015**
REACH	**REACH Compliance -** TECHNOSOFT hereby confirms that this product comply with the legal obligations regarding Article 33 of the European REACH Regulation 1907/2006 (Registration, Evaluation, Authorization and Restriction of Chemicals), which came into force on 01.06.2007.
ROHS	**RoHS Compliance -** Technosoft SA here with declares that this product is manufactured in compliance with the RoHS directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
CE	Technosoft SA hereby declares that this product conforms to the following European applicable directives: **2014/30/EU** **Electromagnetic Compatibility (EMC) Directive** **2014/35/EU** **Low Voltage Directive (LVD)** **93/68/EEC** **CE Marking Directive**
CONFLICT MINERALS	**Conflict minerals statement -** Technosoft declares that the company does not purchase 3T&G (tin, tantalum, tungsten & gold) directly from mines or smelters... We have no indication that Technosoft products contain minerals from conflict mines or smelters in and around the DRC.

For other certifications visit: https://technosoftmotion.com/en/quality/

2 Product Overview

2.1 Introduction

The **Micro 4804** is a family of fully digital intelligent servo drives that combine the latest DSP technology with an integrated motion controller, delivering exceptional drive performance in a compact size.

Suitable for controlling **brushless DC**, **brushless AC** (vector control), **DC brushed** motors, and **step** motors, the Micro 4804 accepts various types of position feedback, including incremental encoders (quadrature), absolute encoders (SSI, BiSS, Panasonic, Tamagawa, EnDAT, Nikon, Sanyo Denki), and digital or linear Hall signals.

All drives perform position, speed or torque control and work in single, multi-axis or stand-alone configurations. Thanks to the embedded motion controller, the Micro 4804 drives combine controller, drive and PLC functionality in a single compact unit and are capable to execute complex motions without requiring intervention of an external motion controller. Using the high-level Technosoft Motion Language (TML) the following operations can be executed directly at drive level:

- Configuring various motion modes (profiles, PVT, PT, electronic gearing[1] or camming[1], etc.)
- Switching between motion modes and adjusting motion parameters.
- Executing homing sequences
- Controlling the program flow through:
  - Conditional jumps and calls of TML functions
  - TML interrupts triggered by pre-defined or programmable conditions (e.g., protection triggers, limit switch transitions, or capture inputs)
  - Waits for programmed events to occur
- Managing digital I/O and analog input signals.
- Executing arithmetic and logic operations
- Transferring data between axes
- Controlling the motion of one axis from another via inter-axis motion commands
- Sending commands to a group of axes (multicasting), including the ability to start motion sequences on all axes in the group simultaneously
- Synchronizing all the axes from a network

By implementing motion sequences directly at the drive level, intelligence can be effectively distributed between the master and the drives in complex multi-axis applications, significantly reducing both development time and overall communication requirements. For instance, rather than commanding each movement of an axis individually, the drives can be programmed using TML to execute complex motion tasks autonomously and notify the master upon completion. Consequently, the master's role in controlling each axis is minimized to simply calling TML functions stored in the drive's EEPROM and awaiting a confirmation message indicating the completion of these functions.

All Micro 4804 CAN drives are equipped with a **CAN 2.0B** interface that can be set to operate in 2 communication protocol modes:

- **CANopen**
- **TMLCAN**

When **CANopen** mode is selected, the drive conforms to **CiA 301 v4.2** application layer communication profile, the **CiA WD 305 v2.2.13** and **CiA DSP 402 v4.1.1** device profile for drives and motion control, now included in IEC 61800-7-1 Annex A, IEC 61800-7-201 and IEC 61800-7-301 standards. In this mode, the drive may be controlled via a CANopen master. The drive offers the possibility for a CANopen master to call motion sequences/ functions, written in TML and stored in the drive EEPROM, using manufacturer specific objects. Also, the drives can communicate separately between each other by using non reserved 11 bit identifiers.

When **TMLCAN** mode is selected, the unit behaves as standard Technosoft intelligent drive and conforms to Technosoft protocol for exchanging **TML commands via CAN-bus**. When TMLCAN protocol is used, it is not mandatory to have a master. Any drive can be set to operate standalone, and may play the role of a master to coordinate both the network communication/synchronization and the motion application via **TML commands** sent directly to the other drives.

For higher-level coordination, besides a master, the Micro 4804 drives can also be controlled via a PC or PLC using one of the **TML_LIB motion libraries**.

For commissioning the Micro 4804, the EasyMotion Studio II PC application is available in two versions: LITE and FULL.

[1] Available if the master axis sends its position via a communication channel, or by using the secondary encoder input

The LITE version simplifies the setup process for any Technosoft drive, enabling quick **commissioning**. It generates setup data that can be downloaded into the drive's EEPROM or saved as a file on a PC. Upon power-up, the drive initializes with the setup data from its EEPROM. Additionally, the LITE version allows for the retrieval of complete setup information from a previously programmed drive and is available for free download from the Technosoft website.

The FULL version of EasyMotion Studio II is designed for **commissioning** and **advanced motion programming**. It supports the development of complex motion programs using TML, which are executed locally by the drive's integrated motion controller.

While the LITE version includes only the setup functionality, making it suitable for scenarios where motion programming is managed through a CANopen/EtherCAT master or a PC/PLC using Technosoft's TML_LIB motion libraries, it can be upgraded to the FULL version by entering a **license number** obtained from Technosoft.

2.2 Product Features

- Fully digital servo drive suitable for the control of rotary or linear **brushless**, **DC brush**, and **step** motors
- **Open or closed-loop** control of 2 and 3-phase steppers
- Very compact design
- **Sinusoidal (FOC)** or **trapezoidal (Hall-based)** control of brushless motors
- **Technosoft Motion Language (TML)** instruction set for the definition and execution of motion sequences
- Standalone operation with stored motion sequences
- **Motor supply**: 7-48V; **Logic supply**: 6-48V; **PWM switching frequency**: up to 100kHz
- **Output current:**
  - **Nominal**:
    - **Micro 4804 MZ**: $3A_{RMS}$ / 4.2A amplitude;
    - **Micro 4804 LZ**: $3A_{RMS}$ / 4.2A amplitude;
    - **Micro 4804 PZ**: $4A_{RMS}$ / 5.6A[1] amplitude;
    - **Micro 4804 CZ**: $4A_{RMS}$ / 5.6A amplitude.
  - **Peak**: $10A_{RMS}$ / 14A amplitude.
- **Communication**:
  - USB;
  - RS-232
  - For **CAN** executions: CAN-bus 2.0B up to 1Mbit/s (for CAN drives);
  - For **CAT** executions:
    - **MZ, PZ and LZ executions:** EtherCAT® connection to standard RJ45 requires external magnetics (may be integrated into RJ45)
    - **CZ execution:** Dual 100Mbps EtherCAT® interfaces, communication cycle time down to 10 kHz.
- **Thermal Protection**: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 105°C
- **Various modes of operation**, including:
  - Position profiles with trapezoidal or S-curve speed shape
  - Position, Velocity, Time (PVT) 3rd order interpolation
  - Position, Time (PT) 1st order interpolation
  - Electronic gearing and camming
  - 40 Homing modes
  - **CAN version:** torque, speed or position control; position or speed profiles, Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV) and Cyclic Synchronous Torque (CST) for CANopen mode; external reference mode (analogue or encoder feedback) or sent via a communication bus
  - **EtherCAT version:** position or speed profiles, Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV) and Cyclic Synchronous Torque (CST)
- **Digital and analog I/O's:**
  - **1 x analogue** input software selectable: 12-bit 0-5V or ±10V: Reference, Feedback or general purpose
  - **3 x digital inputs**: 2 for limit switches + one Enable, NPN, pull-to-GND to activate, pull-up on-board to +5V. Pull to GND to activate

[1] Limited to $3A_{RMS}$ / 4.2A amplitude nominal using the recommended mating connectors. For current values >$3A_{RMS}$ pins needs to be soldered.

- **3 x configurabile I/O's**, each software selectable as:
  - Digital input, NPN, with pull-up on-board to +5V. Pull to GND to activate;
  - Digital output, NPN (open-collector), with pull-up on-board to +5V. Sink current: 1 x 1.5A to drive inductive loads (such as mechanical brake), 2 x 0.1A.

- **Feedback devices:** Single-loop support is available for the Micro 4804 LZ, while dual-loop support is offered for the Micro 4804 MZ, PZ and CZ.
  - **1 x Hall sensor interface** (digital or linear)

  1st feedback devices supported:
  - **Incremental A / B** (index Z available only for 1 encoder): differential or single-ended
  - **Pulse & direction** interface (single-ended or differential) for external (master) digital reference
  - **Absolute[1]:** differential or single-ended encoder. Supported protocols: SSI, BiSS, EnDAT, TAMAGAWA, Panasonic, Nikon, Sanyo Denki

  2nd feedback devices supported[2]:
  - **Incremental encoder** interface:
    - Micro 4804 MZ/PZ: Incremental A / B: differential or single-ended
    - Micro 4804 CZ: Incremental A / B: differential
  - **Pulse & direction** interface for external (master) digital reference
  - **Absolute:** differential or single-ended encoder. Supported protocols: SSI, BiSS, EnDAT, TAMAGAWA, Panasonic, Nikon, Sanyo Denki
- **For CAN executions** - two CAN operation modes selectable by HW pin:
  - **CANopen** – conforming with **CiA 301 v4.2, CiA DSP 402 v3.0** and **CiA 305 v.2.2.13**
  - **TMLCAN** – intelligent drive conforming with Technosoft protocol for exchanging TML commands via CAN-bus
- **For CAT executions** - supported protocols:
  - **CoE** - CAN application protocol over EtherCAT
  - **FoE** – File over EtherCAT – for setup/TML functions and firmware update
  - **EoE** – Ethernet over EtherCAT – for Easy Motion Studio communication over EtherCAT
- **16K × 16 SRAM** memory for data acquisition
- **24K × 16 E²ROM** to store TML motion programs, cam tables and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- **Voltage efficiency**: >99%
- Feature that **detects breakage** of **Hall wires** and/or of **incremental/absolute encoder wires**
- **Protections:**
  - Short-circuit between motor phases
  - Short-circuit from motor phases to ground
  - Over-voltage
  - Under-voltage
  - Over-current
  - Over-temperature
  - Communication error
  - Control error

[1] Absolute encoders are not supported by the Micro 4804 LZ (P020.022.E102 and P020.022.E122)

[2] The second feedback is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

2.3 Identification Labels

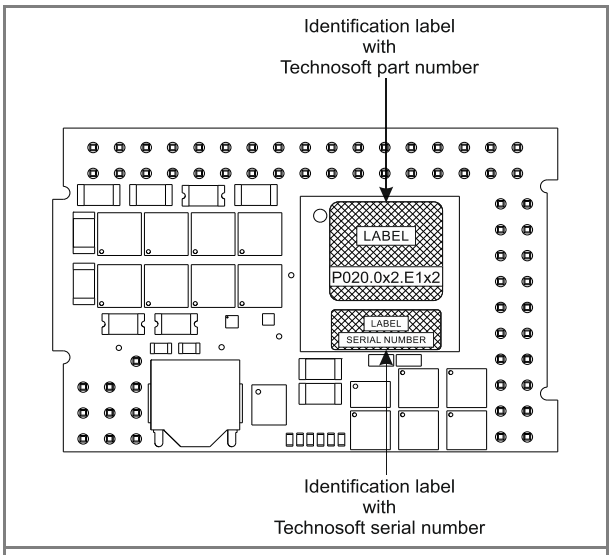


Figure 2-1 ***Micro 4804 MZ and LZ identification labels***

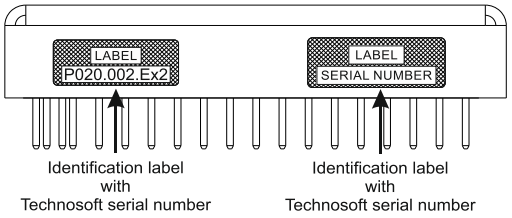


Figure 2-2 ***Micro 4804 PZ identification labels***

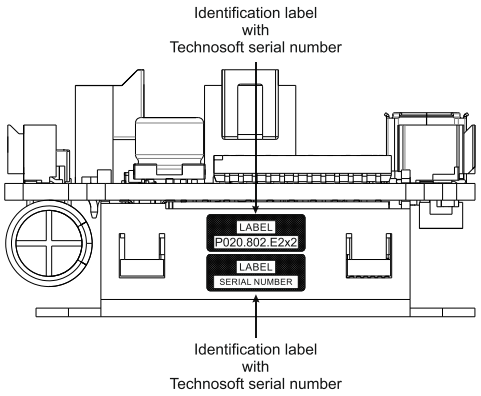


Figure 2-3 ***Micro 4804 CZ identification labels***

The **Micro 4804 c**an have the following part numbers and names on the identification label:

Product Name	Part Number
Micro 4804 MZ-CAT	P020.002.E122
Micro 4804 MZ-CAN	P020.002.E102
Micro 4804 PZ-CAT	P020.002.E322
Micro 4804 PZ-CAN	P020.002.E302
Micro 4804 CZ-CAT	P020.802.E222
Micro 4804 CZ-CAN	P020.802.E202
Micro 4804 LZ-CAT	P020.022.E122
Micro 4804 LZ-CAN	P020.022.E102

2.4 Supported Motor-Sensor Configurations

2.4.1 Single loop configurations

The position and/or speed are controlled using one feedback sensor. The other available feedback sensor input can be used for External reference Position or Velocity, Pulse and Direction, Electronic Gearing or Camming.

Motor sensors				Motor types		
Encoder[1]	Digital Halls	Linear Halls	Tacho	Brushless PMSM[2]	Brushless BLDC[3]	Brushed DC Voice coils
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[56]				✓		✓
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[56]	✓			✓	✓	
None	✓			✓		
None		✓		✓		
None			✓			✓

2.4.2 Dual loop configurations[7]

The motor speed control loop is closed on one feedback connected on the motor while the motor position control loop is closed on the other available feedback which is placed on the load. There is usually a transmission between the load and the motor.

Motor sensor				Motor types			Load sensors
Encoder[1]	Digital Halls	Linear Halls	Tacho	Brushless PMSM[2]	Brushless BLDC[3]	Brushed DC Voice coils	Encoder[8]
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[5]				✓		✓	Incremental encoder[4]/ SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[5]	✓			✓	✓		Incremental encoder[4]/ SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki
None	✓			✓			Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[9]
None		✓		✓			Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[10]
None			✓			✓	Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki

Each defined motor type can have any combination of the supported feedbacks either on motor or on load.

Example: PMSM motor with Incremental encoder (from feedback #1) on motor and Incremental encoder (from feedback#2) on load

[1] Motor encoder can be either on Feedback 1 or on Feedback 2
[2] Sinusoidal. Brushless motor is controlled as PMSM using a field oriented control algorithm
[3] Trapezoidal. Brushless motor is controlled as a BLDC motor using Hall-based commutation.
[4] Single-ended or differential. Only differential on Feedback 2 for Micro 4804 CZ
[5] SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki are differential, but single-ended option is also accepted
[6] Absolute encoders (SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki) are not supported by the Micro 4804 LZ (P020.022.E102 and P020.022.E122).
[7] Feedback 2 is not available for the Micro 4804 LZ (models P020.022.E102 and P020.022.E122), therefore dual-loop configurations are not supported.
[8] Load encoder is on Feedback 2 / 1, if motor encoder is on Feedback 1 / 2
[9] Load encoder can be only on Feedback 1
[10] Load encoder can be only on Feedback 2

3 Hardware Installation

3.1 Micro 4804 MZ and LZ Dimensions

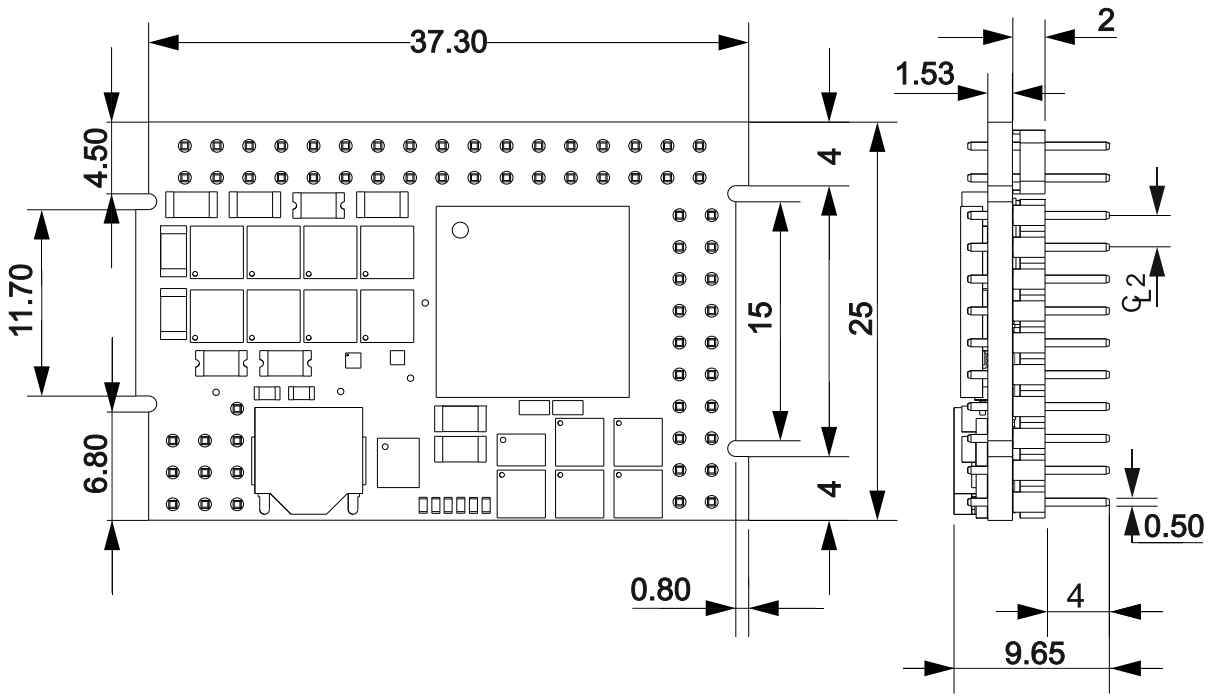


Figure 3-1 **Micro 4804 MZ dimensions**

3.2 Micro 4804 PZ Dimensions

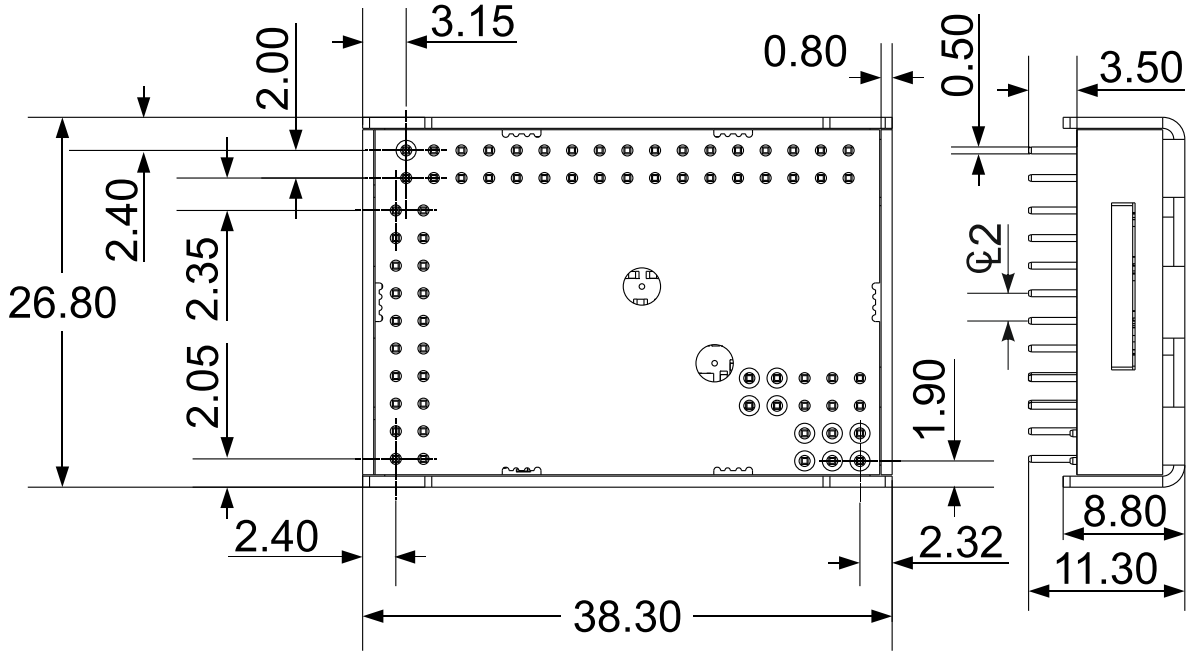


Figure 3-2 **Micro 4804 PZ dimensions**

3.3 Micro 4804 CZ-CAN Dimensions

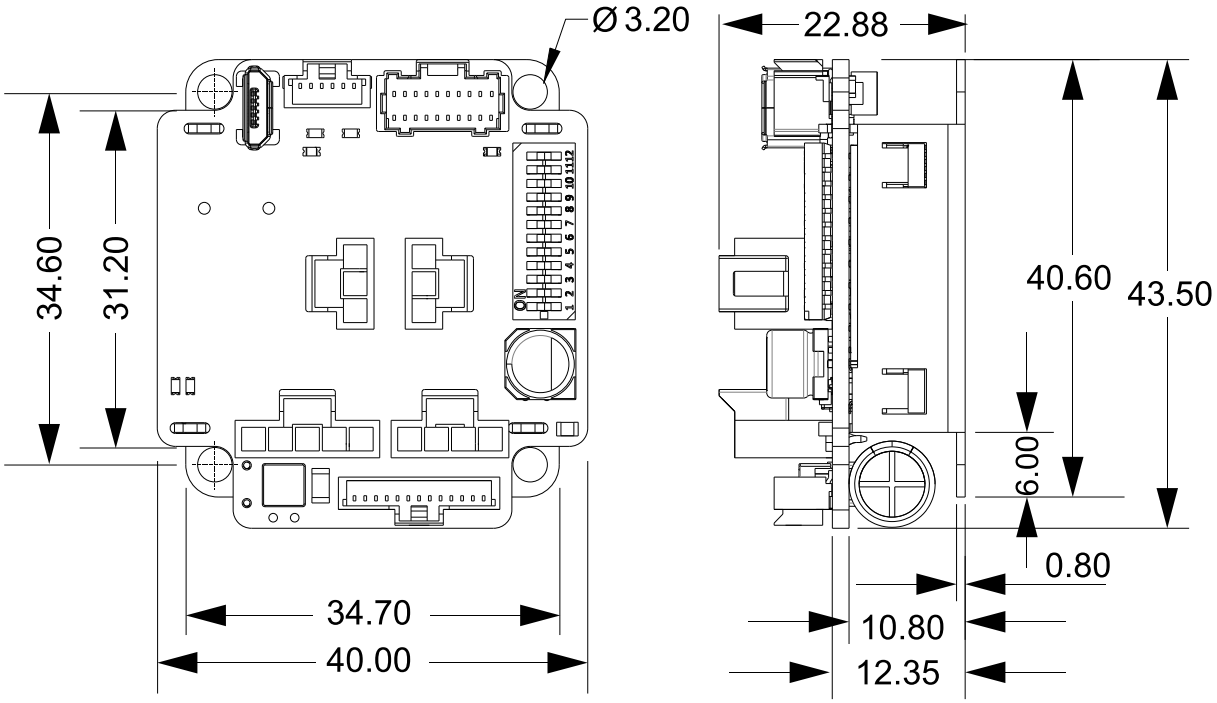


Figure 3-3 ***Micro 4804 CZ-CAN dimensions***

3.4 Micro 4804 CZ-CAT Dimensions

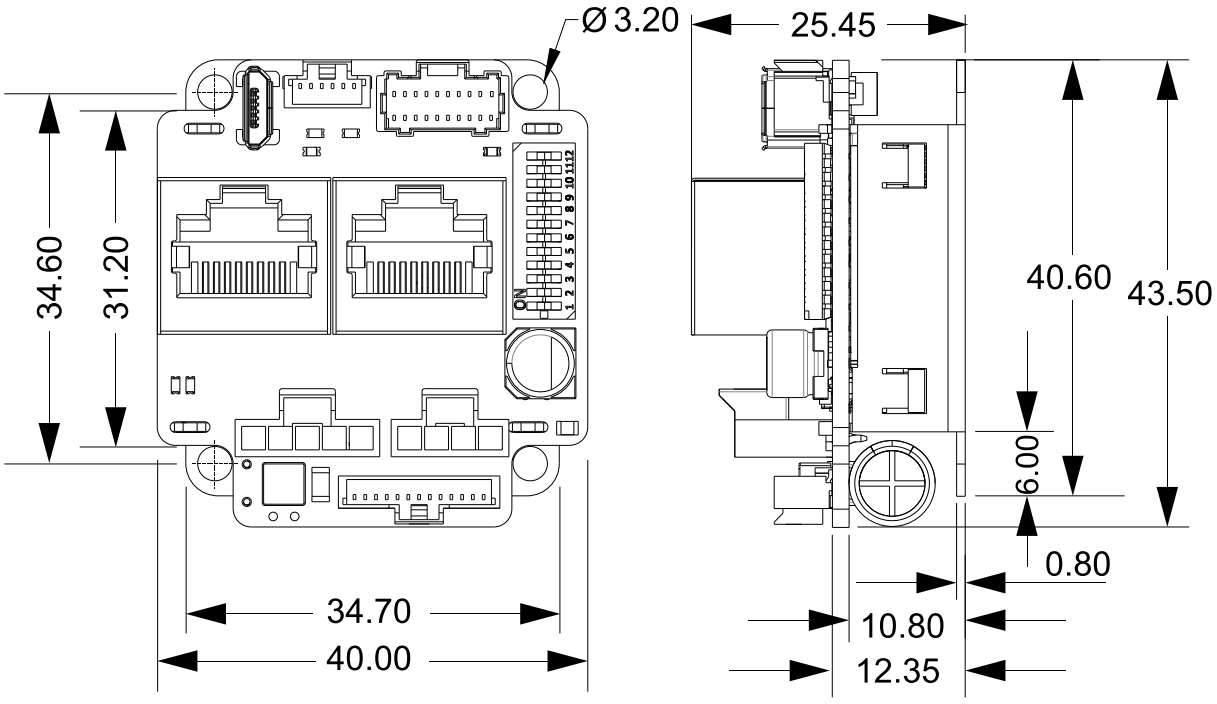


Figure 3-4 ***Micro 4804 CZ-CAT dimensions***

3.5 Mechanical Mounting

The ***Micro 4804 MZ/PZ/LZ*** is intended to be mounted horizontally on a motherboard equipped with the recommended mating connectors, as specified in chapter *3.3.2.1*. Motherboard PCB Design. Several drives can be hosted by a single motherboard.

The ***Micro 4804 CZ*** is intended to be mounted vertically or horizontally on a metallic support using the provided mounting holes and the recommended mating connectors.

The recommended inserts and screws for ***Micro 4804 CZ*** are:

Image	Connector	Description	Manufacturer	Part Number
	-	Self-clinching nuts M3	PennEngineering® (PEM®)	KF2-M3-ET
	-	Screws M3x10	Bossard	BN610-M3x10

For thermal calculations: the ***Micro 4804*** can be assumed to generate 1.5 Watt (=5.1 BTU/hour) at idle, and up to 2.8 Watt (=9.5 BTU/hour) worst case while driving a motor.

3.5.1 Recommended spacing for Micro 4804 MZ/PZ/LZ

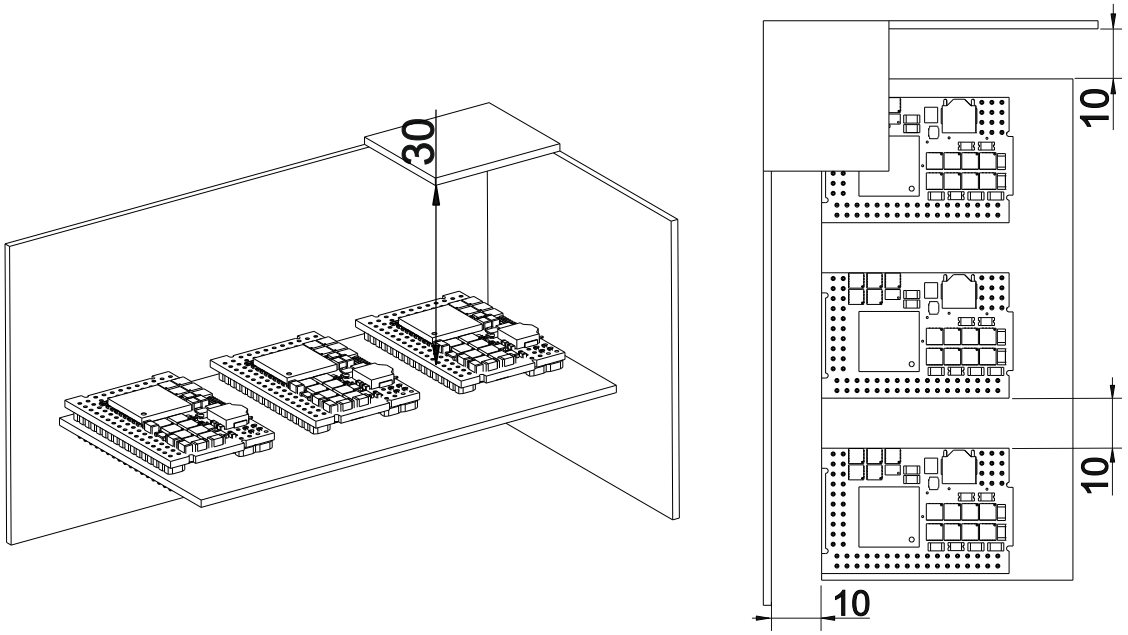


Figure 3-5 ***Recommended spacing - horizontal mounting, worst case: non-metallic, closed box (All dimension are expressed in mm)***

The figures above shows the minimum spacing to assure proper airflow by natural convection. If closed completely in a box, ventilation openings shall be foreseen on the top and bottom sides. If ventilation driven by natural convection is not enough to maintain the temperature surrounding the drives, then alternate forced cooling methods must be applied.

Remark: *In case of using a metallic box, with ventilation openings, all spacing values may be reduced substantially. With proper ventilation, keeping the air surrounding the drive inside the limits indicated, the spacing values may be reduced down to zero*.

3.5.2 PCB Design

For Micro 4804 MZ and LZ motherboard PCB design, please refer to the following dimensional drawing:

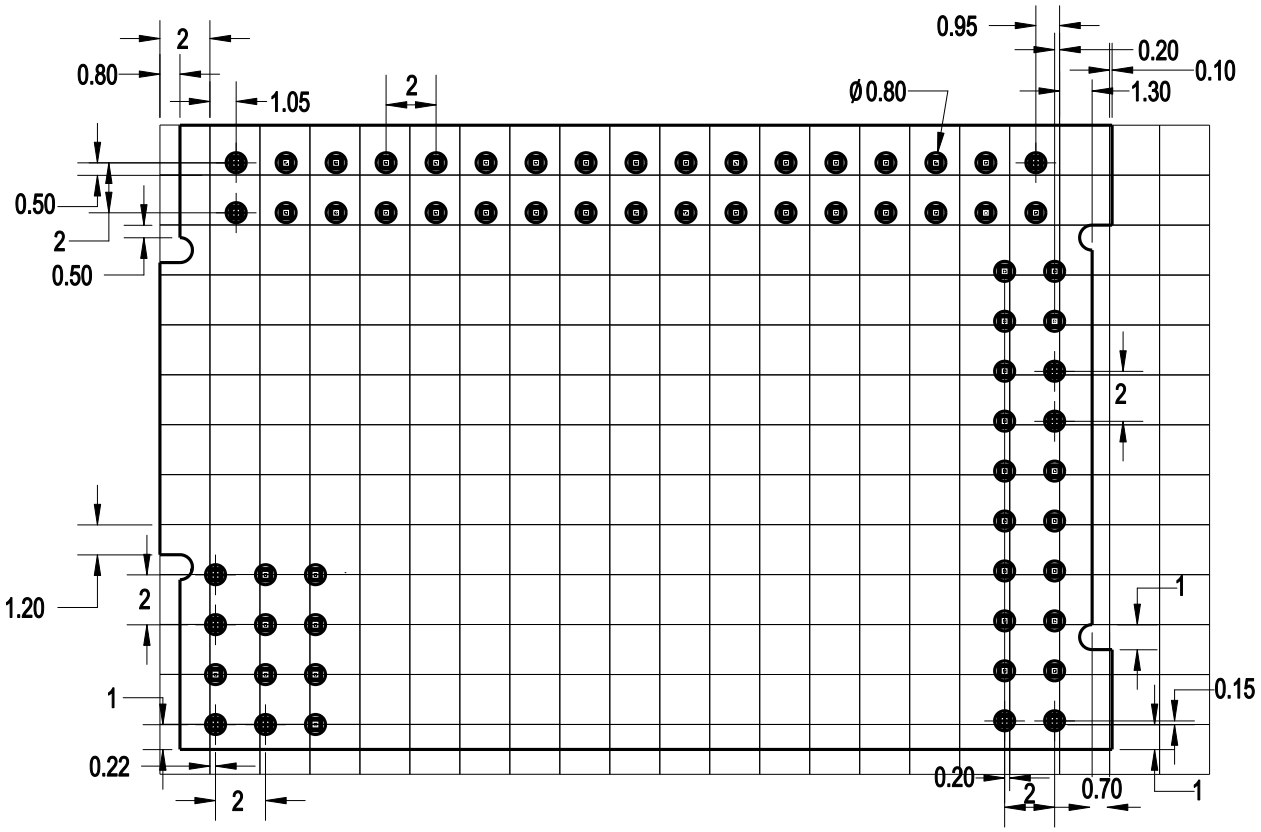


Figure 3-6 **Micro 4804 MZ PCB Footprint**

For the Micro 4804 PZ motherboard PCB design, please refer to the following dimensional drawing:

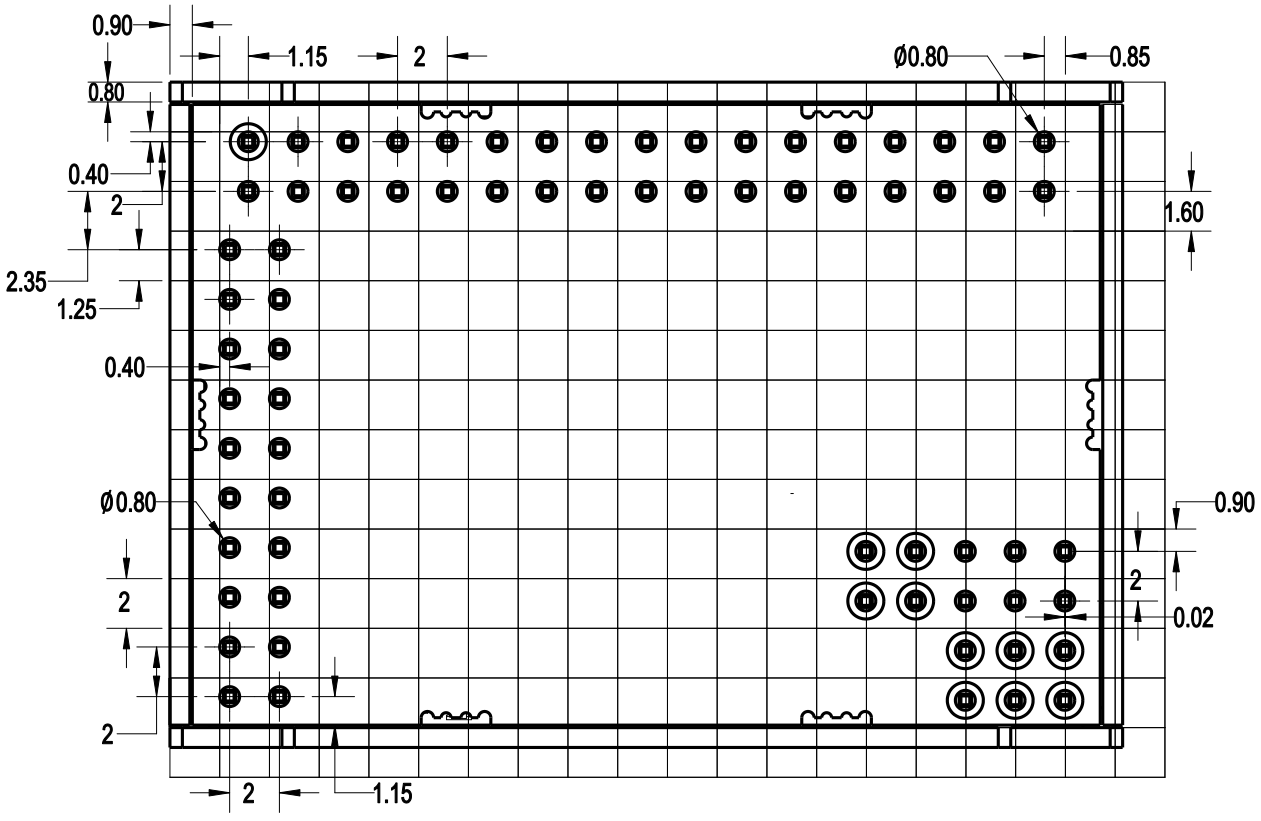


Figure 3-7 **Micro 4804 PZ PCB Footprint**

3.5.2.1 Motherboard PCB Design

It is recommended to use a multi-layer PCB for the motherboard to provide sufficient space for routing all the pins of the Micro 4804 MZ/PZ/LZ drives. While a 2-layer PCB can be used, this may require leaving some pins unconnected.

The Micro 4804 MZ/PZ/LZ drives are designed to be mounted on a mainboard. The preferred method for electrical connection is to use sockets on the mainboard; however, direct soldering of the module into the mainboard is also an option.

3.5.2.2 Recommendations for the PCB Design

Below is a list of recommendations for the PCB design of the motherboard:

- Motor supply and motor outputs: use islands / areas of copper to escape connector area; this will maximize current capability. When using simple tracks, use at least 100mil cross section (75mil track width for 1oz/ft^2 copper thickness) – for Micro 4804 MZ/PZ/LZ drives.
- Motor supply and ground return tracks between Micro 4804 MZ/PZ/LZ drive and the nearby V_{MOT} decoupling capacitor are to be considered as EMI sources, and kept to a minimum length.
- Place the decoupling capacitors on V_{MOT} and V_{LOG} (see also 3.10 Power Supply Connection) as close as physically possible to the drive, to minimize EM radiated emissions. For un-shielded applications (no metallic box) and typical EMC regulations, the spacing between drive and capacitors must be less than 3 centimeters.
- In multi-axis applications (multiple Micro 4804 MZ/PZ/LZ drives on the same motherboard), it is preferable to have a separate decoupling capacitor for each drive's V_{MOT}. For V_{LOG} it is acceptable to share one decoupling capacitor for two drives.
- For stringent EMI requirements, it may be necessary to add common-mode filtering on the motor and/or logic supply inputs. Be sure to use 3-phase EMC filters, not 2-phase filters, in order to fulfill the basic requirement of zero common-mode current through the filter. This is necessary because the ground negative return is shared between V_{MOT} and V_{LOG}.
- Motor outputs shall be routed with parallel traces, and minimizing the loop area between these tracks. Avoid placing components above or below the motor output tracks, as these components may become effective antennas radiating EMI. If possible, route all 3 motor outputs in strip-line configuration (above or below a ground plane).
- For stringent EMI requirements, it may be necessary to add common-mode inductors on the motor outputs. Place these filters near the Micro 4804 MZ/PZ/LZ drive, not near the external connector, to reduce radiation from the PCB tracks.
- Motor outputs must be separated from any nearby track (on the same layer) by a guard ring / track / area connected to ground. It is recommended to use the same guarding precaution also for tracks on nearby layers, i.e. use intermediate guard layer(s) connected to ground. The motor outputs must be treated as first source of noise on the motherboard. Second source of noise is the current flow between each drive and it's decoupling V_{MOT} capacitor.
- For best EMC performance, it is strongly recommended to provide an un-interrupted ground plane on one of the inner layers.
- All GND pins of the Micro 4804 MZ/PZ/LZ drive are galvanically connected together on-board. If the motherboard provides an uninterrupted ground plane, it is recommended to connect all GND pins to the ground plane, and use the ground plane to distribute GND wherever needed. If the motherboard does not provide an uninterrupted ground plane, it is best to use each GND pin for its intended purpose. This will create local "star point" ground connection on-board each drive.
- For a multi-axis motherboard with one common power supply for all motors, each motor power supply return track shall be routed separately for each Micro 4804 MZ/PZ/LZ drive, and star-point connected at the power supply terminal.
- The following signal pairs must be routed differentially, i.e. using parallel tracks with minimal loop area: A1+/DAT1+, A1-/DAT1- ; B1+/CLK1+, B1-/CLK1- ; Z1+, Z1- ; A2+/DAT2+, A2-/DAT2- ; B2+/CLK2+, B2 /CLK2-; CAN-Hi, CAN-Lo.
- When using +5V_{OUT} as supply for external devices (like encoders, Hall sensors, etc.) provide extra filtering and protection: use series resettable (PTC) fuses to add short-circuit protection; use transient absorbers to protect against ESD and over-voltage; add high-frequency filtering to protect against external noise injected on +5V_{OUT}.
- The outer box / case / cabinet must be connected to the motherboard ground either galvanically (directly) or through high-frequency decoupling capacitors, rated at an appropriate voltage.
- For PZ and CZ versions, the outer metallic shell of the drive is weakly connected to GND, but electrical contact cannot be guaranteed, so do not use this metallic shell for any electrical purpose. Its purpose is only for thermal dissipation, EMC shielding, ESD protection and mechanical/environmental protection.

3.5.2.3 EtherCAT signals PCB routing indications

3.5.2.3.1 PCB electrical Wiring calculations

$$Z_{DIFF} = \frac{174}{sqrt(1.41 + E_r)}\left(1 - 0.48e\left(-0.96\frac{S}{H}\right)\right)\ln\left(\frac{5.98H}{0.8W + T}\right)$$

W = Width of the trace
H = Height of dielectric above the return plane
T = Trace thickness
S = Space between traces
E_r = Relative permittivity of the dielectric

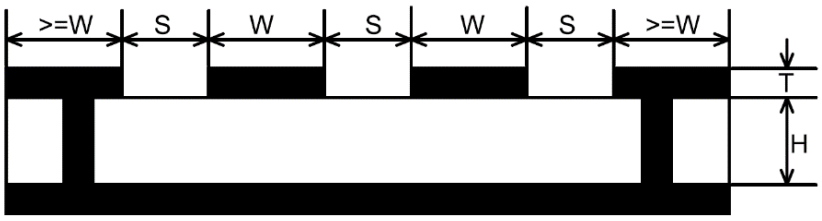


Figure 3-8 **Microstrip Differential Impedance**

For example:

$$\begin{cases} T = 17.5\ microns \\ H = 175\ microns \\ E_r = 4.8(FR4) \\ W = 8mil \\ S = 7\ mil \end{cases} \rightarrow Z_{DIFF} = 100.6\ \Omega$$

$$Z_{DIFF} = \frac{200}{sqrt(E_r)}\left(1 - 0.347e\left(-2.9\frac{S}{H}\right)\right)\ln\left(\frac{1.9(2H + T)}{0.8W + T}\right)$$

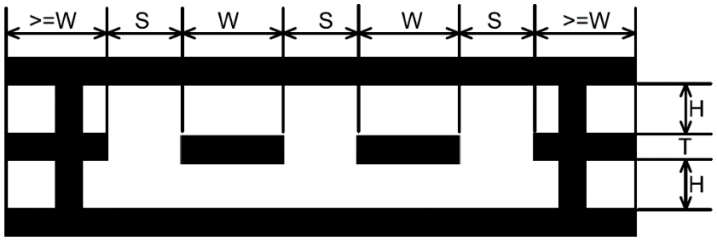


Figure 3-9 **Stripline Differential Impedance**

For example:

$$\begin{cases} T = 17.5\ microns \\ H = 175\ microns \\ E_r = 4.8(FR4) \\ W = 4mil \\ S = 4\ mil \end{cases} \rightarrow Z_{DIFF} = 100.2\ \Omega$$

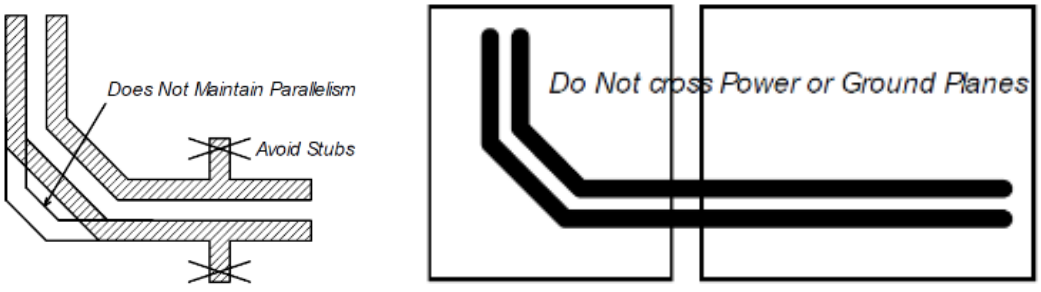


Figure 3-10 **Stripline Differential Impedance**

3.5.2.3.2 PCB EtherCAT routing indications applicable to Micro 4804 MZ/PZ/LZ version

- High-speed signals (Tx/Rx 0/1 +/-) must be routed as differential pairs, with controlled impedance, microstrip or stripline with 100 ohm differential characteristic impedance.
- Microstrip and stripline pairs shall be guarded on the same layer as the differential pair, with outer traces connected to the return plane by vias. The guarding traces shall form preferably a closed ring, wherever possible.
- Use above formulae (or other method) to calculate microstrip or stripline differential impedance
- Avoid stubs, crossovers and vias on high-speed signals. Vias present impedance discontinuities and should be avoided. Route an entire differential pair trace on a single layer if possible.
- High-speed signals should not be run such that they cross a plane split. A signal crossing a plane split may cause unpredictable return path currents and would likely impact signal quality, also potentially creating EMI problems.
- The center tap of the magnetics non-isolated winding (connected to drive) shall be connected to J1 dedicated GND pins 15 and 16. Avoid using these two pins for other purposes, such as connecting them to the system-wide ground plane, because this may create unwanted voltage drops affecting quality of EtherCAT signals. For example, do not use these two pins to carry motor supply current, which contains harmful harmonics in the frequency range of EtherCAT signals. Practically, keep these two connections isolated from system GND.
- Return plane(s) for differential signals shall be connected to J1 dedicated GND pins 15 and 16. If possible, keep these local return plane(s) isolated from each other, and mandatorily keep them isolated from system-wide GND plane. Maintaining isolation between port 0 and port 1 local return planes is optimal for noise rejection. If this is not possible due to routing constraints, then strap the pins near the drive, but always keep this local return plane(s) separate from GND plane, to avoid circulating currents from power supply(ies).
- The center tap of the magnetics isolated winding has a "Bob Smith" termination to system ground. "Bob Smith" termination is used to reduce noise resulting from common-mode current flows, as well as reduce susceptibility to any noise from unused wire pairs on the RJ45.
- "Bob Smith" termination is different depending on Power Over Ethernet (PoE) compliance. PoE carries up to 57V between pairs, which would destroy the 75ohm terminating resistors if DC blocking capacitors of 10nF are not in place.
- Capacitor 1nF 2KV must sustain 1.5KVrms for 1 minute as per IEEE802.3. The 1Meg discharge resistor may be destroyed during this hi-pot testing.
- For enhanced EMC immunity it is possible to add surge protectors on the high-speed signals, on the isolated side of the magnetics (not across pins, there is DC current flowing through windings). Check that signals are not affected by the added parasitic capacitance.
- Use magnetics with integrated common-mode choking devices. Use magnetics compatible with Auto MDI/MDI-X (with symmetrical windings). Use metal shielded connectors, and connect the shield to device chassis / PE.
- Do not run any signals under the magnetics - this could cause unwanted noise crosstalk. Likewise void the planes under magnetics, this will help prevent common-mode noise coupling.
- To save board space and reduce component count, RJ45 connectors with integrated magnetics may be used. Check the PoE compliance where applicable.
- It is recommended to use magnetics in between two drives mounted on the same mainboard PCB, as shown in *Figure 3-13* **EtherCAT wiring for connection between Micro 4804 MZ/PZ/LZ drives**.
- It is NOT recommended to directly connect two modules on the same PCB via EtherCAT over a very short distance without using magnetics. This method is NOT recommended because it is very sensitive to the design quality of the mainboard, specifically to the voltage difference between drives' ground potential (ground bounce), which can lead to packet loss when PCB design is not done correctly. So, we do NOT encourage this approach. But technically this is feasible. Direct (galvanic) connection, without any extra components, between Rx and Tx, will work (the Micro 4804 has on-board DC blocking capacitors series with all EtherCAT signals). For an error-free direct-connection, follow the following PCB design rules:
    - Make sure you use one (or preferably more) GND plane(s) on the mainboard, to minimize ground voltage difference between boards.
    - Make sure you use isolated local return plane(s) to implement stripline or microstrip, controlled-impedance, differential routing of the high-speed Ethernet signals.
    - Do not use the local return plane(s), which implements stripline / microstrip, to carry current, for example as ground return for V_{MOT}.
- A possible method is to connect the local return plane(s) using capacitors of 10nF...22nF, connected at both ends (drives) of the local return plane(s). This will break the unwanted current paths, while keeping the high-frequency return path.

3.5.2.3.3 EtherCAT Bus connection

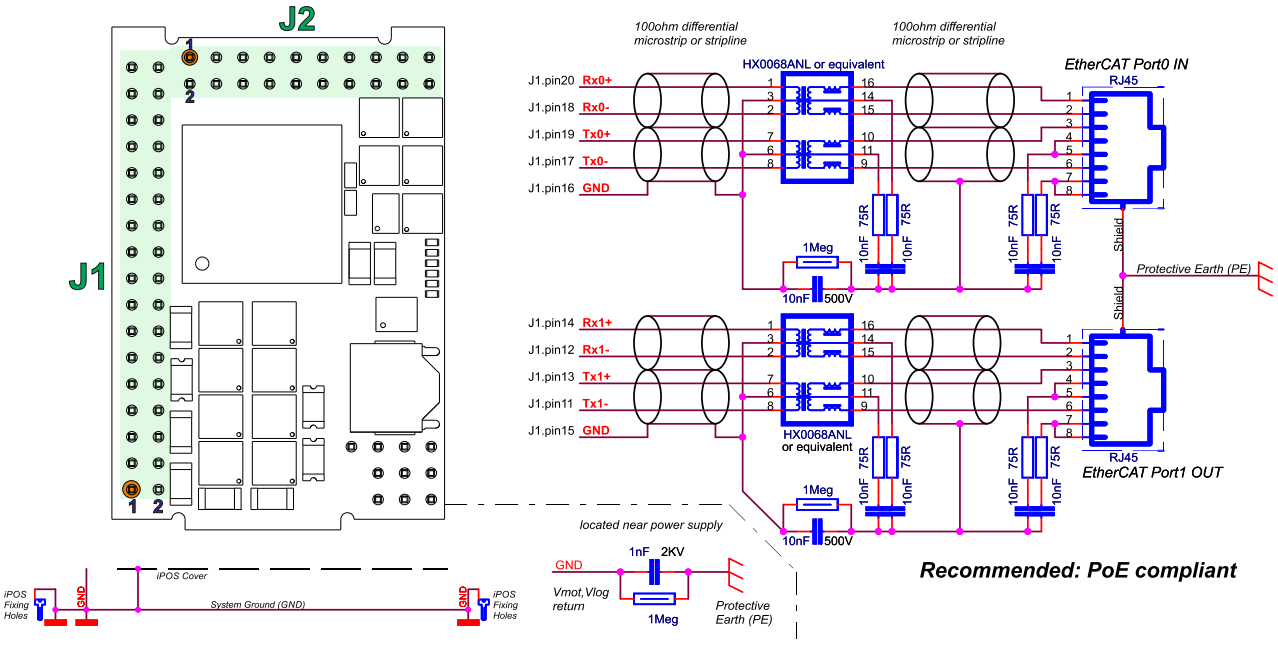


Figure 3-11 **EtherCAT bus to RJ45 connection PoE compliant**

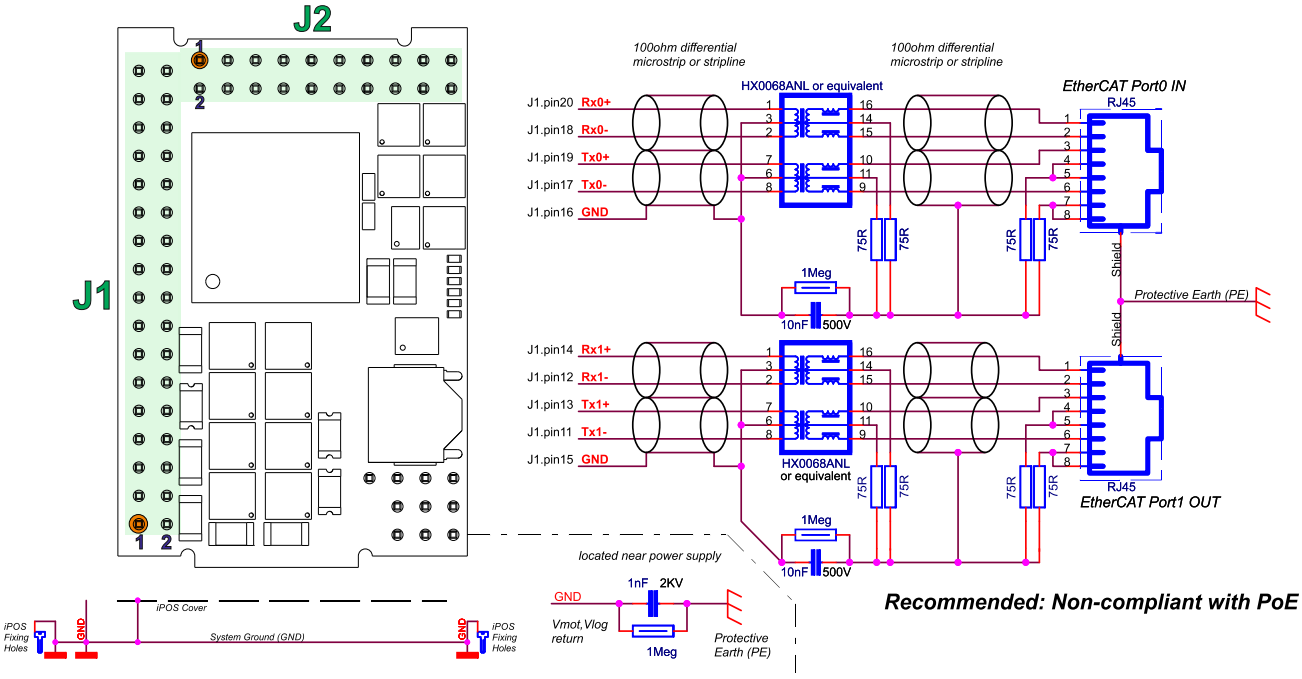


Figure 3-12 **EtherCAT bus to RJ45 connection non-compliant with PoE**

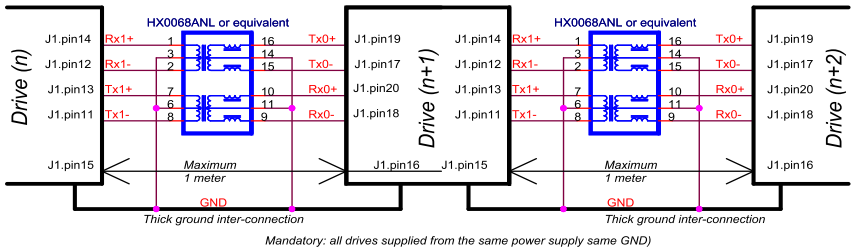


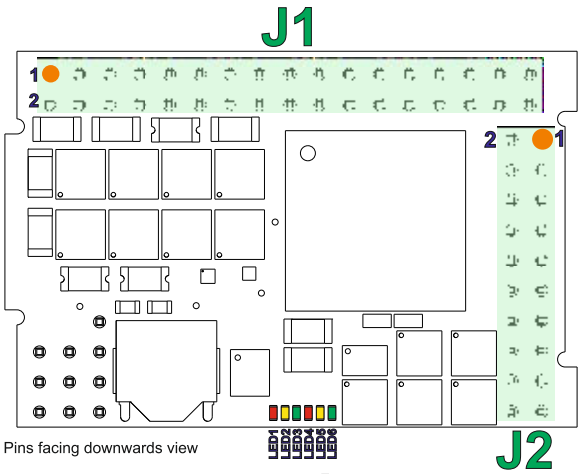
Figure 3-13 **EtherCAT wiring for connection between Micro 4804 MZ/PZ/LZ drives**

For additional details regarding signal swapping, please check the EtherCAT signals schematic considerations chapter

3.6 Connectors and Pinouts

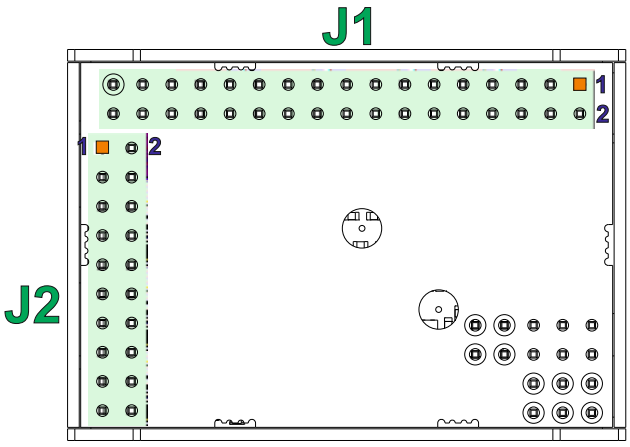
3.6.1 Pinouts for Micro 4804 MZ/PZ

Micro 4804 MZ



Pins facing downwards view

Micro 4804 PZ



Pins facing upwards view

J1

Pin	Name	Description
1	+Vlog	Positive terminal of the logic supply input: 6 to 48 VDC
2	A	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
3	GND	Ground return for logic supply
4	B	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5	GND	Shield for motor windings cable
6	C	Phase C for 3-ph motors, B+ for 2-ph steppers
7	+Vmot	Positive terminal of the motor supply: 7 to 48 VDC
8	Cr/B-	Chopping resistor / Phase B- for 2-ph steppers
9	BFS	Connect to GND to perform a firmware update after a critical firmware failure
10	ID2	*AxisID*[2] selection pin. See *AxisID* register settings table
11	TX1-	Transmit/Receive negative, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0- (Not functional for CAN versions)
12	RX1-	Receive/Transmit negative, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0- (Not functional for CAN versions)
13	TX1+	Transmit/Receive positive, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0+ (Not functional for CAN versions)
14	RX1+	Receive/Transmit positive, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0+ (Not functional for CAN versions)
15	GND	Ground shield for port 1
16	GND	Ground shield for port 0
17	TX0-	Transmit/Receive negative, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1- (Not functional for CAN versions)
18	RX0-	Receive/Transmit negative, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1- (Not functional for CAN versions)
19	TX0+	Transmit/Receive positive, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1+ (Not functional for CAN versions)
20	RX0+	Receive/Transmit positive, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1+ (Not functional for CAN versions)
21	ID0	*AxisID*[0] selection pin. See *AxisID* register settings table
22	ID1	*AxisID*[1] selection pin. See *AxisID* register settings table
23	232TX	RS-232 Data Transmission.
24	232RX	RS-232 Data Reception.
25	CAN Hi	CAN-Bus positive line (dominant high) (Not functional for CAT versions)
26	CAN Lo	CAN-Bus negative line (dominant low) (Not functional for CAT versions)
27	IN2/LSP	5-60V digital NPN input. Positive limit switch input
28	IN3/LSN	5-60V digital NPN input. Negative limit switch input
29	IN5/Enable	5-60V digital NPN input. Drive Enable input
30	I/O0	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0
31	I/O1	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1
32	I/O4	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4
33	GND	Ground return and shield
34	AnalogIn	Analog input (range software selectable 0-5V or ±10V)

J2

Pin	Name	Description
1	+V USB	5V input from USB
2	GND	Ground return for USB
3	Hall1	Digital Hall, or Linear Hall sensor 1
4	Hall2	Digital Hall, or Linear Hall sensor 2
5	Hall3	Digital Hall, or Linear Hall sensor 3
6	GND	Ground return and shield
7	+5V	Supply for all feedback sensors
8	GND	Ground return and shield
9	EncA1+/EncA1/ Dt1+/Dt1	Encoder 1 A+/Data+ diff. input or single-ended input
10	EncA1-/Dt1-	Encoder 1 A-/Data- diff. input. Leave open for single-ended; Add externally 120Ω to pin 9 for differential
11	EncB1+/EncB1/ Clk1+/Clk1	Encoder 1 B+/Clock+ diff. input or single-ended input
12	EncB1/ Clk1-	Encoder 1 B-/Clock- diff. input. Leave open for single-ended; Add externally 120Ω to pin 11 for differential
13	EncA2+/EncA2/ Dt2+/Dt2	Encoder 2 A+/Data+ diff. input or single-ended input
14	EncA2-/Dt2-	Encoder 2 A-/Data- diff. input. Leave open for single-ended; Add externally 120Ω to pin 13 for differential
15	EncB2+/EncB2/ Clk2+/Clk2	Encoder 2 B+/Clock+ diff. input or single-ended input
16	EncB2-/ Clk2-	Encoder 2 B-/Clock- diff. input. Leave open for single-ended; Add externally 120Ω to pin 15 for differential
17	Z1+	Encoder 1 Z+ diff. input or single-ended input
18	Z1-	Encoder 1 Z- diff. input. Leave open for single-ended; Add externally 120Ω to pin 17 for differential
19	USB DM	USB data-
20	USB DP	USB data+

LEDs

No.	Name	Color	Description
LED1	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.
LED4	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED5	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED6	ECAT ACT1	YELLOW	
LED1, LED4, LED5, and LED6 are not used in the CAN versions.			
In the PZ version, the LEDs are not accessible.			

3.6.2 Pinouts for Micro 4804 LZ

J1

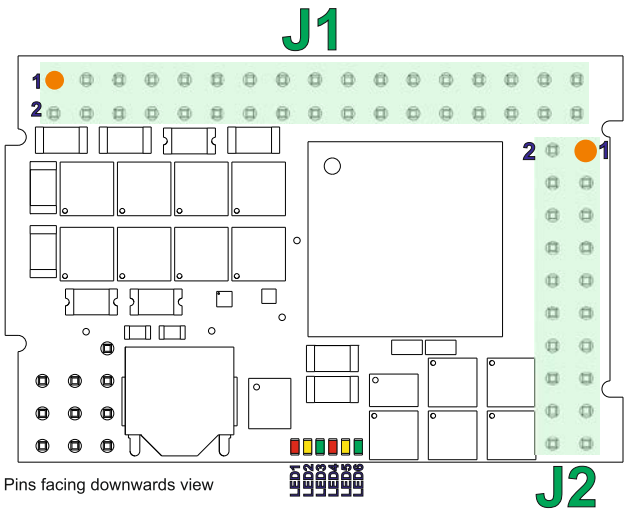
Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 VDC
2	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
3	GND	-	Ground return for logic supply
4	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5	GND	-	Shield for motor windings cable
6	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
7	+Vmot	I	Positive terminal of the motor supply: 7 to 48 VDC
8	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers
9	BFS	-	Connect to GND to perform a firmware update after a critical firmware failure
10	ID2	I	*AxisID*[2] selection pin. See *AxisID* register settings table
11	TX1-	I/O	Transmit/Receive negative, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0-
12	RX1-	I/O	Receive/Transmit negative, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0-
13	TX1+	I/O	Transmit/Receive positive, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0+
14	RX1+	I/O	Receive/Transmit positive, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0+
15	GND	-	Ground shield for port 1
16	GND	-	Ground shield for port 0
17	TX0-	I/O	Transmit/Receive negative, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1-
18	RX0-	I/O	Receive/Transmit negative, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1-
19	TX0+	I/O	Transmit/Receive positive, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1+
20	RX0+	I/O	Receive/Transmit positive, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1+
21	ID0	I	*AxisID*[0] selection pin. See *AxisID* register settings table
22	ID1	I	*AxisID*[1] selection pin. See *AxisID* register settings table
23 … 24	Rsvd.	-	Reserved. Do not use.
25	CAN Hi	-	CAN-Bus positive line (dominant high)
26	CAN Lo	-	CAN-Bus negative line (dominant low)
27	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input
28	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input
29	IN5/Enable	I	5-60V digital NPN input. Drive Enable input
30	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0
31	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1
32	I/O4	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4
33	GND	-	Ground return and shield
34	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)

Not functional for CAN versions.

Not functional for CAN versions.

Not functional for CAT versions.

Micro 4804 LZ



Pins facing downwards view

J2

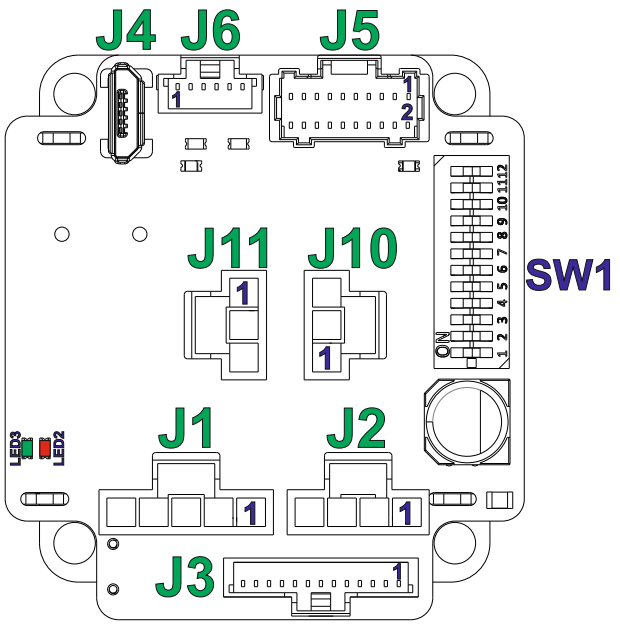
Pin	Name	Type	Description
1	+V USB	I	5V input from USB
2	GND	-	Ground return for USB
3	Hall1	I	Digital Hall sensor 1
4	Hall2	I	Digital Hall sensor 2
5	Hall3	I	Digital Hall sensor 3
6	GND	-	Ground return and shield
7	+5V	O	Supply for all feedback sensors
8	GND	-	Ground return and shield
9	EncA1+/EncA1	I	Encoder 1 A+ diff. input or single-ended input
10	EncA1-	I	Encoder 1 A- diff. input. Leave open for single-ended; Add externally 120Ω to pin 9 for differential
11	EncB1+/EncB1	I	Encoder 1 B+ diff. input or single-ended input
12	EncB1-	I	Encoder 1 B- diff. input. Leave open for single-ended; Add externally 120Ω to pin 11 for differential
13 … 16	Rsvd.	-	Reserved. Do not use.
17	Z1+	I	Encoder 1 Z+ diff. input or single-ended input
18	Z1-	I	Encoder 1 Z- diff. input. Leave open for single-ended; Add externally 120Ω to pin 17 for differential
19	USB DM	I/O	USB data-
20	USB DP	I/O	USB data+

LEDs

No.	Name	Color	Description
LED1	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.
LED4	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED5	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED6	ECAT ACT1	YELLOW	
LED1, LED4, LED5, and LED6 are not used in the CAN version.			

3.6.3 Pinouts for Micro 4804 CZ-CAN

Micro 4804 CZ-CAN



J5

Pin	Name	Type	Description
1	GND	-	Ground return.
2	Hall1 / LH1	I	Digital Hall, or Linear Hall sensor 1.
3	+5V	O	5V supply for all feedback sensors.
4	Hall2 / LH2	I	Digital Hall, or Linear Hall sensor 2.
5	+5V	O	5V supply for all feedback sensors.
6	Hall3 / LH3	I	Digital Hall, or Linear Hall sensor 3.
7	EncA1+/EncA1 Dt1+/Dt1	I	Encoder 1 A / Data+; set SW1 position 7 for differential.
8	GND	-	Ground return.
9	EncA1-/Dt1-	I	Encoder 1 A-/Data- diff. input.; set SW1 position 7 for differential.
10	+5V	O	5V supply for all feedback sensors.
11	EncB1+/EncB1 Clk1+/Clk1	I	Encoder 1 B+ / Clock positive; set SW1 position 8 for differential.
12	EncA2+/EncA2 Dt2+/Dt2	I	Incr. encoder 2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; set SW1 position 9 for differential.
13	EncB1/ Clk1-	I	Encoder 1B - / Clock- diff. input.; set SW1 position 8 for differential.
14	EncA2-/Dt2-	I	Incr. encoder 2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; set SW1 position 9 for differential.
15	Z1+	I	Incr. encoder 1 Z single-ended or Z+ diff. input; set SW1 position 11 for differential.
16	EncB2+/EncB2 Clk2+/Clk2	I/O	Incr. encoder 2 B+ diff. input, or Dir+-, or Clock+ for SSI, or Master+ for BiSS; set SW1 position 10 for differential.
17	Z1-	I	Leave open for single-ended; set SW1 position 11 for differential.
18	EncB2- Clk2-	I	Incr. encoder 2 B- diff. input, or Dir--, or Clock- for SSI, or Master- for BiSS; set SW1 position 10 for differential.
19	GND	-	Ground return.
20	+Vlog	I	Positive terminal of the logic supply: 6 to 48 V_{DC}.

J1

Pin	Name	Type	Description
1	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
2	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
3	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
4	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers
5	PE	-	Earth connection

J2

Pin	Name	Type	Description
1	+Vmot	I	Positive terminal of the motor supply: 7 to 48 V_{DC}.
2	GND	-	Ground return.
3	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
4	PE	-	Earth connection

J3

Pin	Name	Type	Description
1	232TX	O	RS-232 Data Transmission.
2	232RX	I	RS-232 Data Reception.
3	GND	-	Ground return.
4	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
5	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input.
6	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input.
7	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0.
8	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1.
9	I/O4	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4.
10	IN5/Enable	I	5-60V digital NPN input. Drive Enable input.
11	GND	-	Ground return.
12	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)
13	+5V	O	Supply for all feedback sensors.

J4

Pin	Name	Type	Description
1	+V USB	I	USB supply.
2	USB DM	I/O	USB data-.
3	USB DP	I/O	USB data+.
4	Rsvd	-	Reserved. Do not connect.
5	GND	-	Ground return.

J6

Pin	Name	Type	Description
Reserved. Do not connect.			

J10 & J11

Pin	Name	Type	Description
1	GND	-	Ground return.
2	CAN Lo	-	CAN-Bus negative line (dominant low)
3	CAN Hi	-	CAN-Bus positive line (dominant high)

SW

SW1

MSB **AxisID register** LSB

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Position	Description
1	AxisID register Bit 0.
2	AxisID register Bit 1.
3	AxisID register Bit 2.
4	AxisID register Bit 3.
5	AxisID register Bit 4.

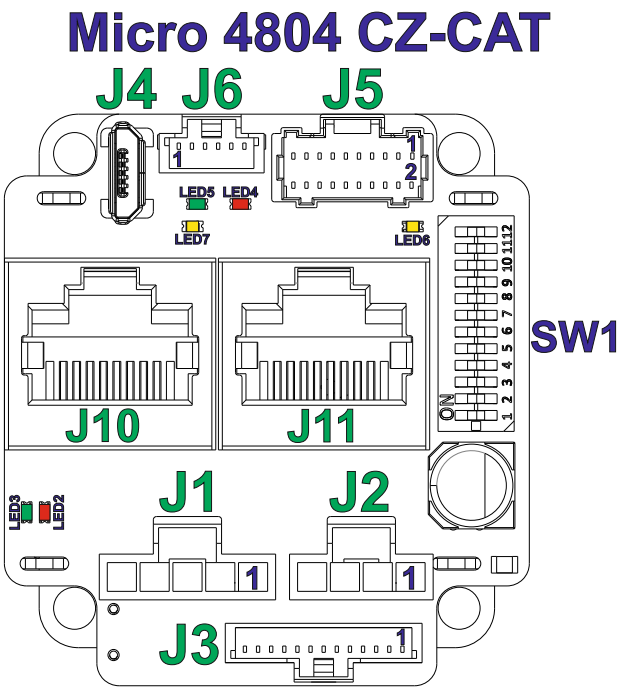
ON: Bit x = 1.
OFF: Bit x = 0.
The maximum AxisID value is 31.
When all Bits are set to 0, AxisID value is 255.
In CANOpen mode, if the AxisID is set to 255, the drive enters the "LSS inactive" state. In this state, the Green LED will flash at 1-second intervals.

Position	Description
6	ON = TMLCAN mode is selected OFF = CANOpen mode is selected
7	ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins.
8	ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins.
9	ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins.
10	ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins.
11	ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins.
12	ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals.

LEDs

No.	Name	Color	Description
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.

3.6.1 Pinouts for Micro 4804 CZ-CAT



J5

Pin	Name	Type	Description
1	GND	-	Ground return.
2	Hall1 / LH1	I	Digital Hall, or Linear Hall sensor 1.
3	+5V	O	5V supply for all feedback sensors.
4	Hall2 / LH2	I	Digital Hall, or Linear Hall sensor 2.
5	+5V	O	5V supply for all feedback sensors.
6	Hall3 / LH3	I	Digital Hall, or Linear Hall sensor 3.
7	EncA1+/EncA1 Dt1+/Dt1	I	Encoder 1 A / Data+; set SW1 position 7 for differential.
8	GND	-	Ground return.
9	EncA1-/Dt1-	I	Encoder 1 A-/Data- diff. input.; set SW1 position 7 for differential.
10	+5V	O	5V supply for all feedback sensors.
11	EncB1+/EncB1 Clk1+/Clk1	I	Encoder 1 B+ / Clock positive; set SW1 position 8 for differential.
12	EncA2+/EncA2 Dt2+/Dt2	I	Incr. encoder 2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; set SW1 position 9 for differential.
13	EncB1/ Clk1-	I	Encoder 1B - / Clock- diff. input.; set SW1 position 8 for differential.
14	EncA2-/Dt2-	I	Incr. encoder 2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; set SW1 position 9 for differential.
15	Z1+	I	Incr. encoder 1 Z single-ended or Z+ diff. input; set SW1 position 11 for differential.
16	EncB2+/EncB2 Clk2+/Clk2	I/O	Incr. encoder 2 B+ diff. input, or Dir+-, or Clock+ for SSI, or Master+ for BiSS; set SW1 position 10 for differential.
17	Z1-	I	Leave open for single-ended; set SW1 position 11 for differential.
18	EncB2- Clk2-	I	Incr. encoder 2 B- diff. input, or Dir--, or Clock- for SSI, or Master- for BiSS; set SW1 position 10 for differential.
19	GND	-	Ground return.
20	+Vlog	I	Positive terminal of the logic supply: 6 to 48 V_{DC}.

J6

Pin	Name	Type	Description
Reserved. Do not connect.			

J1

Pin	Name	Type	Description
1	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
2	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
3	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
4	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers
5	PE	-	Earth connection

J10 & J11

Port	Name	Type	Description
J10	ECAT IN	I	EtherCAT standard RJ45 Ethernet IN port.
J11	ECAT OUT	O	EtherCAT standard RJ45 Ethernet OUT port.

J2

Pin	Name	Type	Description
1	+Vmot	I	Positive terminal of the motor supply: 7 to 48 V_{DC}.
2	GND	-	Ground return.
3	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
4	PE	-	Earth connection

SW

SW1

AxisID register

MSB					LSB
Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Position	Description
1	AxisID register Bit 0.
2	AxisID register Bit 1.
3	AxisID register Bit 2.
4	AxisID register Bit 3.
5	AxisID register Bit 4.
6	AxisID register Bit 5.
7	ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins.
8	ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins.
9	ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins.
10	ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins.
11	ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins.
12	ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals.

ON: Bit x = 1.
OFF: Bit x = 0.
The maximum AxisID value is 63.
When all Bits are set to 0, AxisID value is 255.
When the AxisID value is 255, the EtherCAT register called "configured station alias" will be 0

J3

Pin	Name	Type	Description
1	232TX	O	RS-232 Data Transmission.
2	232RX	I	RS-232 Data Reception.
3	GND	-	Ground return.
4	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
5	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input.
6	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input.
7	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0.
8	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1.
9	I/O4	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4.
10	IN5/Enable	I	5-60V digital NPN input. Drive Enable input.
11	GND	-	Ground return.
12	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)
13	+5V	O	Supply for all feedback sensors.

LEDs

No.	Name	Color	Description
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.
LED4	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED5	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED6	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.

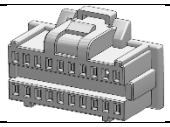
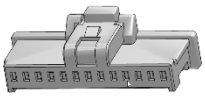
J4

Pin	Name	Type	Description
1	+V USB	I	USB supply.
2	USB DM	I/O	USB data-.
3	USB DP	I/O	USB data+.
4	Rsvd	-	Reserved. Do not connect.
5	GND	-	Ground return.

3.6.1 Mating Connectors for Micro 4804 MZ/PZ/LZ

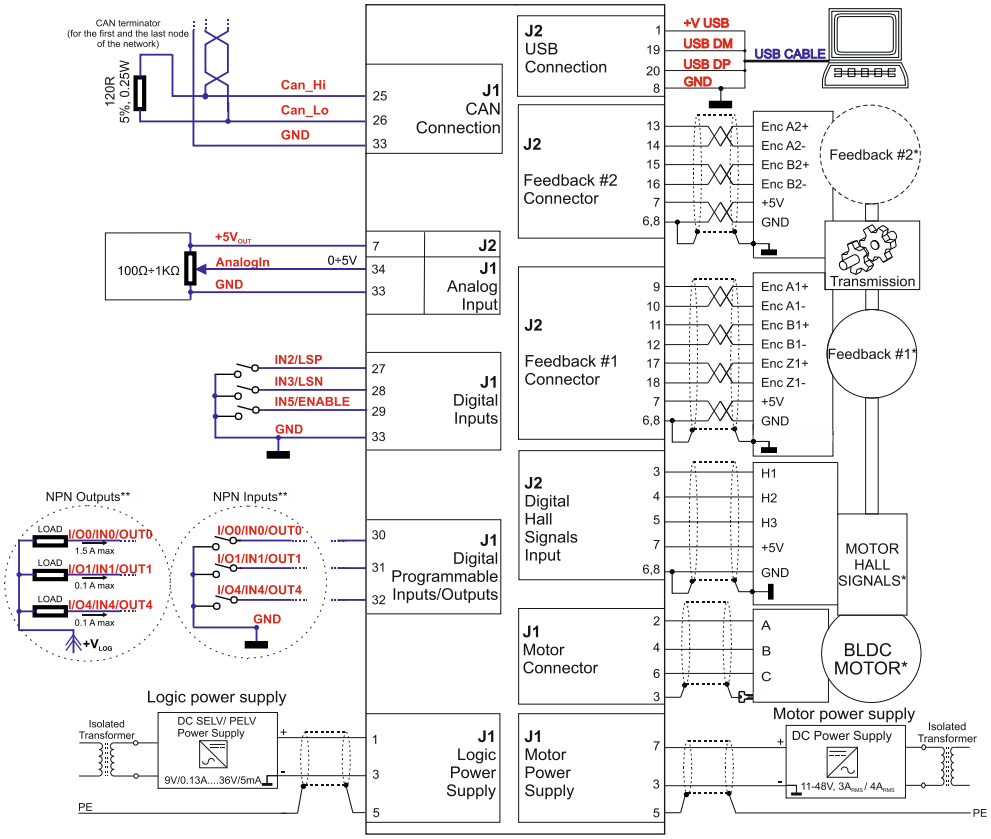
Producer	Part No.	Connector	Description	
Samtec	SQW-117-01-F-D(-VS)	J1	2x17, 2.0mm THT (SMD) socket	
	CLT-117-02-F-D		2x17, 2.0mm SMD pass-through socket	
	SQW-110-01-F-D(-VS)	J2	2x10, 2.0mm THT (SMD) socket	
	CLT-110-02-F-D		2x10, 2.0mm SMD pass-through socket	

3.6.2 Mating Connectors for Micro 4804 CZ

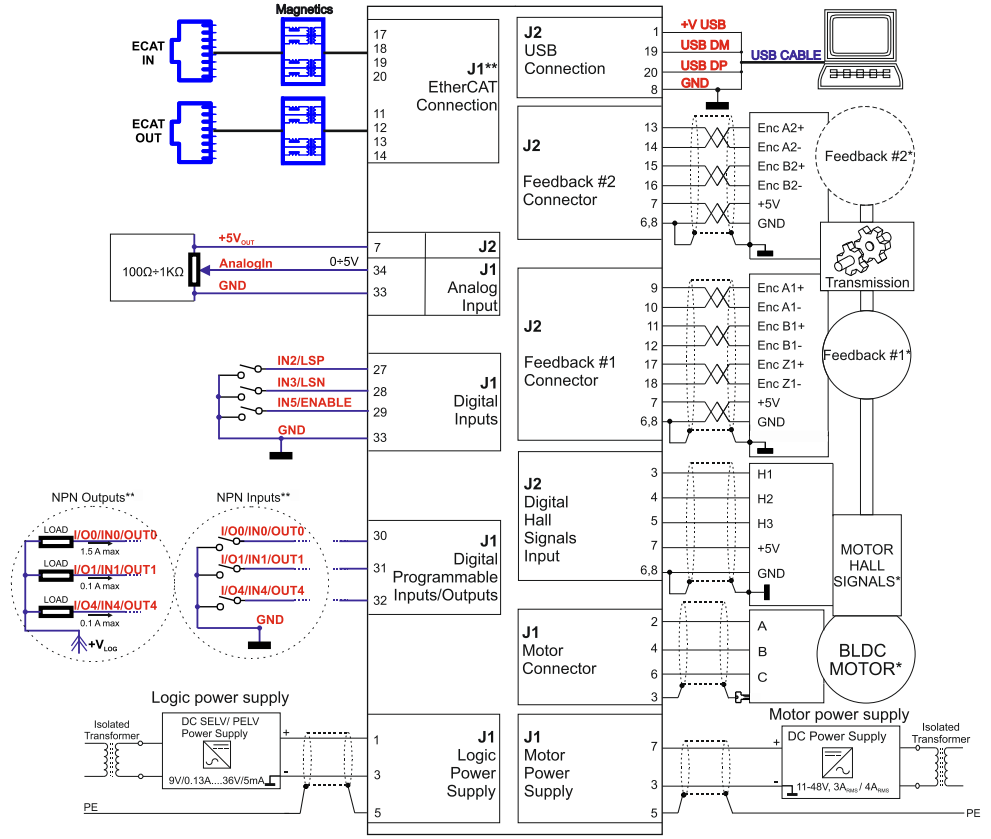
Image	Connector	Description	Manufacturer	Part Number	Image
	J1	1x5 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 5 circuits	Molex	1053071205	
	J2	1x4 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 4 circuits	Molex	1053071204	
	J5	2x10 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 20 Circuits	Molex	5011892010	
	J3	1x13 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 13 Circuits	Molex	5013301300	
	J6	1x6 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 6 Circuits	Molex	5013300600	
	J4	USB cable, Cable USB A Male - Micro B Male, 1m, shielded, black, 9.6mm plastic width	Tensility International Corp	1002333	
	J1, J2	Pre-Crimped wires for Nano-Fit — Cable Assembly, Nano-Fit Crimp Terminal Socket to Nano-Fit Crimp Terminal Socket, 300mm	Molex	0797582140	
	J3, J5, J6	Pre-Crimped wires for Pico-Clasp — Cable Assembly, Pico-Clasp Crimp Terminal Socket to Pico-Clasp Crimp Terminal Socket, 300mm	Molex	0797581019	
	J1, J2	Pins for Nano-Fit — Nano-Fit Crimp Terminal, Female, 0.76µm Gold (Au) Plating, Lubricated, 24-26 AWG	Molex	1053001400	
	J3, J5, J6	Pins for Pico-Clasp — 1.00mm Pitch, Pico-Clasp Female Crimp Terminal, Gold Plating 0.10µm, 28-32 AWG, Reel	Molex	5011937000	
	J1, J2	Crimp tool Nano Fit — Crimp Tool, Ratchet, Molex Nano-Fit 105300 Series 26-24AWG Socket Contacts, 207129 Series	Molex	638276000	
	J3, J5, J6	Crimp tool Pico-Clasp — Crimp Tool, Ratchet, Molex Pico-Clasp 501193 & 501334 Series 32-28AWG Contacts	Molex	638191500	

3.7 Connection diagrams

3.7.1 Micro 4804 MZ/PZ-CAN connection diagram

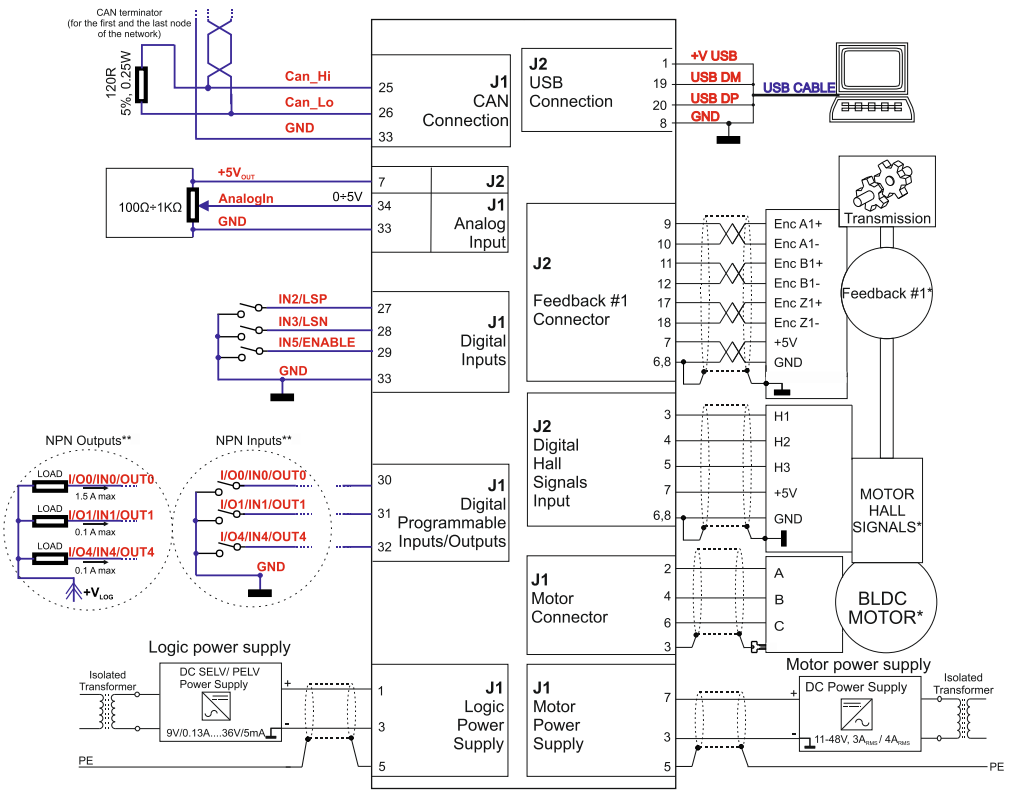


3.7.2 Micro 4804 MZ/PZ-CAT connection diagram

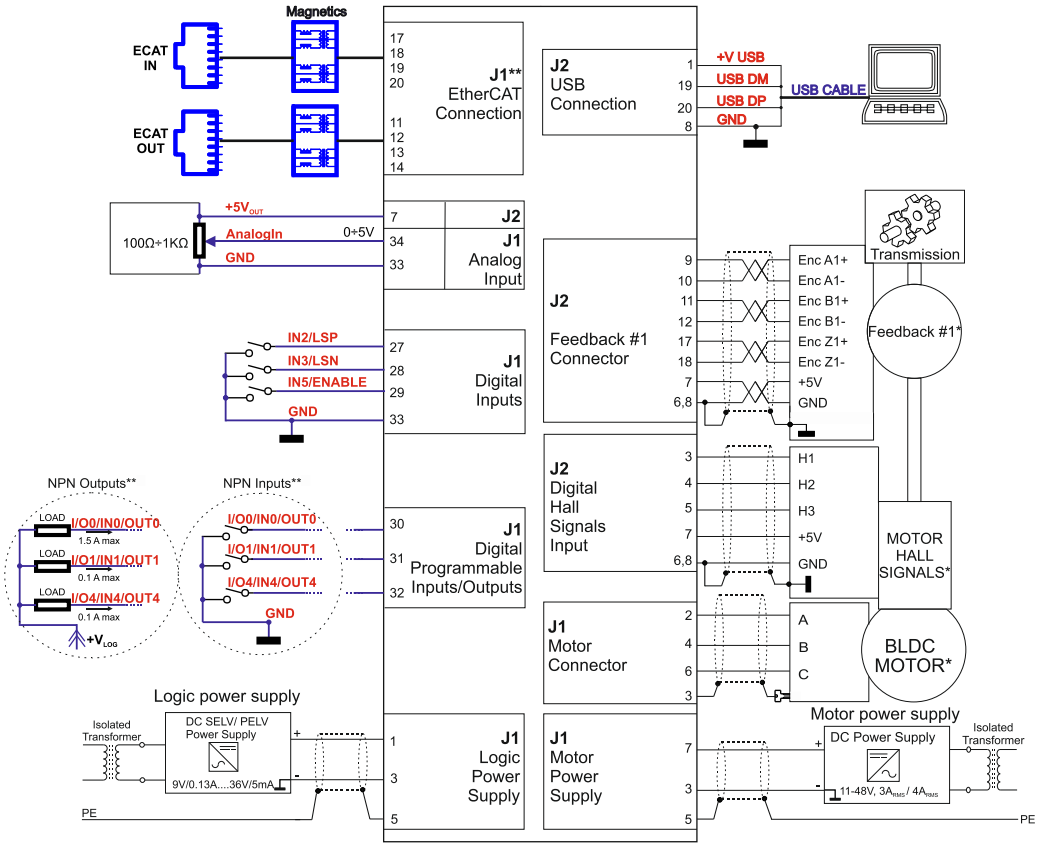


* For other available feedback / motor options, check the detailed diagrams below
** Pins are software selectable individually as NPN inputs/outputs

3.7.3 Micro 4804 LZ-CAN connection diagram

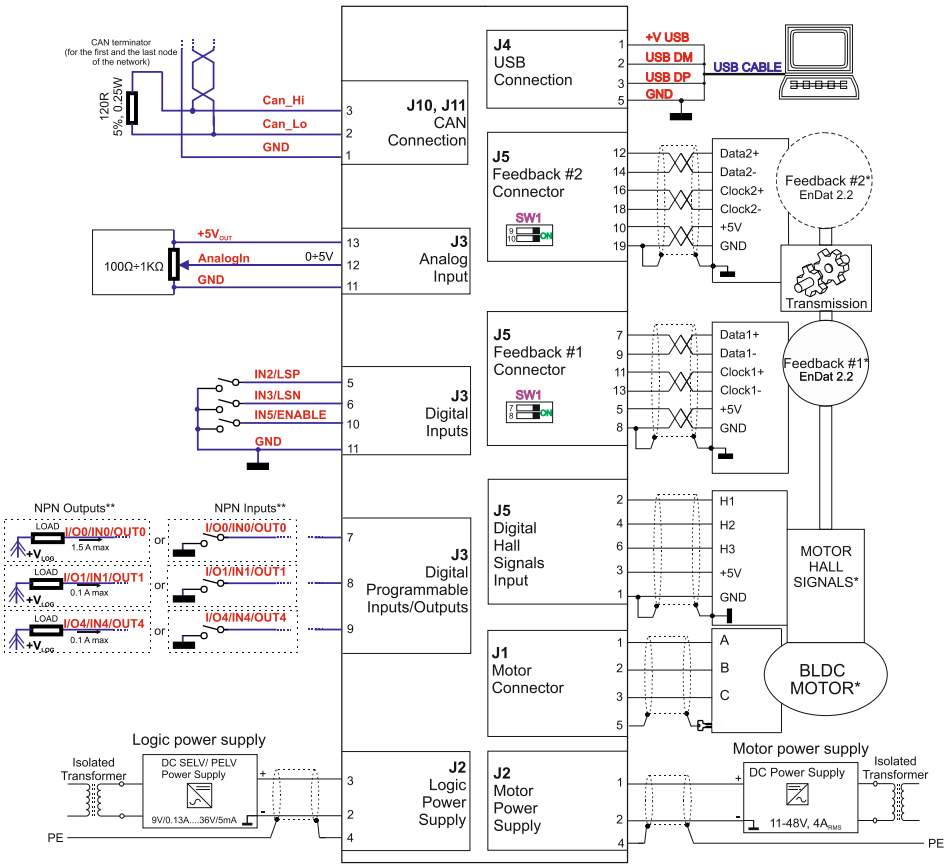


3.7.4 Micro 4804 LZ-CAN connection diagram

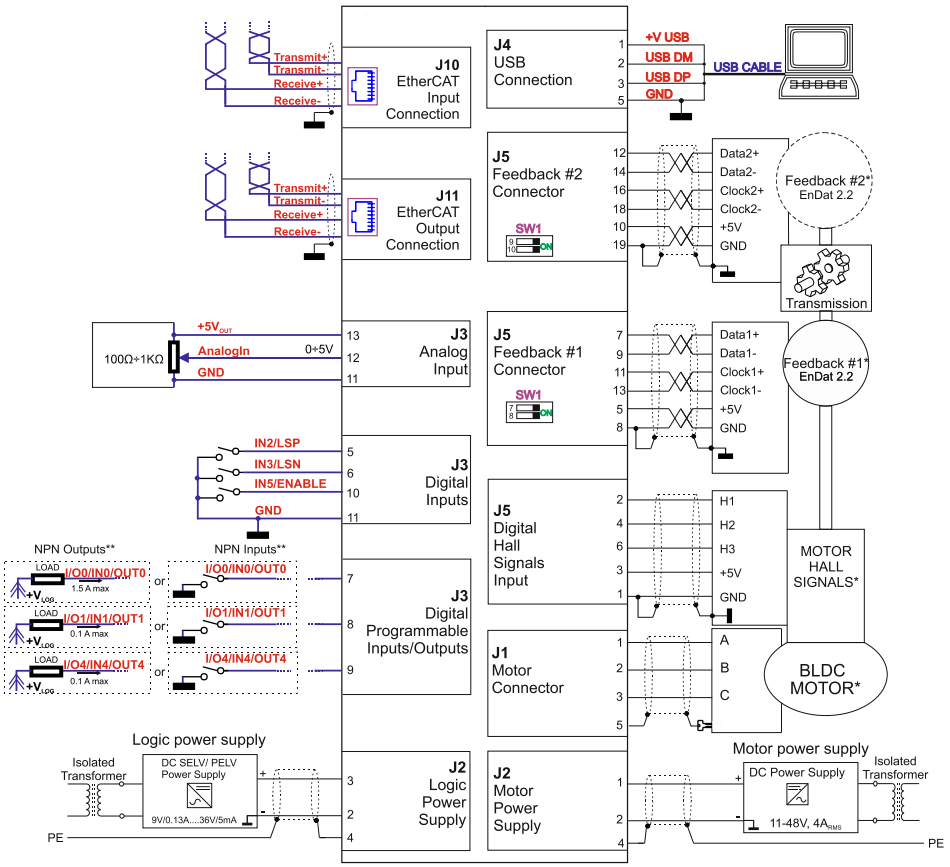


* For other available feedback / motor options, check the detailed diagrams below
** Pins are software selectable individually as NPN inputs/outputs

3.7.5 Micro 4804 CZ-CAN connection diagram



3.7.6 Micro 4804 CZ-CAT connection diagram



* For other available feedback / motor options, check the detailed connection diagrams below
** Pins are software selectable individually as NPN inputs/outputs

3.8 Digital I/O Connection

3.8.1 NPN inputs

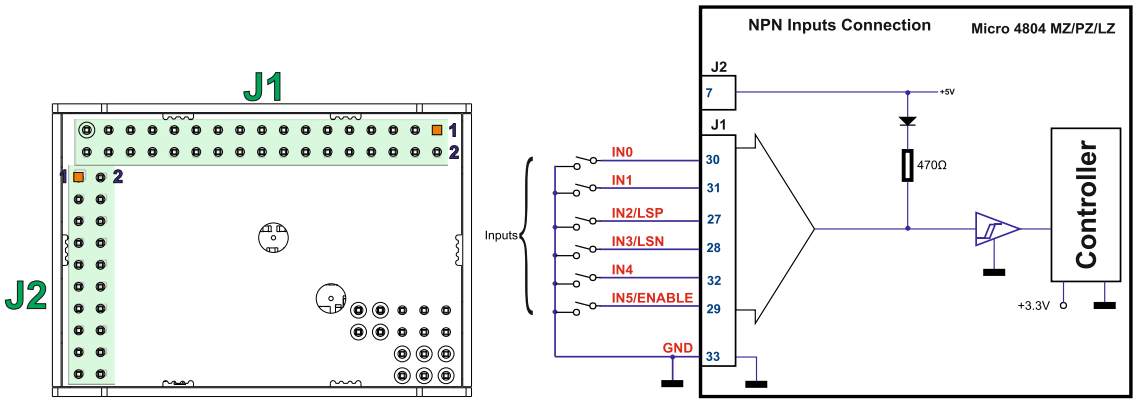


Figure 3-14 **Digital NPN Inputs connection for Micro 4804 MZ/PZ/LZ**

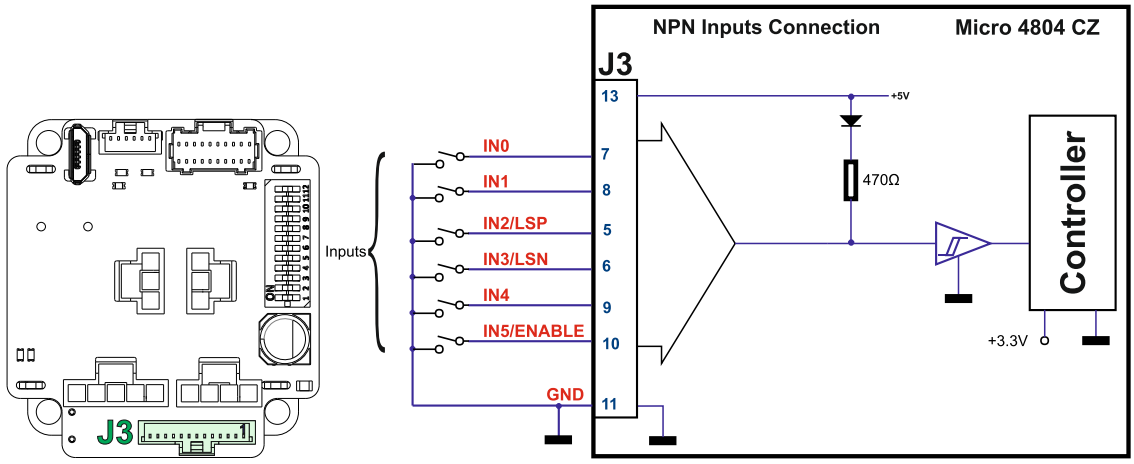


Figure 3-15 **Digital NPN Inputs connection for Micro 4804 CZ**

Remarks:

1. *The inputs are compatible with NPN type outputs (input must be pulled to GND to change its default state).*
2. *The I/O pins are software selectable individually as inputs/outputs.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

3.8.2 NPN outputs

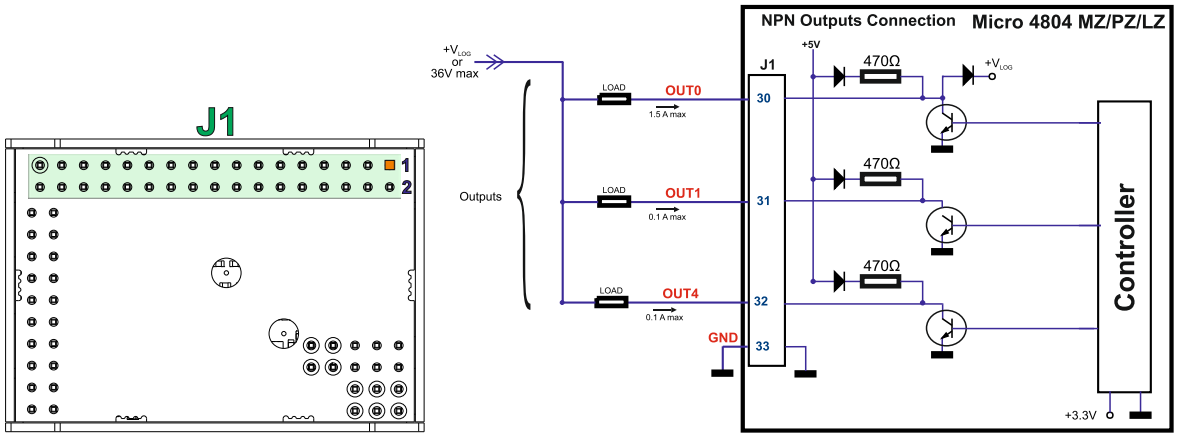


Figure 3-16 **Digital NPN Outputs connection for Micro 4804 MZ/PZ/LZ**

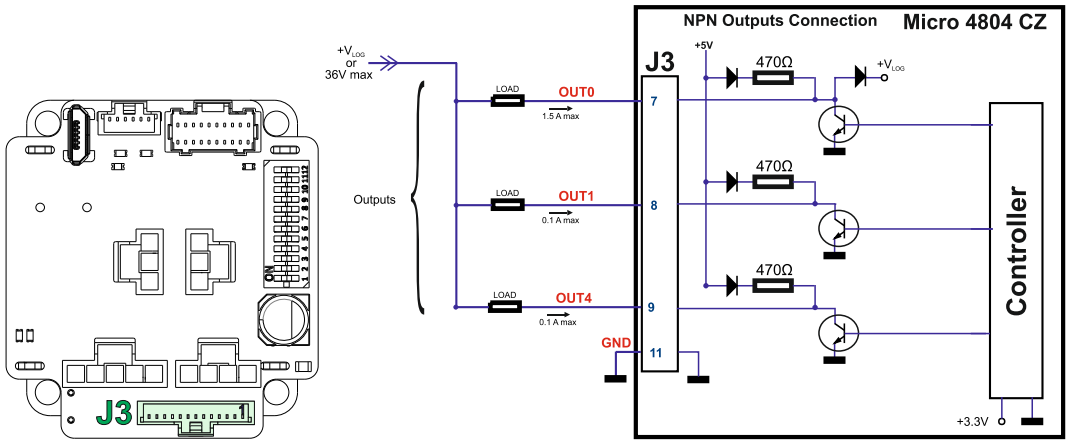


Figure 3-17 **Digital NPN Outputs connection for Micro 4804 CZ**

Remarks:

1. *The outputs are compatible with NPN type inputs (load is tied to common $+V_{LOG}$, output pulls to GND when active and is floating when inactive).*
2. *The I/O pins are software selectable individually as inputs/outputs.*

3.8.3 Solenoid driver connection for motor brake

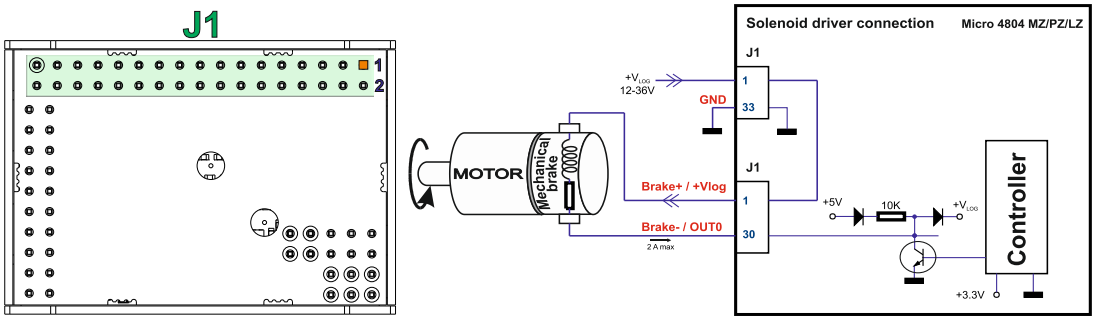


Figure 3-18. **Solenoid driver connection for Micro 4804 MZ/PZ/LZ**

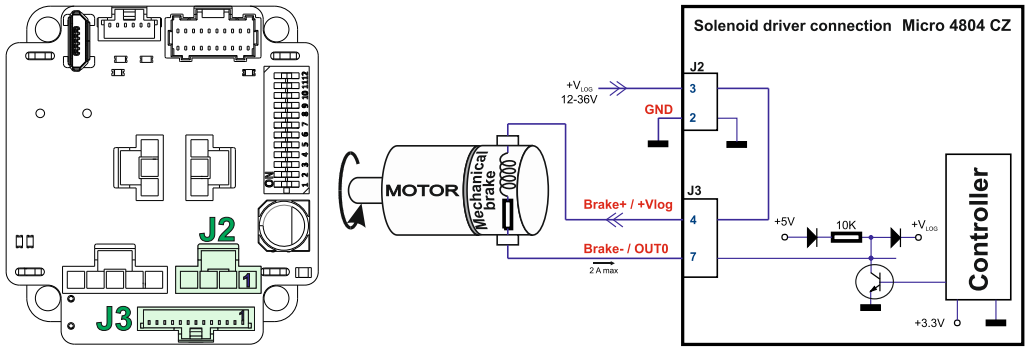


Figure 3-19. **Solenoid driver connection for Micro 4804 CZ**

Remarks:

1. *The firmware can control the Brake- output automatically to engage/disengage a mechanical brake when motor control is started/stopped.*
2. *The Brake- pin can also be used as the NPN digital output OUT0.*
3. *To enable the mechanical brake functionality select the following checkbox from EasyMotion Studio II:*

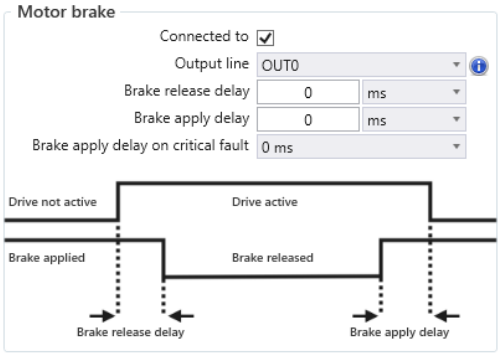


Figure 3-20. **Motor brake checkbox in EasyMotion Studio II**

3.9 Analog Inputs Connection

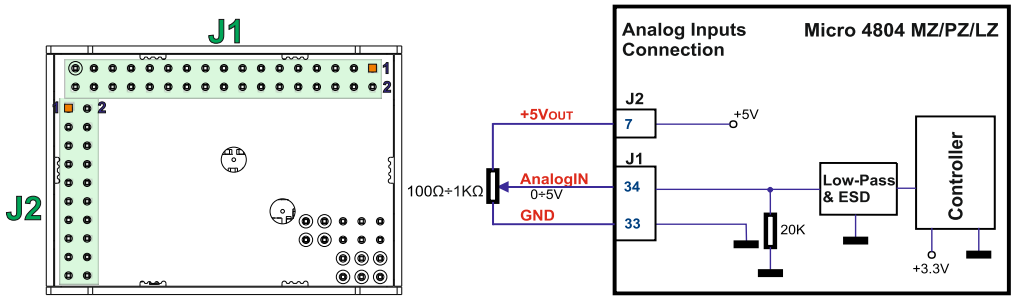


Figure 3-21 ***0-5V*** **Analog inputs connection for Micro 4804 MZ/PZ/LZ**

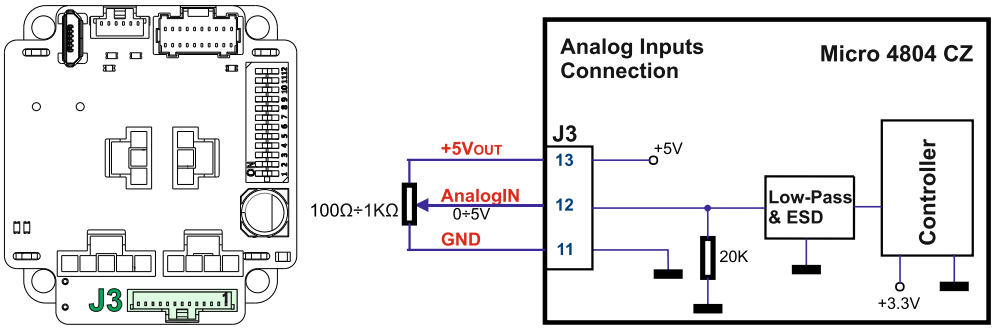


Figure 3-22 ***0-5V*** **Analog inputs connection for Micro 4804 CZ**

Remarks:

1. *The analog input range is configurable by software: 16bit ±10V or 12-bit 0-5V: Reference, Feedback or general purpose input.*
2. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

3.9.1.1 Recommendation for wiring

a) If the analogue signal source is single-ended, use a 2-wire twisted shielded cable as follows: 1st wire connects the live signal to the drive input; 2nd wire connects the source ground to the drive ground; shield will be connected to the drive ground terminal.

b) If the analogue signal source is differential and the signal source ground is isolated from the drive GND, use a 2-wire twisted shielded cable as follows: 1st wire connects the source plus (positive, in-phase) to the drive analogue input; 2nd wire connects the source minus (negative, out-of-phase) to the drive ground (GND). Shield is connected only at the drive side, to the drive PE, and is left unconnected at the source side.

c) If the analogue signal source is differential and the signal source ground is common with the drive GND, use a 2-wire shielded cable as follows: 1st wire connects the source plus (positive, in-phase) to the drive analogue input; 2nd wire connects the source ground to the drive ground (GND); shield is connected only at the drive side, to the drive PE, and is left unconnected at the source side. The source minus (negative, out-of-phase) output remains unconnected.

3.10 Motor connections

3.10.1 Brushless Motor connection

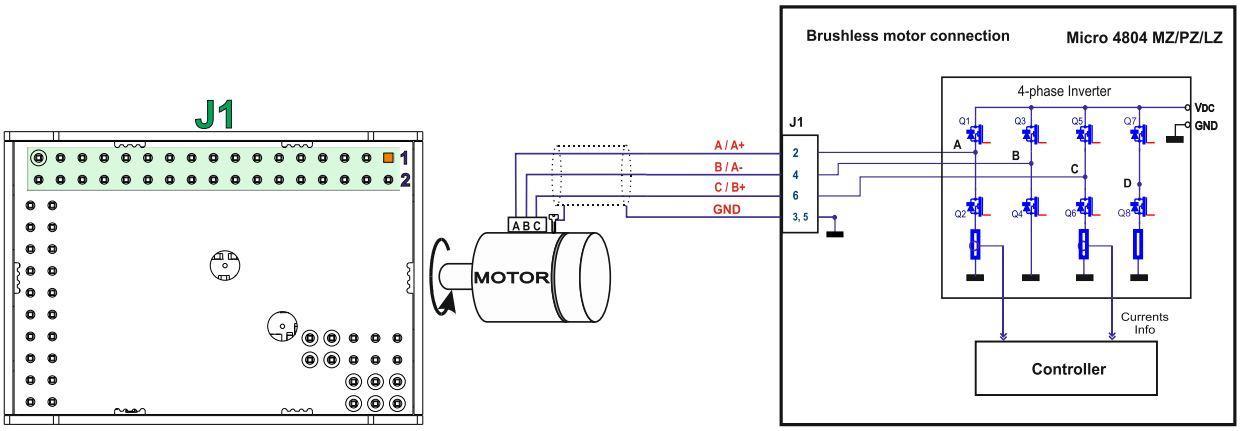


Figure 3-23 **Brushless motor connection for Micro 4804 MZ/PZ/LZ**

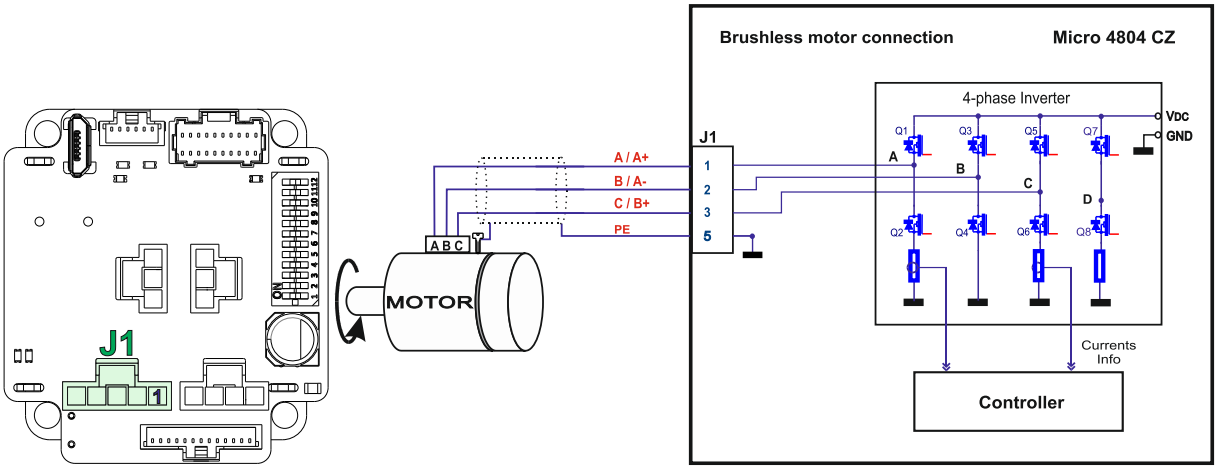


Figure 3-24 **Brushless motor connection for Micro 4804 CZ**

3.10.2 2-phase Step Motor connection

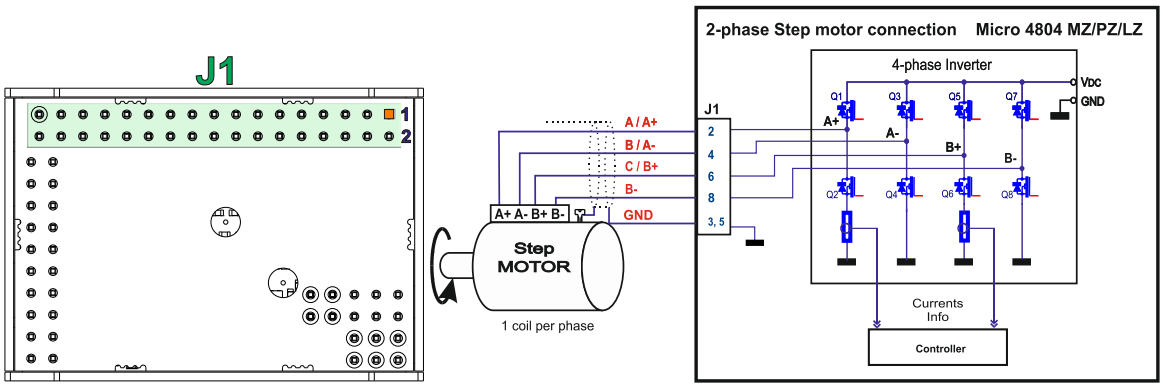


Figure 3-25 **2-phase step motor connection, one coil per phase for Micro 4804 MZ/PZ/LZ**

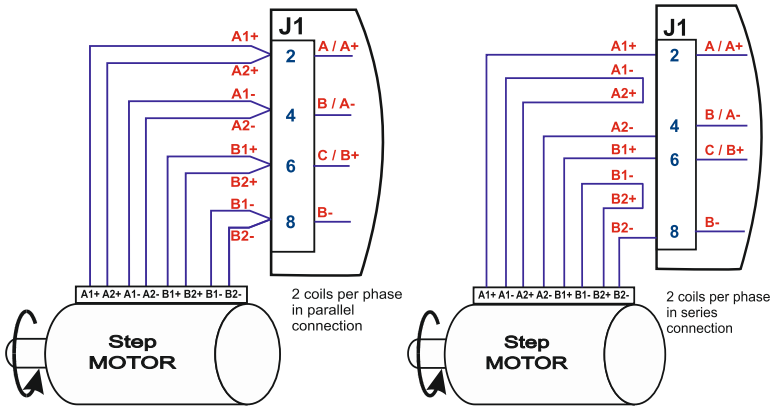


Figure 3-26 **2-phase step motor connection, two coils per phase for Micro 4804 MZ/PZ/LZ**

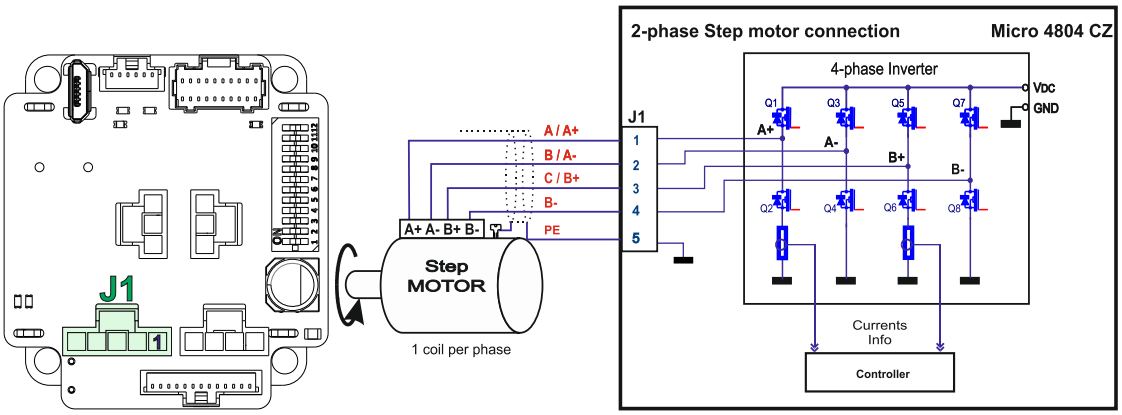


Figure 3-27 **2-phase step motor connection, one coil per phase for Micro 4804 CZ**

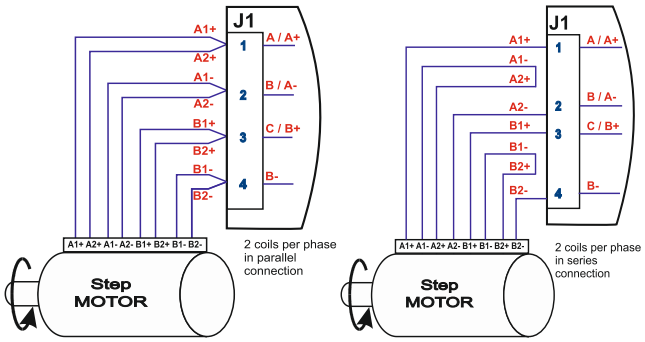


Figure 3-28 **2-phase step motor connection, two coils per phase for Micro 4804 CZ**

3.10.3 3-Phase Step Motor connection

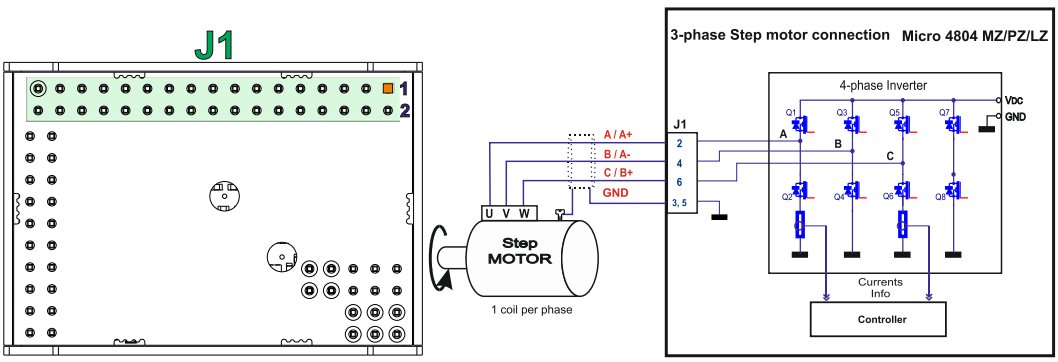


Figure 3-29 **3-phase step motor connection for Micro 4804 MZ/PZ/LZ**

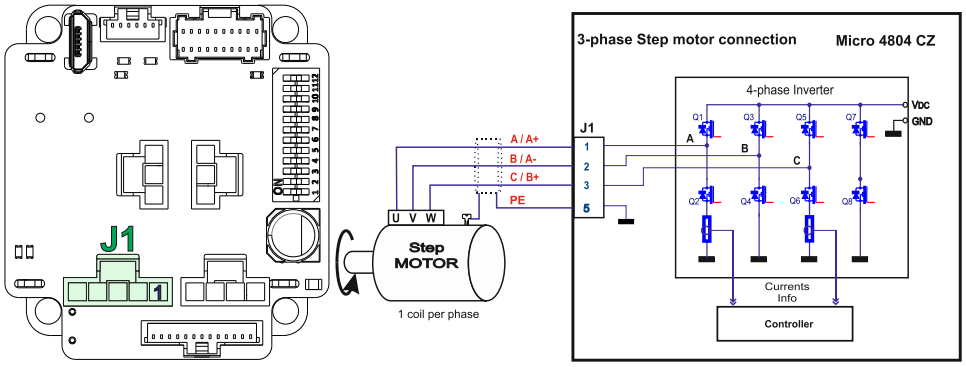


Figure 3-30 **3-phase step motor connection for Micro 4804 CZ**

3.10.4 DC Motor connection

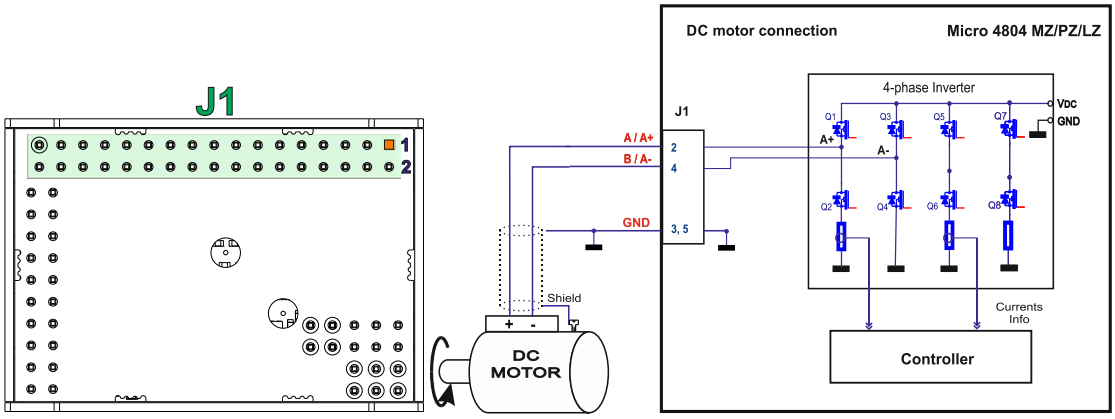


Figure 3-31 **DC Motor connection for Micro 4804 MZ/PZ/LZ**

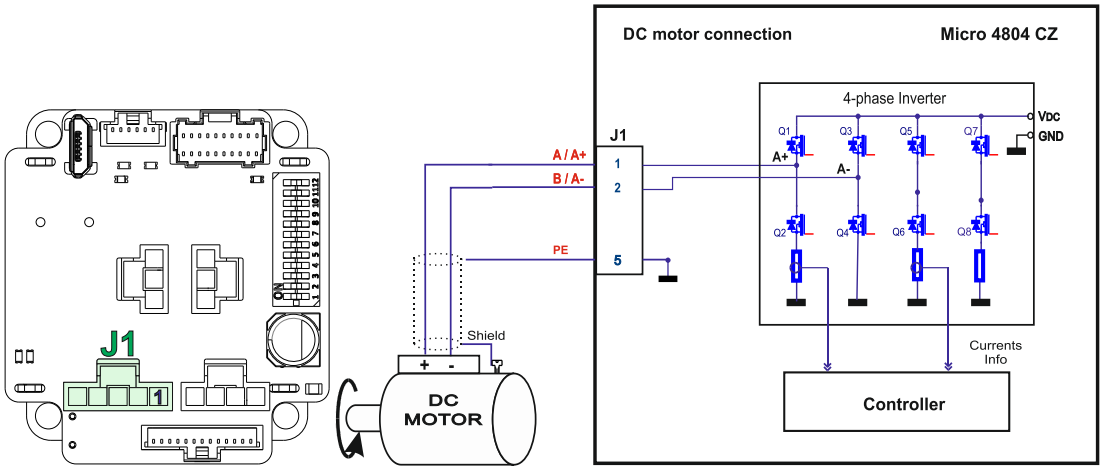


Figure 3-32 **DC Motor connection for Micro 4804 CZ**

3.10.4.1 Recommendations for motor wiring

a) Avoid running the motor wires in parallel with other wires for a distance longer than 2 meters. If this situation cannot be avoided, use a shielded cable for the motor wires. Connect the cable shield to the Micro 4804 GND pin and also to the motor chassis.

b) The parasitic capacitance between the motor wires must not bypass 10nF. If very long cables (tens of meters) are used, this condition may not be met. In this case, add series inductors between the Micro 4804 outputs and the cable. The inductors must be magnetically shielded (toroidal, for example), and must be rated for the motor surge current. Typically the necessary values are around 100 µH.

c) A good shielding can be obtained if the motor wires are running inside a metallic cable guide.

3.11 Feedback connections

3.11.1 Feedback #1 - Single-ended Incremental Encoder Connection

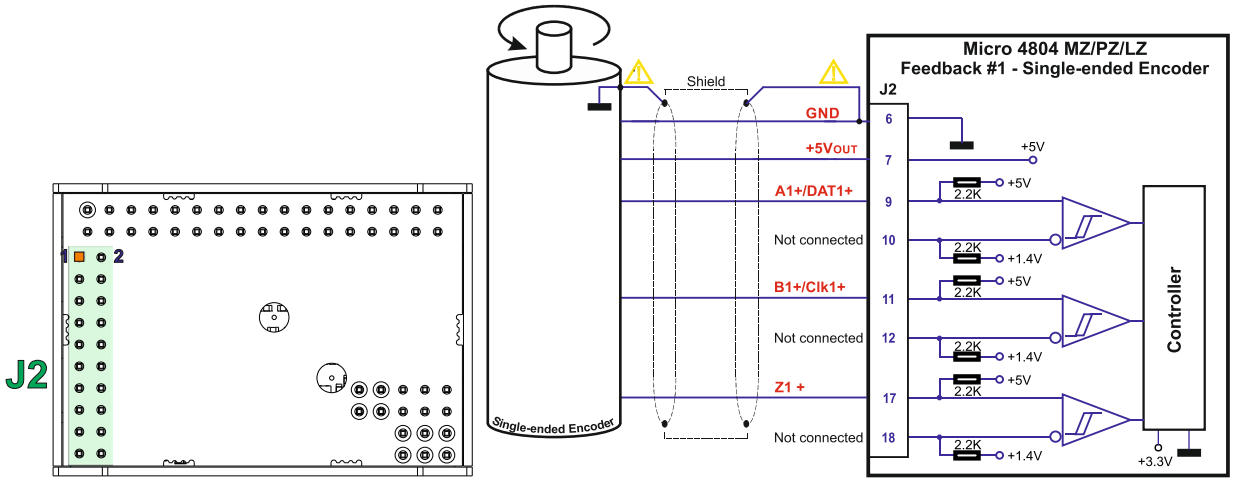


Figure 3-33 **Feedback #1 - Single-ended Incremental Encoder Connection for Micro 4804 MZ/PZ/LZ**

CAUTION!	***Do not connect unterminated wires to pins J2.10, J2.12 and J2.18. They might pick up unwanted noise and give false encoder readings.*** ***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

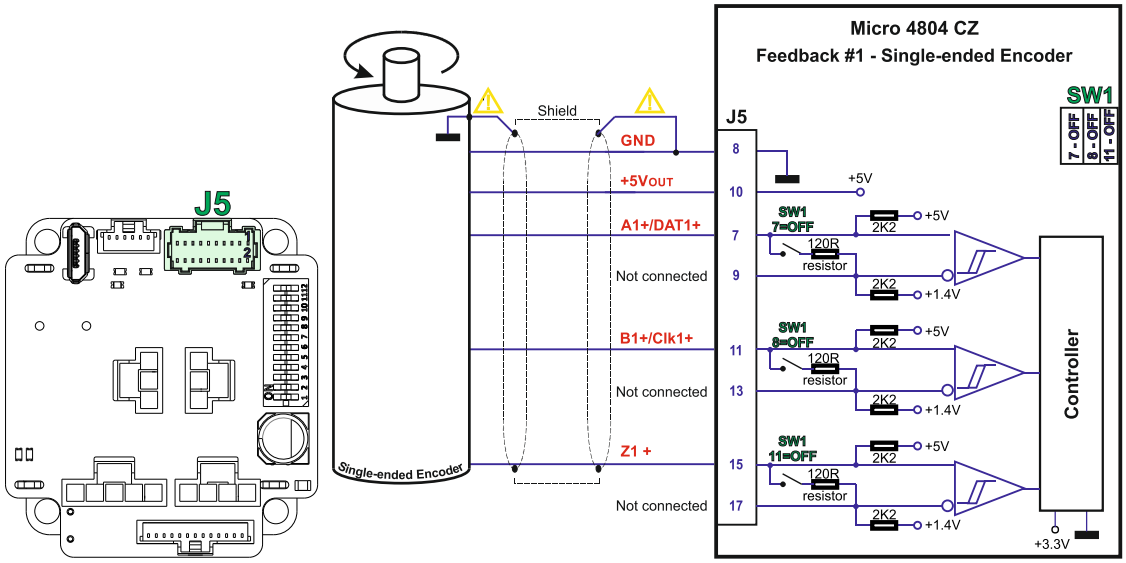


Figure 3-34 **Feedback #1 - Single-ended Incremental Encoder Connection for Micro 4804 CZ**

CAUTION!	***Do not connect unterminated wires to pins J5.9, J5.13 and J5.17. They might pick up unwanted noise and give false encoder readings.*** ***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

3.11.2 Feedback #1 - Differential Incremental Encoder Connection

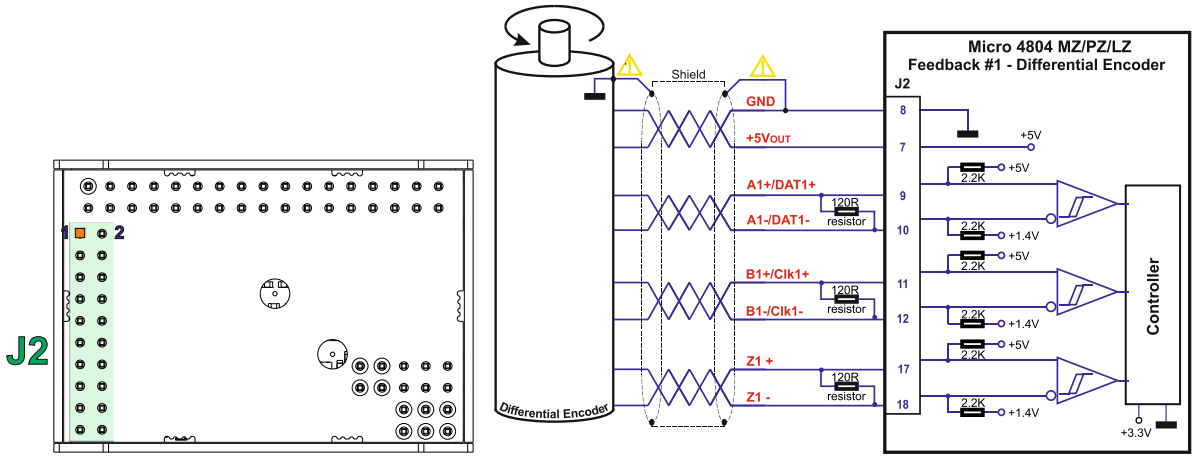


Figure 3-35 **Feedback #1 - Differential Incremental Encoder Connection for Micro 4804 MZ/PZ/LZ**

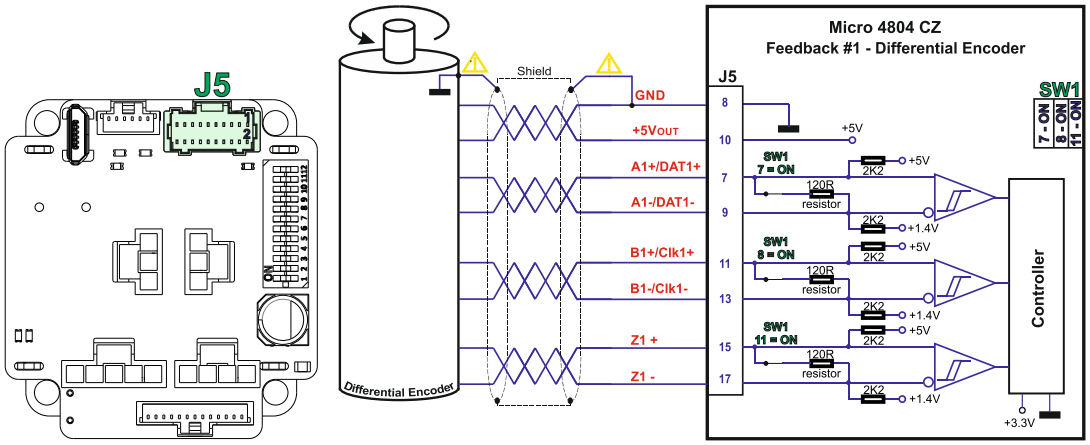


Figure 3-36 **Feedback #1 - Differential Incremental Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ/LZ Feedback#1 differential connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For the Micro 4804 CZ Feedback #1 differential connection, 120Ω (0.25W) terminators are internally added by setting SW1 pins 7, 8, and 11 to the "ON" position.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

3.11.3 Feedback #2[1] - Single-ended Incremental Encoder Connection

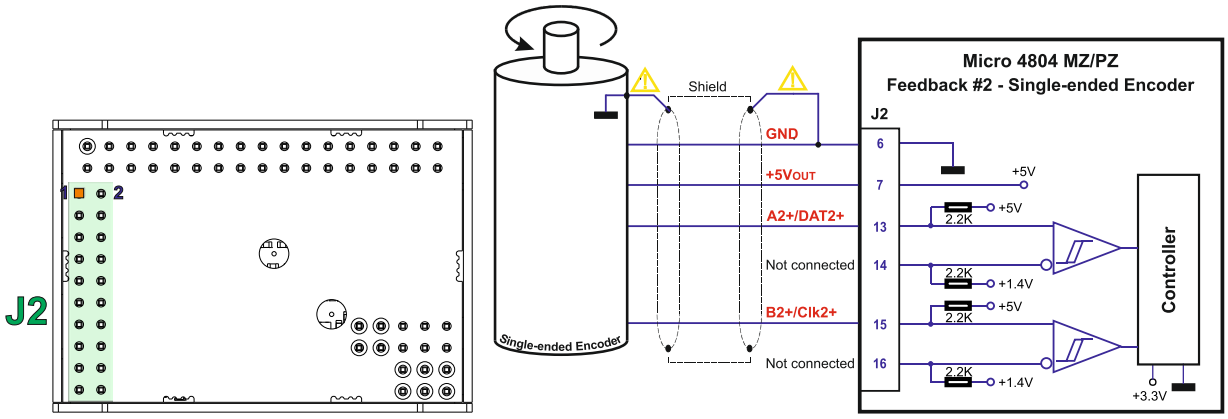


Figure 3-37 **Feedback #2 - Single-ended Incremental Encoder Connection for Micro 4804 MZ/PZ**

CAUTION!	***Do not connect unterminated wires to pins J2.14 and J2.16. They might pick up unwanted noise and give false encoder readings.*** ***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

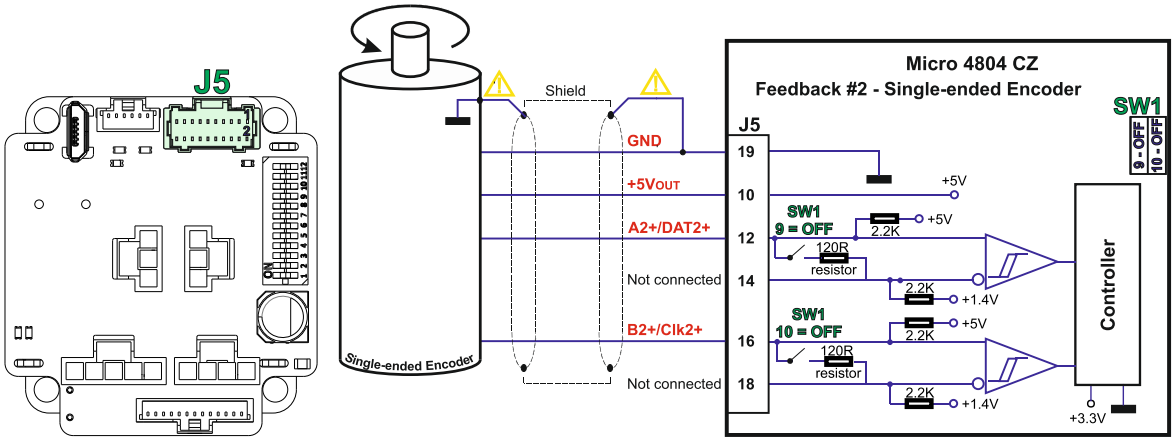


Figure 3-38 **Feedback #2 - Single-ended Incremental Encoder Connection for Micro 4804 CZ**

CAUTION!	***Do not connect unterminated wires to pins J5.14 and J5.18. They might pick up unwanted noise and give false encoder readings.*** ***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Feedback #2 is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

3.11.4 Feedback #2[1] - Differential Incremental Encoder Connection

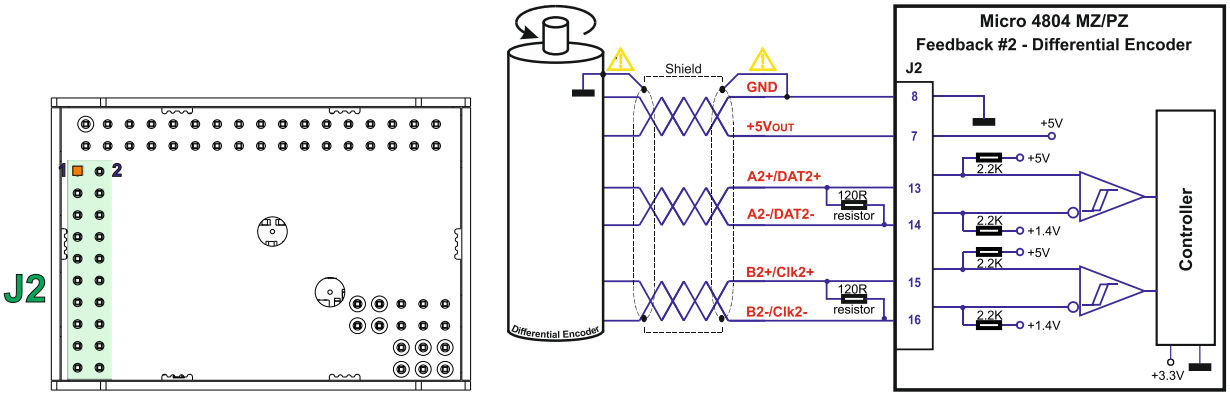


Figure 3-39 **Feedback #2 - Differential Incremental Encoder Connection for Micro 4804 MZ/PZ**

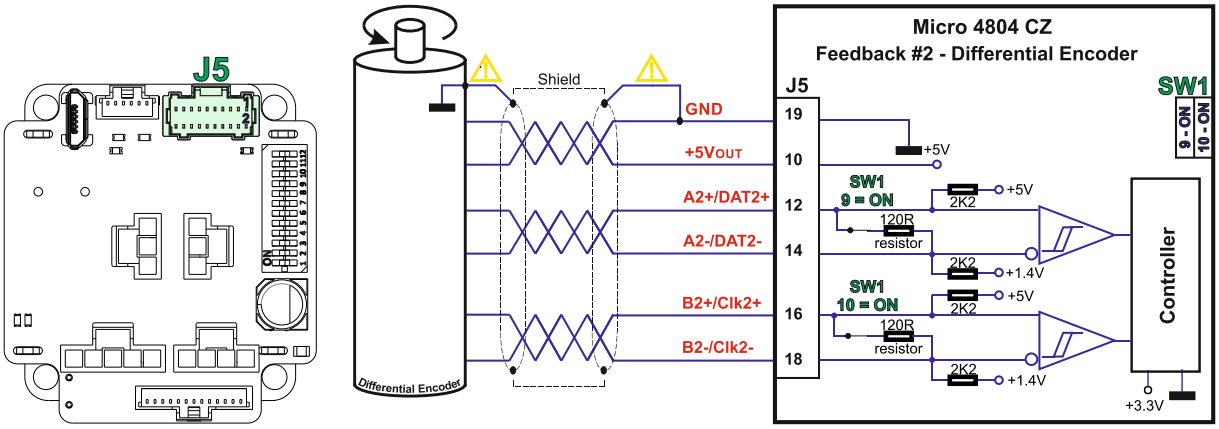


Figure 3-40 **Feedback #2 - Differential Incremental Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ Feedback#2 differential absolute connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For Micro 4804 CZ Feedback #2 features internal terminators, equivalent to 120Ω (0.25W), connected between the encoder lines through SW1 positions 9 and 10.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Feedback #2 is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

3.11.5 Feedback #1 – Absolute Encoder Connection: SSI, BiSS, EnDAT[1]

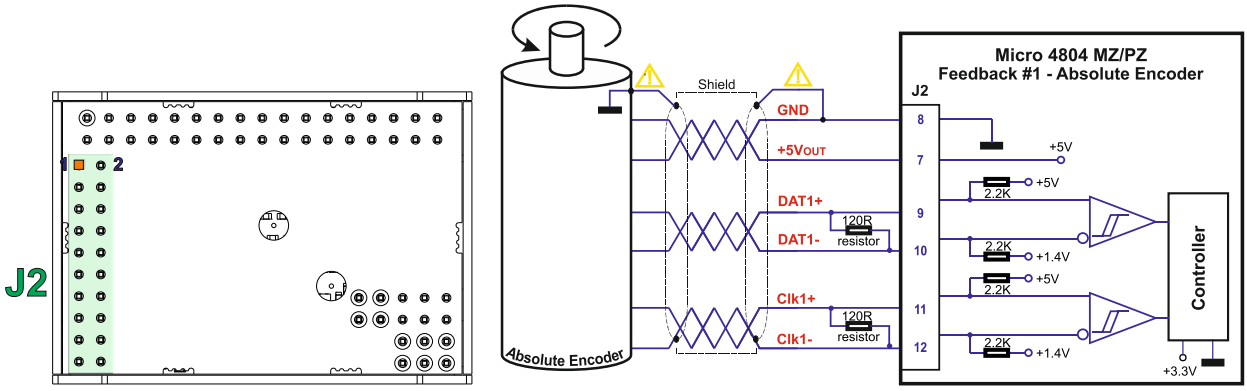


Figure 3-41 **Feedback #1 – Absolute Encoder Connection for Micro 4804 MZ/PZ**

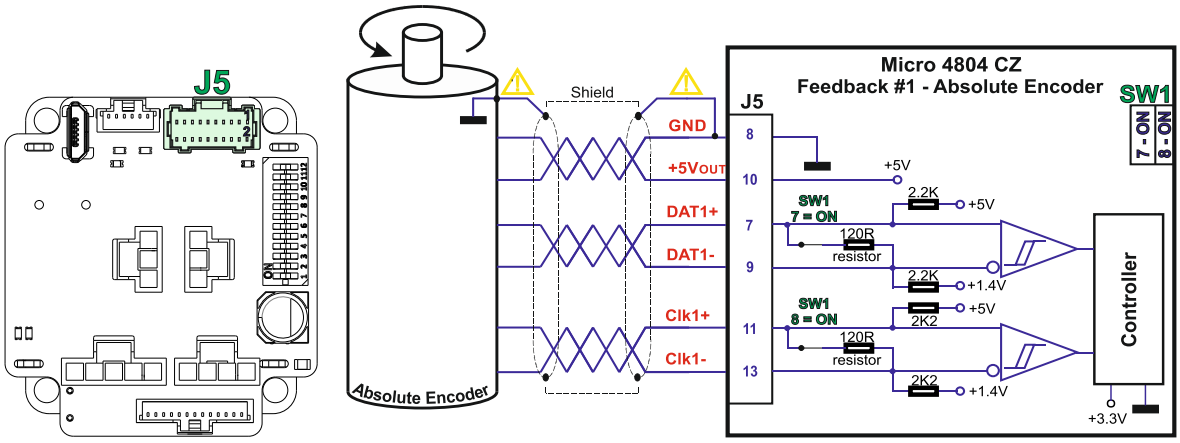


Figure 3-42 **Feedback #1 – Absolute Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ Feedback#1 differential absolute connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For the Micro 4804 CZ Feedback #1 absolute connection, internal terminators equivalent to 120Ω (0.25W) must be connected between the encoder lines via SW1 positions 7 and 8.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Absolute encoders (SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki) are not supported by the Micro 4804 LZ (P020.022.E102 and P020.022.E122).

3.11.6 Feedback #1 – Absolute Encoder Connection: Nikon, Tamagawa, Panasonic, Sanyo Denki[1]

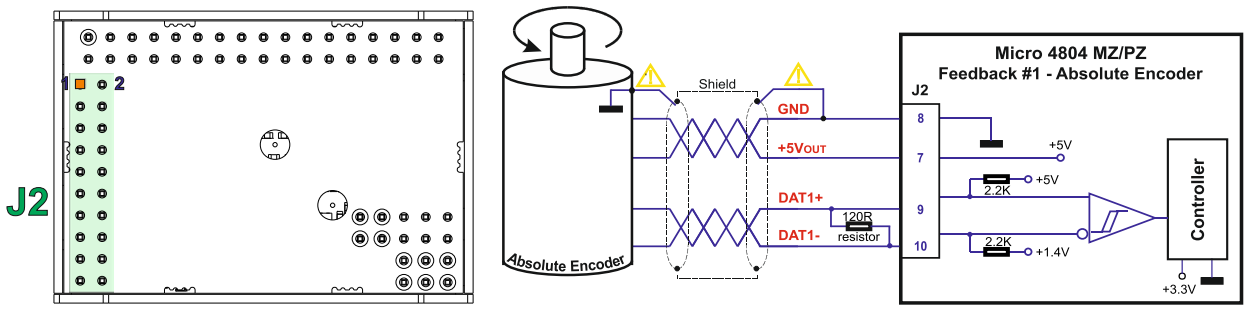


Figure 3-43 **Feedback #1 – Absolute Encoder Connection for Micro 4804 MZ/PZ**

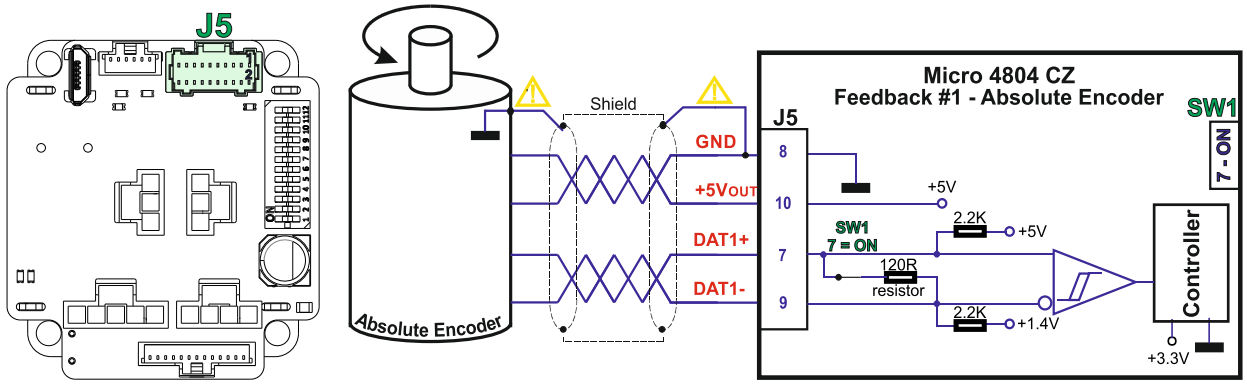


Figure 3-44 **Feedback #1 – Absolute Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ Feedback#1 differential absolute connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For the Micro 4804 CZ Feedback #1 absolute connection, internal terminators equivalent to 120Ω (0.25W) must be connected between the encoder lines via SW1 position 7.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Absolute encoders (SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki) are not supported by the Micro 4804 LZ (P020.022.E102 and P020.022.E122).

3.11.7 Feedback #2[1] – Absolute Encoder Connection: SSI, BiSS, EnDAT

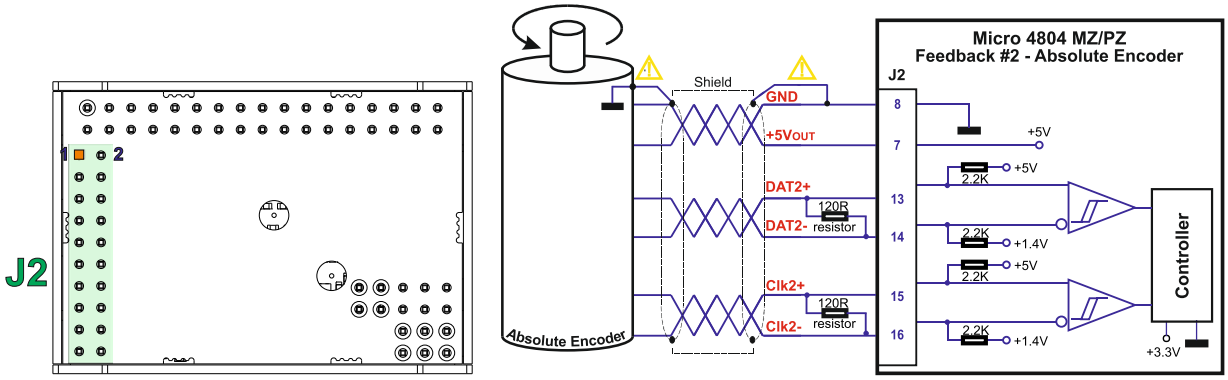


Figure 3-45 **Feedback #2 – Absolute Encoder Connection for Micro 4804 MZ/PZ**

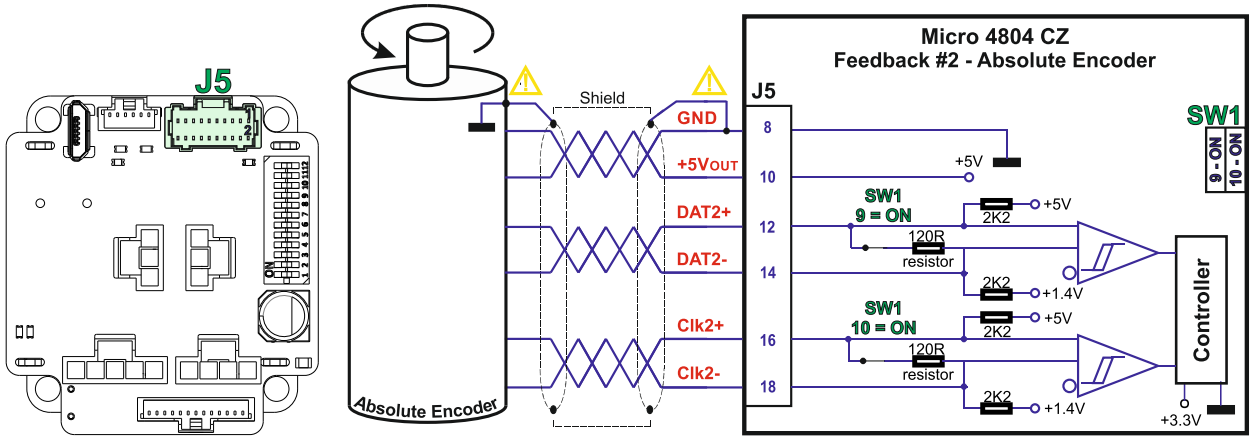


Figure 3-46 **Feedback #2 – Absolute Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ Feedback#2 absolute connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For the Micro 4804 CZ Feedback #2 absolute connection, internal terminators equivalent to 120Ω (0.25W) must be connected between the encoder lines via SW1 positions 9 and 10.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Feedback #2 is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

3.11.8 Feedback #2[1] – Absolute Encoder Connection: Nikon, Tamagawa, Panasonic, Sanyo Denki

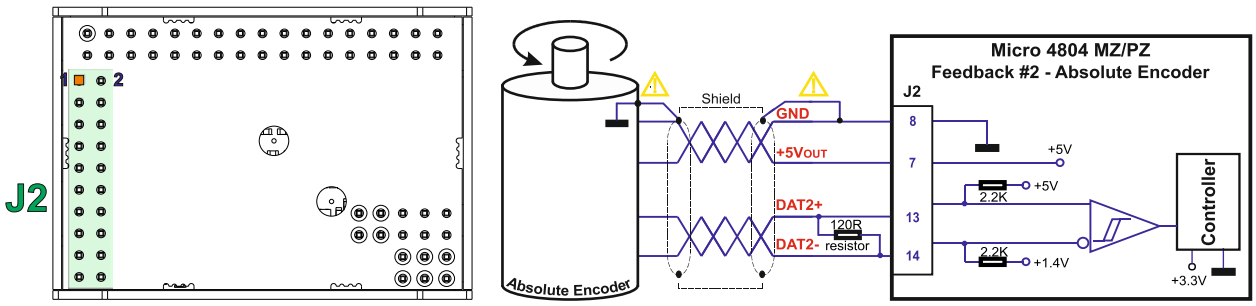


Figure 3-47 **Feedback #2 – Absolute Encoder Connection for Micro 4804 MZ/PZ**

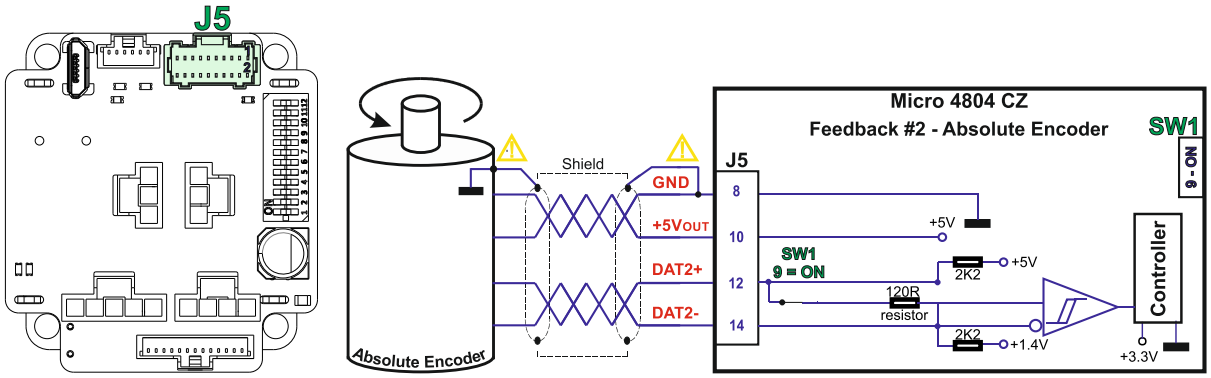


Figure 3-48 **Feedback #2 – Absolute Encoder Connection for Micro 4804 CZ**

Remarks:

1. *For Micro 4804 MZ/PZ Feedback#2 absolute connection, 120Ω (0.25W) terminators must be connected for long encoder cables, or noisy environments.*
2. *For the Micro 4804 CZ Feedback #2 absolute connection, internal terminators equivalent to 120Ω (0.25W) must be connected between the encoder lines via SW1 position 9.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] Feedback #2 is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

3.11.9 Linear (Analog) Hall Connection[1]

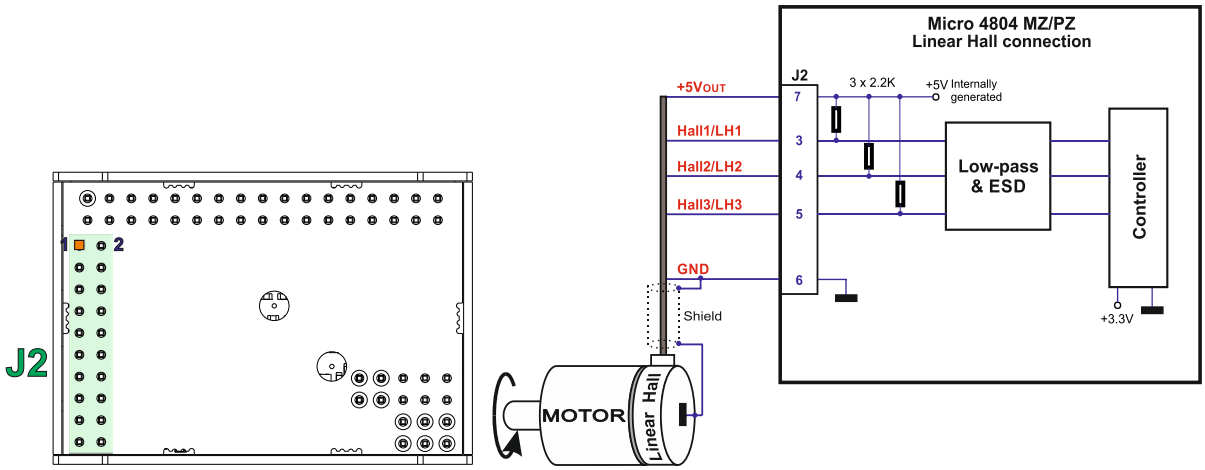


Figure 3-49 **Linear Hall connection for Micro 4804 MZ/PZ**

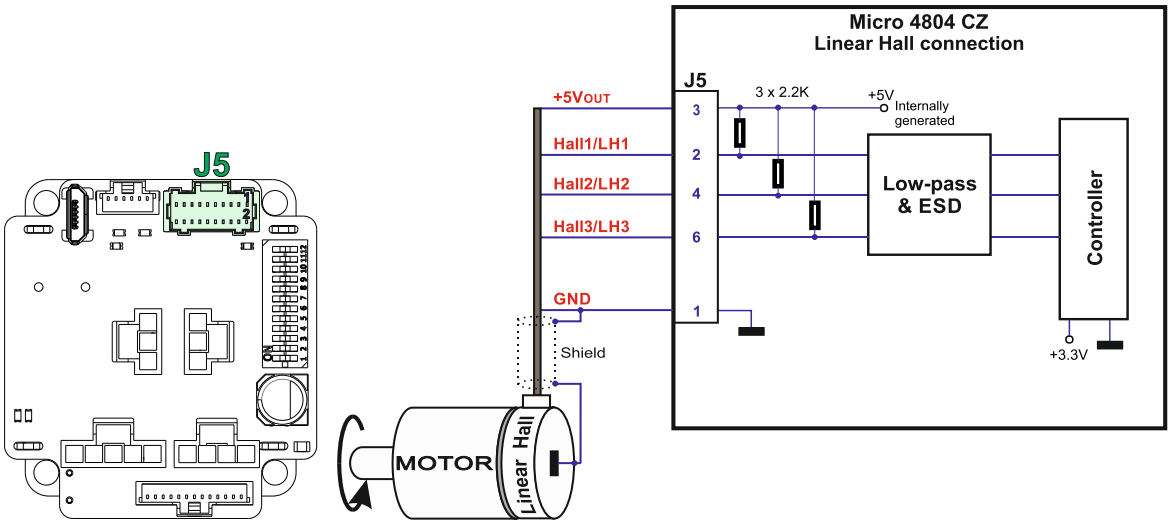


Figure 3-50 **Linear Hall connection for Micro 4804 CZ**

CAUTION!	***Analog Hall cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] cccc

3.11.10 Digital Hall Connection for Motor + Hall + Incremental or Absolute Encoder

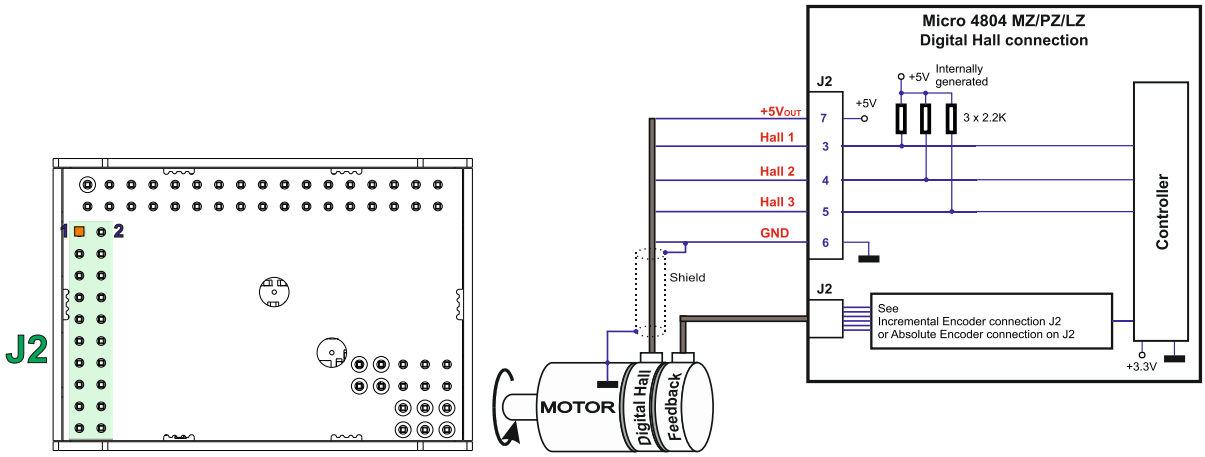


Figure 3-51 **Digital Hall connection for Micro 4804 MZ/PZ/LZ**

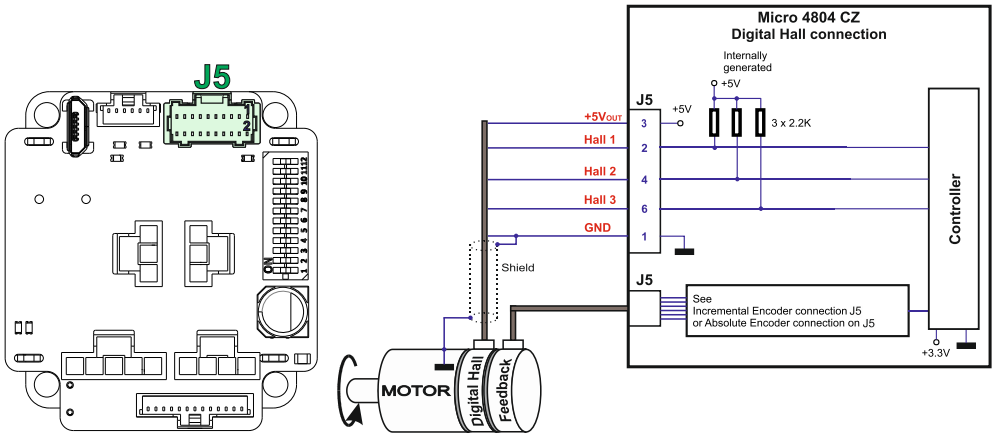


Figure 3-52 **Digital Hall connection for Micro 4804 CZ**

Remarks:

1. *This connection is necessary when using the Hall start method for BLDC or PMSM motors, as well as for the Trapezoidal commutation method. In this setup, the digital halls are not used as feedback measurement devices; instead, motor control is performed using an incremental encoder.*
2. *The Micro 4804 drives are equipped with a feature that detects breakage of Hall wires and/or of incremental/absolute encoder wires.* [1]
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

CAUTION!	***Digital Hall cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

[1] In case of an absolute encoder connection, if only just one wire is missing from a pair the breakage can't be detected.

3.11.11 Digital Hall Connection for Motor + Digital Hall only control

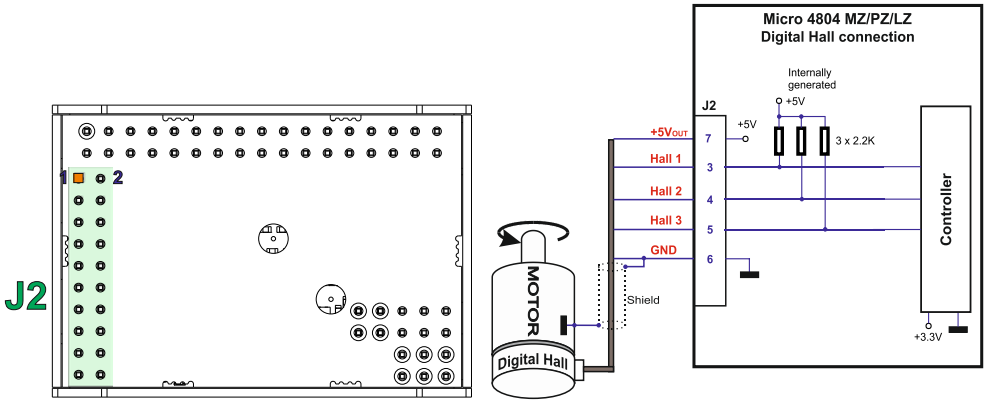


Figure 3-53 **Digital Hall connection for Micro 4804 MZ/PZ/LZ**

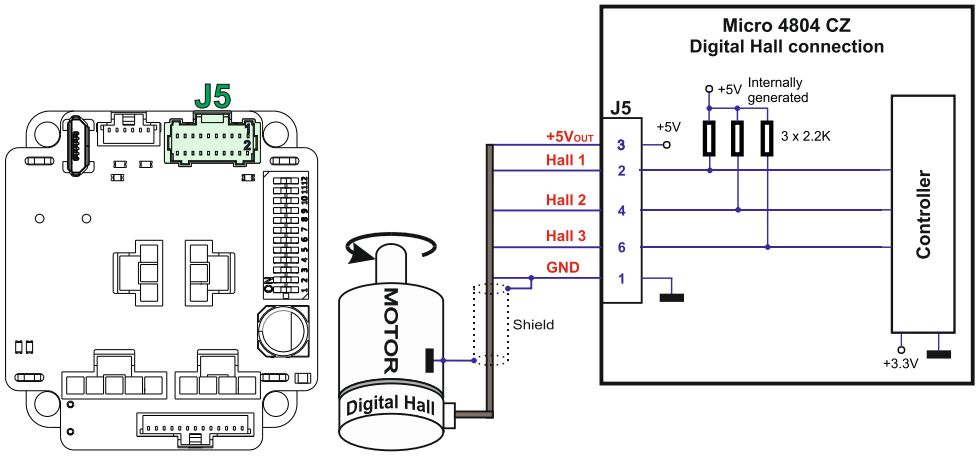


Figure 3-54 **Digital Hall connection for Micro 4804 CZ**

Remarks:

1. *This connection is required when using only Digital hall signals as the main feedback device for motor control. In this case, no incremental encoder is needed.*
2. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*
3. *While using this control scheme, the incremental encoder signals are used internally by the drive.*

CAUTION!	***Digital Hall cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.***

3.11.11.1 General recommendations for feedback wiring

a) Always connect both positive and negative signals when the position sensor is differential and provides them. Use one twisted pair for each differential group of signals as follows: A1+/DAT1+ with A1-/DAT1-, B1+/CLK1+ with B1-/CLK1-, Z1+ with Z1-, A2+/DAT2+ with A2-/DAT2- and B2+/CLK2+ with B2-/CLK2-. Use another twisted pair for the 5V supply and GND.

b) Always use shielded cables to avoid capacitive-coupled noise when using single-ended encoders or Hall sensors with cable lengths over 1 meter. Connect the cable shield to the GND, at both ends.

c) If the +5V supply output is used by another device (like for example an encoder) and the connection cable is longer than 5 meters, add a decoupling capacitor near the supplied device, between the +5V and GND lines. The capacitor value can be 1...10 µF, rated at 6.3V.

3.12 Power Supply Connection

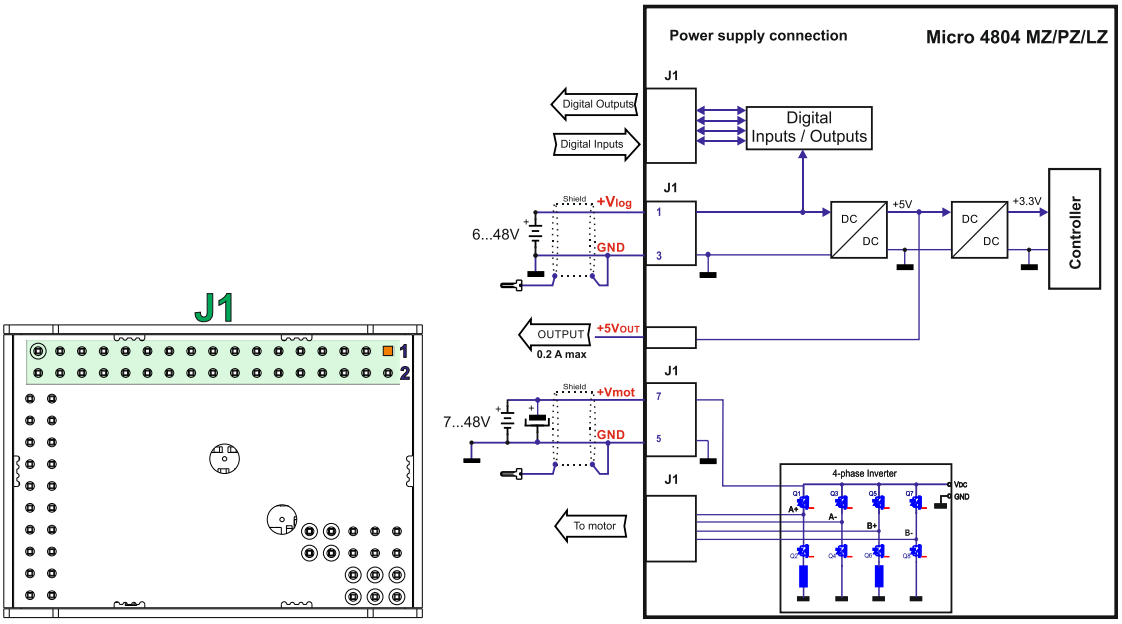


Figure 3-55 **Supply connection for Micro 4804 MZ/PZ/LZ**

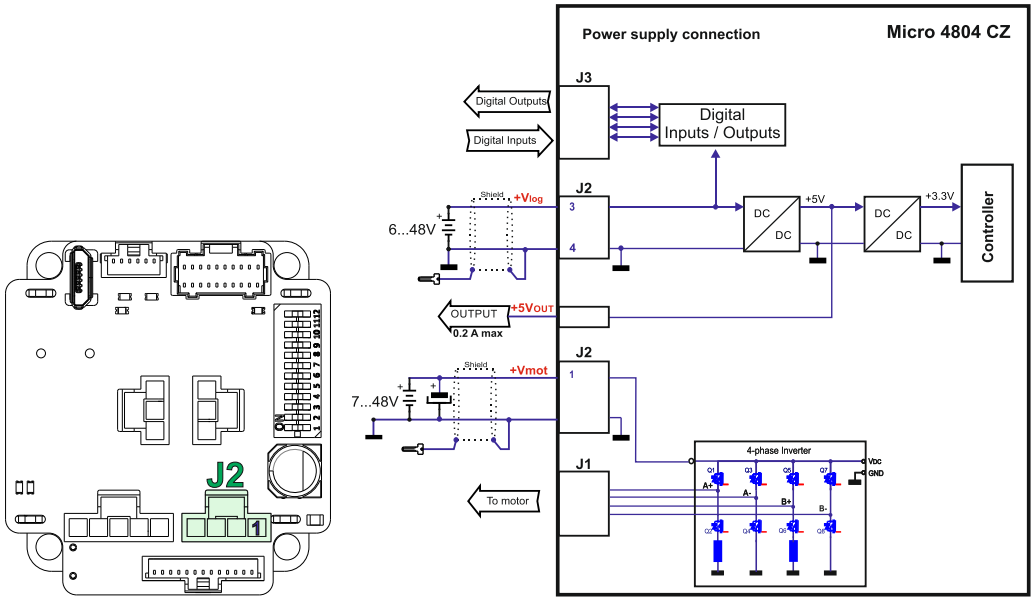


Figure 3-56 **Supply connection for Micro 4804 CZ**

Remarks:

1. *The Micro 4804 always requires two supply voltages: $+V_{LOG}$ and + V_{MOT}.*
2. *The $+V_{LOG}$ inputs can be supplied from the same power source as long as its output voltage is 6 to 48V DC from a SELV/ PELV power supply.*
3. *An external electrolytic capacitor may be added between $+V_{MOT}$ and GND, to help reduce over-voltage during load braking/ reversals. See paragraph 3.10.1.1 for details.*

3.12.1.1 Recommendations for Supply Wiring

a) Use short, thick wires between the Micro 4804 and the motor power supply. Connect power supply wires to all the indicated pins. If the wires are longer than 2 meters, use twisted wires for the supply and ground return. For wires longer than 20 meters, add a capacitor of at least 1000µF (rated at an appropriate voltage) right on the terminals of the Micro 4804.

b) It is recommended to connect the negative motor supply return (GND) to the Earth protection near the power supply terminals.

c) The logic and motor power supply cables shield must be connected to GND at both ends.

3.12.1.2 Recommendations to limit over-voltage during braking

During abrupt motion brakes or reversals the regenerative energy is injected into the motor power supply. This may cause an increase of the motor supply voltage (depending on the power supply characteristics). If the voltage bypasses 60V, the drive over-voltage protection is triggered and the drive power stage is disabled.

In order to avoid this situation you have 2 options:

1. ***Add a capacitor on the motor supply*** big enough to absorb the overall energy flowing back to the supply. The capacitor must be rated to a voltage equal or bigger than the maximum expected over-voltage and can be sized with the formula:

$$C \geq \frac{2 \times E_M}{U_{MAX}^2 - U_{NOM}^2}$$

where:

U_{MAX} = 60V is the over-voltage protection limit

U_{NOM} is the nominal motor supply voltage

E_M = the overall energy flowing back to the supply in Joules. In case of a rotary motor and load, E_M can be computed with the formula:

$$E_M = \underbrace{\frac{1}{2}(J_M + J_L)\varpi_M^2}_{\text{Kinetic energy}} + \underbrace{(m_M + m_L)g(h_{initial} - h_{final})}_{\text{Potential energy}} - \underbrace{3I_M^2 R_{Ph} t_d}_{\text{Copper losses}} - \underbrace{\frac{t_d \varpi_M}{2} T_F}_{\text{Friction}}$$

where:

J_M – total rotor inertia [kgm^2]

J_L – total load inertia as seen at motor shaft after transmission [kgm^2]

ϖ_M – motor angular speed before deceleration [rad/s]

m_M – motor mass [kg] – when motor is moving in a non-horizontal plane

m_L – load mass [kg] – when load is moving in a non-horizontal plane

g – gravitational acceleration i.e. 9.8 [m/s^2]

$h_{initial}$ – initial system altitude [m]

h_{final} – final system altitude [m]

I_M – motor current during deceleration [A_{RMS}/phase]

R_{Ph} – motor phase resistance [Ω]

t_d – time to decelerate [s]

T_F – total friction torque as seen at motor shaft [Nm] – includes load and transmission

In case of a linear motor and load, the motor inertia J_M and the load inertia J_L will be replaced by the motor mass and the load mass measured in [kg], the angular speed ϖ_M will become linear speed measured in [m/s] and the friction torque T_F will become friction force measured in [N].

2. ***Connect a chopping resistor R_{CR}*** between phase CR / B- and ground, and activate the software option of dynamic braking (see below).

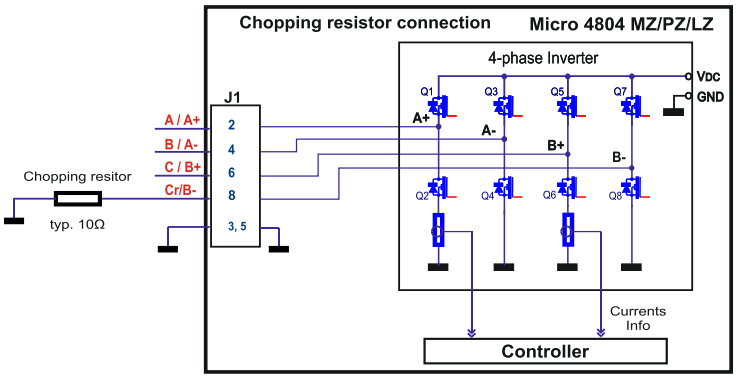


Figure 3-57 **Chopping resistor connection for Micro 4804 MZ/PZ/LZ**

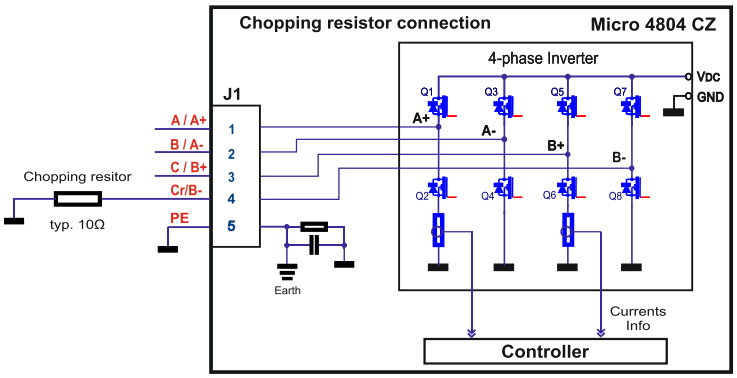
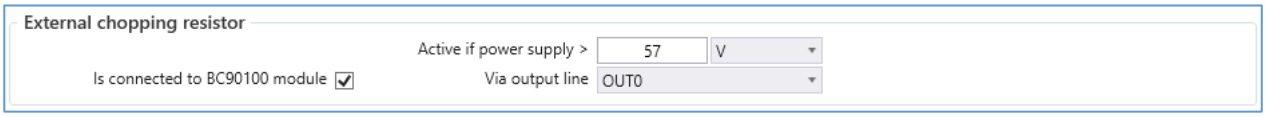


Figure 3-58 **Chopping resistor connection for Micro 4804 CZ**

Remark: This option is not available when the drive is used with a step motor.

The chopping resistor option can be found in the Drive Setup dialogue within EasyMotion / EasySetUp:



The chopping will occur when DC bus voltage increases over U_{CHOP}. This parameter (U_{CHOP}) should be adjusted depending on the nominal motor supply. Optimally (from a braking point of view), U_{CHOP} should be a few volts above the maximum nominal supply voltage. This setting will activate the chopping resistor earlier, before reaching dangerous voltages – when the over-voltage protection will stop the drive. Of course, U_{CHOP} must always be less than U_{MAX} – the over-voltage protection threshold.

***Remark:** This option can be combined with an external capacitor whose value is not enough to absorb the entire regenerative energy E_M but can help reducing the chopping resistor size.*

The BC90100 module (P038.100.E201) is a brake chopper module compatible with all Technosoft Intelligent drives, supporting up to 160A. For more details, refer to the "BC90100 brake chopper module datasheet" (codified as P038.100.E201.DSH.xx).

Chopping resistor selection

The chopping resistor value must be chosen to respect the following conditions:

1. to limit the maximum current below the drive peak current I_{PEAK} = 16A

$$R_{CR} > \frac{U_{MAX}}{I_{PEAK}}$$

2. to sustain the required *braking power*:

$$P_{CR} = \frac{E_M - \frac{1}{2}C(U_{MAX}^2 - U_{CHOP}^2)}{t_d}$$

where C is the capacitance on the motor supply (external), i.e:

$$R_{CR} < \frac{U_{CHOP}^2}{2 \times P_{CR}}$$

3. to limit the average current below the drive nominal current I_{NOM}=8A

$$R_{CR} > \frac{P_{CR} \times t_d}{t_{CYCLE} \times I_{NOM}^2}$$

where t_{CYCLE} is the time interval between 2 voltage increase cycles in case of repetitive moves.

4. to be rated for an average power $P_{AV} = \frac{P_{CR} \times t_d}{t_{CYCLE}}$ and a peak power $P_{PEAK} = \frac{U_{MAX}^2}{R_{CR}}$

Remarks:

1. *If* $\frac{U_{MAX}}{I_{PEAK}} > \frac{U_{CHOP}^2}{2 \times P_{CR}}$ *the braking power* P_{CR} *must be reduced by increasing either* t_d *– the time to decelerate or C – the external capacitor on the motor supply*
2. *If* $\frac{P_{CR} \times t_d}{t_{CYCLE} \times I_{NOM}^2} > \frac{U_{CHOP}^2}{2 \times P_{CR}}$ *either the braking power must be reduced (see Remark 1) or* t_{CYCLE} *– the time interval between chopping cycles must be increased*

	**WARNING!**	***THE CHOPPING RESISTOR MAY HAVE HOT SURFACES DURING OPERATION.***

3.13 USB connection

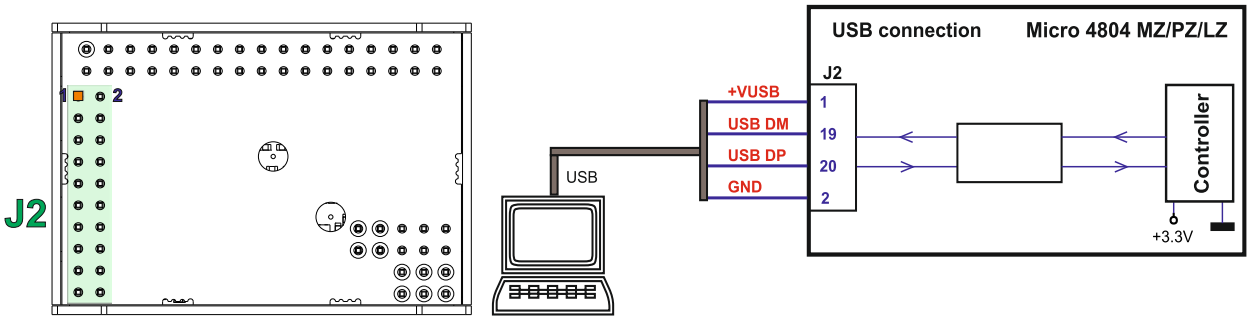


Figure 3-59 **USB connection for Micro 4804 MZ/PZ/LZ**

For Micro 4804 MZ/PZ/LZ, high-speed signals (USB DP, USB DM) must be routed as differential pairs, with controlled impedance, microstrip or stripline with 90 ohm differential characteristic impedance.

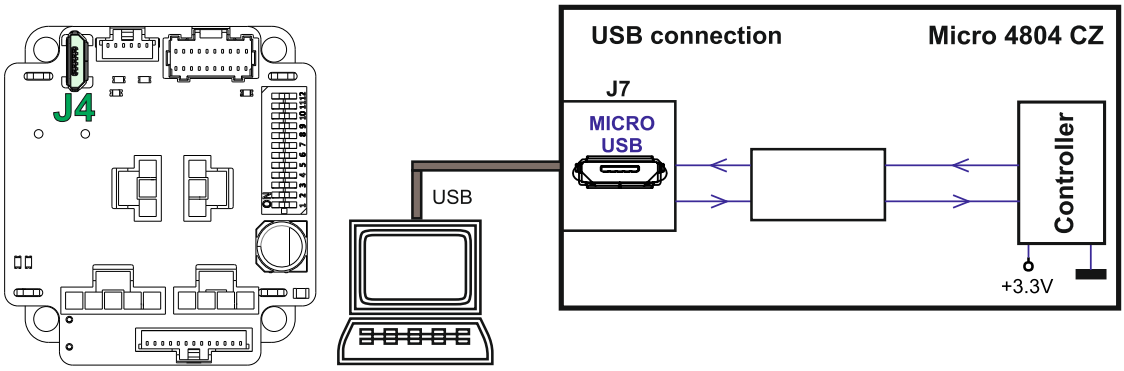


Figure 3-60 **USB connection for Micro 4804 CZ**

For the USB connection a standard USB cable is required. The drivers are found automatically in Windows 10 and the device is identified as a COM port.

Remark:

1. *EasyMotion Studio can communicate either with RS232 or USB communication (not both at the same time).*
2. *EasyMotion Studio can communicate in parallel with RS232/USB communication while CAN or EtherCAT communication is active.*

3.14 Serial RS-232 connection[1]

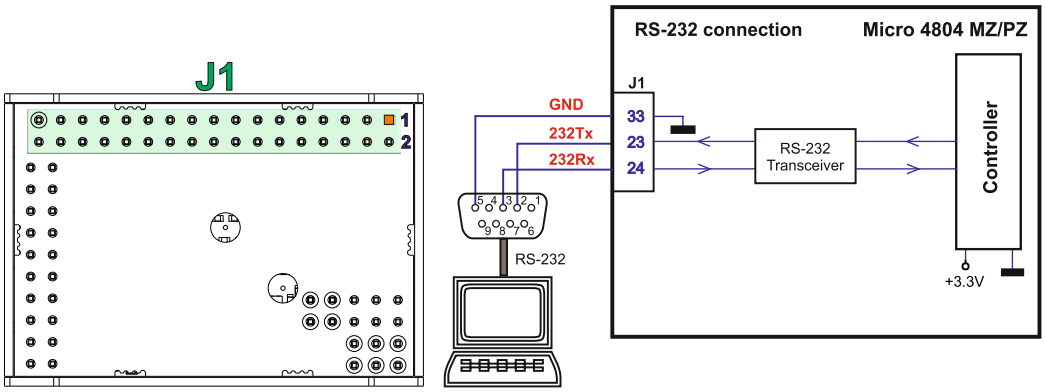


Figure 3-61. ***Serial RS-232 connection for Micro 4804 MZ/PZ***

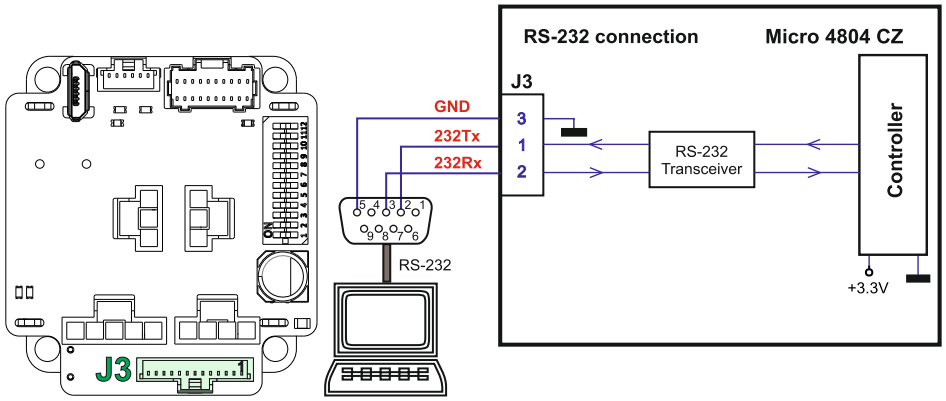


Figure 3-62. ***Serial RS-232 connection for Micro 4804 CZ***

Remark:

1. *EasyMotion Studio can communicate either with RS232 or USB communication (not both at the same time).*
2. *EasyMotion Studio can communicate in parallel with serial RS232 communication while CAN or EtherCAT communication is active.*

3.14.1.1 Recommendation for wiring

b) If you build the serial cable, you can use a 3-wire shielded cable with shield connected to BOTH ends. Do not use the shield as GND. The ground wire must be included inside the shield, like the 232Rx and 232Tx signals.
c) Always power-off all the Micro 4804 supplies before inserting/removing the RS-232 serial connector
d) Do not rely on an earthed PC to provide the Micro 4804 GND connection! The drive must be earthed through a separate circuit. Most communication problems are caused by the lack of such connection.

CAUTION! **DO NOT CONNECT/DISCONNECT THE RS-232 CABLE WHILE THE DRIVE IS PWERED ON. THIS OPERATION CAN DAMAGE THE DRIVE**

[1]RS-232 communication is not available for Micro 4804 LZ (P020.022.E102 and P020.022.E122)

3.15 CAN-bus connection

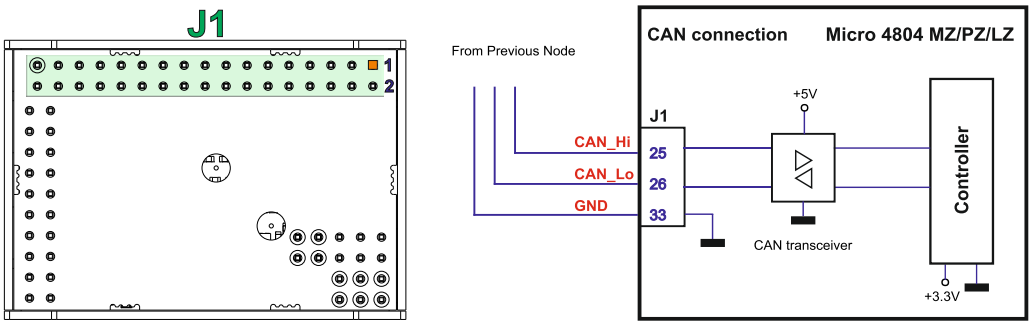


*Figure 3-63**. CAN connection for Micro 4804 MZ/PZ/LZ - CAN***

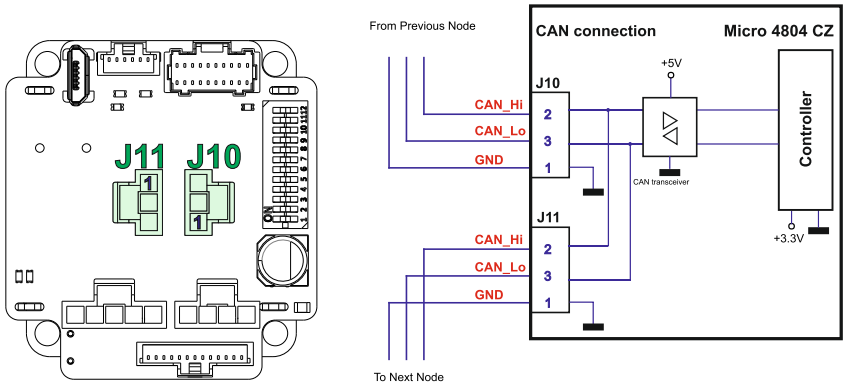


*Figure 3-64**. CAN connection for Micro 4804 CZ - CAN***

Remarks:

1. *The CAN network requires a 120Ω terminator for proper operation. The Micro 4804 MZ/PZ/LZ models do not include this terminator. However, on the Micro 4804 CZ, a 120Ω terminator can be activated by setting SW1 position 12 to 'ON', connecting it between the CAN-Hi and CAN-Lo signals.*
2. *CAN signals are not isolated from other Micro 4804 circuits.*
3. *EasyMotion Studio can communicate in parallel via RS-232 or USB while CAN communication is active*

3.15.1.1 Recommendation for wiring

a) Build CAN network using cables with twisted wires (2 wires/pair), with CAN-Hi twisted together with CAN-Lo. It is recommended but not mandatory to use a shielded cable. If so, connect the shield to GND. The cable impedance must be 105 ... 135 ohms (120 ohms typical) and a capacitance below 30pF/meter.

b) When using a printed circuit board (PCB) motherboard based on FR-4 material, build the CAN network using a pair of 12mil (0.012") tracks, spaced 8 to 10mils (0.008"…0.010") apart, placed over a local ground plane (microstrip) which extends at least 1mm left and right to the tracks.

c) Whenever possible, use daisy-chain links between the CAN nodes. Avoid using stubs. A stub is a "T" connection, where a derivation is taken from the main bus. When stubs can't be avoided keep them as short as possible. For 1 Mbit/s (worst case), the maximum stub length must be below 0.3 meters.

d) The 120Ω termination resistors must be rated at 0.2W minimum. Do not use winded resistors, which are inductive.

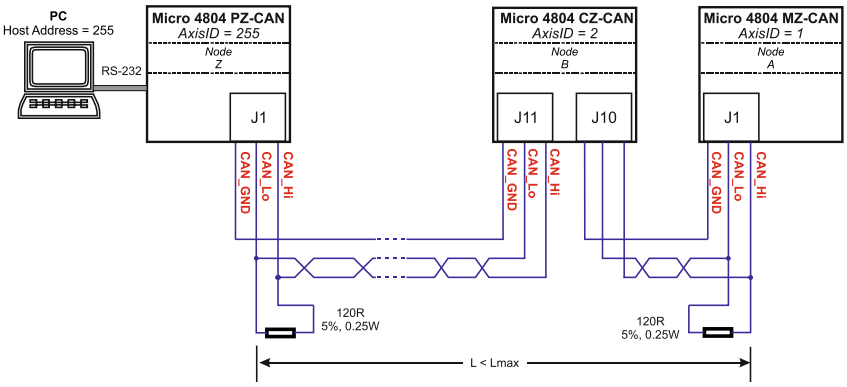


*Figure 3-65**. Multiple-Axis CAN network***

3.16 EtherCAT Connection

3.16.1 Recommendations for EtherCAT Wiring

- Build EtherCAT® network using UTP (unshielded twisted pair) cables rated CAT5E or higher (CAT6, etc.). Cables with this rating must have multiple characteristics, as described in TIA/EIA-568-B. Among these are: impedance, frequency attenuation, cross-talk, return loss, etc.
- It is acceptable to use STP (shielded twisted pair) or FTP (foil twisted pair) cables, rated CAT5E or higher (CAT6, etc.). The added shielding is beneficial in reducing the RF (radio-frequency) emissions, improving the EMC emissions of the application.
- The maximum length of each network segment must be less than 100 meters.
- The network topology is daisy-chain. All connections are done using point-to-point cables. The global topology can be one of the two:
    - Linear, when the OUT port of the last drive in the chain remains not connected. Master is connected to IN port of the first drive; OUT of the first drive is connected to IN of the following drive; OUT of the last drive remains unconnected. See *Figure 3-66* for a visual representation of the linear topology.
    - Ring, when the OUT port of the last drive in the chain is connected back to the master controller, on the 2nd port of the master. This topology consists of the linear topology described above, plus an extra connection between the master, which has two RJ45 ports, to OUT of the last drive. See *Figure 3-67* for a visual representation of the ring topology.
- Ring topology is preferred for its added security, since it is insensitive to one broken cable / connection along the ring (re-routing of communication is done automatically, so that to avoid the broken cable / connection)
- It is highly recommended to use qualified cables, assembled by a specialized manufacturer. When using CAT5E UTP cables that are manufactured / commissioned / prepared on-site, it is highly recommended to check the cables. The check should be performed using a dedicated Ethernet cable tester, which verifies more parameters than simple galvanic continuity (such as cross-talk, attenuation, etc.). The activation of “Link” indicators will NOT guarantee a stable and reliable connection! This can only be guaranteed by proper quality of cables used, according to TIA/EIA-568-B specifications.

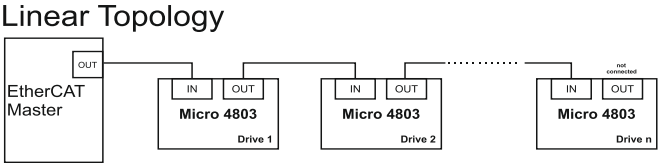


Figure 3-66 **EtherCAT network linear topology**

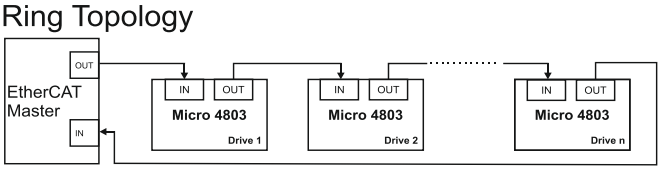


Figure 3-67 **EtherCAT network ring topology**

Remark: *EasyMotion Studio can communicate via RS232 or USB while EtherCAT communication is active.*

3.16.2 EtherCAT signals schematic considerations

- Ports cannot be swapped. Port IN (0) must be always used for connection, while port OUT (1) can be optionally left disconnected (inactive). Swapping ports can lead to packet loss, see EtherCAT documentation on circulating packets.
- For both ports, transmit and receive paths can be swapped freely. For example, it is possible to swap the group (Tx0+, Tx0-) with the group (Rx0+, Rx0-). This feature, called “Auto MDI/MDI-X”, is present on all EtherCAT devices. As a consequence, it is possible to connect EtherCAT devices either by patch cables (1:1 wiring), or by cross-over cables (pair 1-2 swapped with 3-6).
- This feature is already used in the proposed schematics, where channels of Port 0 (IN) have different allocation than channels of Port 1 (OUT).
- For all 4 differential channels, positive and negative lines can be swapped freely. For example, it is possible to swap Tx0+ with Tx0-. This feature, which is specific to Micro 4804 and not to all EtherCAT devices, makes wiring errors transparent, without any hidden consequence. This feature is already used in the proposed schematics, where both channels of Port 0 (IN) have different polarity than both channels of Port 1 (OUT).

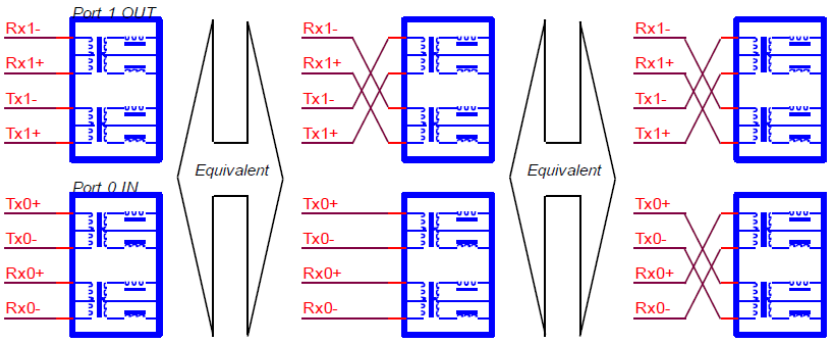


Figure 3-68 **Auto MDI/MDI-X**

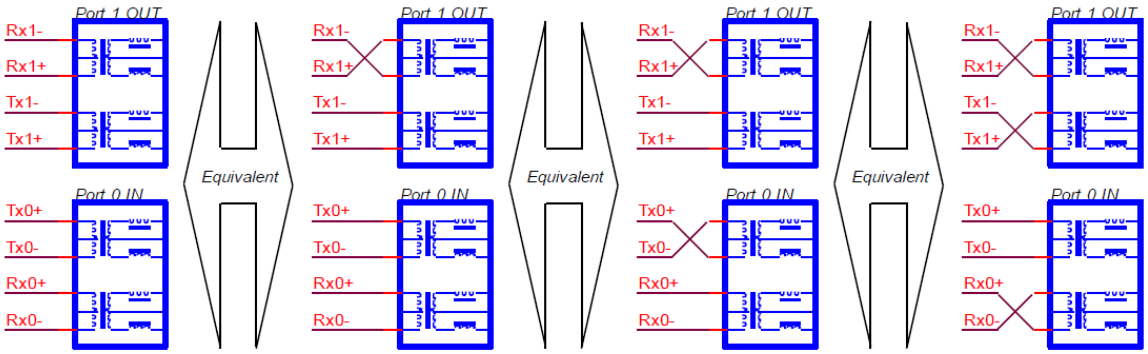


Figure 3-69 **Auto Polarity Detection and Correction**

3.17 Disabling Autorun (for CAN drives); Disabling the setup table (for CAT drives)

3.17.1 Disabling Autorun (for CAN drives)

When a Micro 4804 CAN is set to TMLCAN operation mode, it automatically enters Autorun mode by default after power-on. In this mode, if the drive's local EEPROM contains a valid TML application (motion program), it will automatically execute as soon as the motor supply (V_{MOT}) is turned on.

To disable Autorun mode, you can use one of the following methods:

a) Software - by writing value 0x0001 in first EEPROM location at address 0x2000

b) Hardware1 – set the drive temporarily in CANopen mode. While in CANopen state, no motion will autorun.

c) Hardware2 – by temporary connecting all digital Hall inputs to GND, during the power-on for about 1 second, until the green LED is turned on, as shown in Figure **3-70** and Figure **3-71**.This option is particularly useful when it is not possible to communicate with the drive.

After the drive is set in non-Autorun/slave mode using 2nd method, the 1st method may be used to invalidate the TML application from the EEPROM. On next power on, in absence of a valid TML application, the drive enters in the non-Autorun/slave mode independently of the digital Hall inputs status.

3.17.2 Disabling the setup table at startup (for CAT drives)

In rare instances, the setup table may become corrupted, causing the drive to continuously reset. This condition is indicated by both the Ready and Error LEDs blinking rapidly in succession.

To recover from this state, invalidate the setup table by connecting all digital Hall inputs to GND. Upon the next power-on, the drive will load the default settings and set bit 2 in the Motion Error Register, indicating “Invalid Setup Data.” Once a new valid setup table is loaded onto the drive, disconnect the Hall sensors from GND and perform another power cycle (power off and then on).

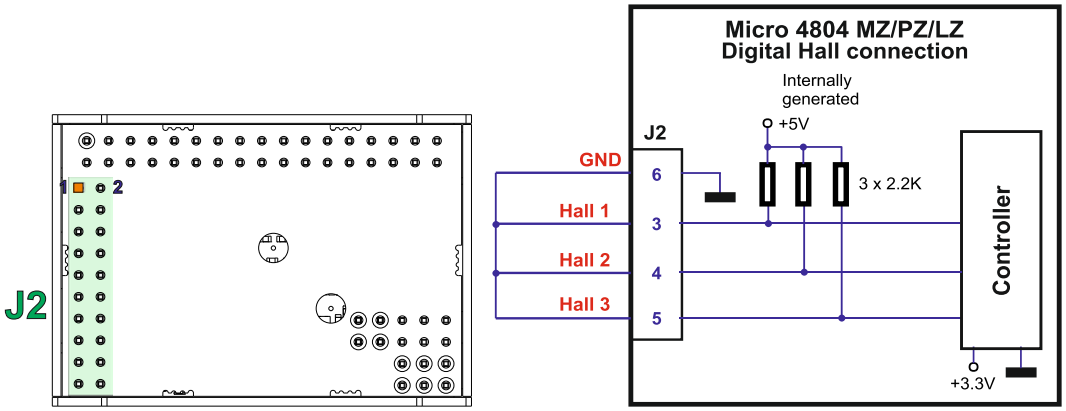


Figure 3-70 **Temporary connection during power-on to invalidate the Setup table for Micro 4804 MZ/PZ/LZ**

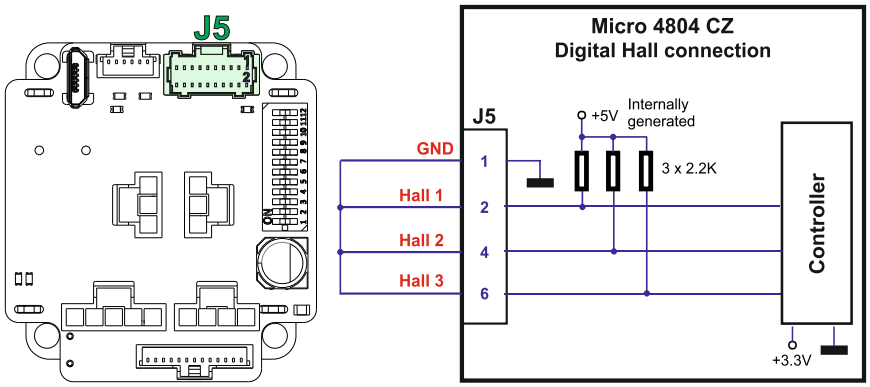


Figure 3-71 **Temporary connection during power-on to invalidate the Setup table for Micro 4804 CZ**

3.18 LED Indicators

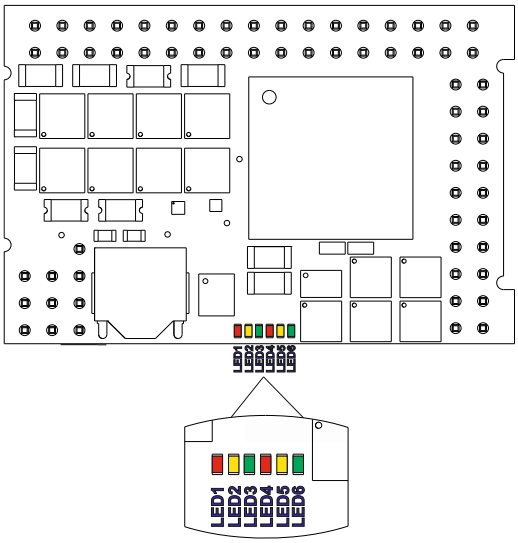


Figure 3-72 **LED indicators for Micro 4804 MZ/LZ**

Table 1- **LED indicators description for Micro 4804 MZ/LZ**

No.	Name	Color	Description
LED1	TML ERR	RED	Turned on when the drive detects an error condition.
LED2	ECAT ACT1	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.
LED4	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED5	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED6	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED2, LED4, LED5 and LED6 are not used for the CAN version			

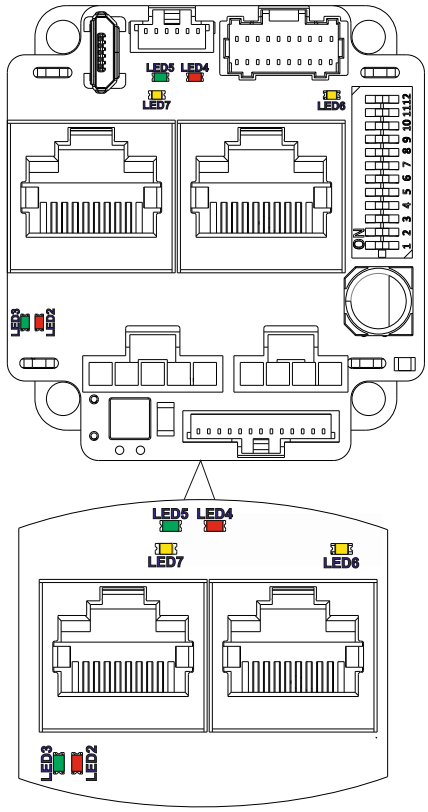


Figure 3-73 **LED indicators for Micro 4804 CZ**

Table 2- **LED indicators description for Micro 4804 CZ**

No.	Name	Color	Description
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.
LED4	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED5	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED6	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED7	ECAT ACT1	YELLOW	
LED4, LED5, LED6 and LED7 are not used for the CAN version			

3.18.1 EtherCAT® RUN and ERROR LED Indicators

The RUN states are displayed with a 180 degree phase shift to the ERROR states as noted in Figure 3-74. STATUS indicator Example.

The behavior of the RUN indicator is specified in Table 3. RUN Indicator States" and the behavior of the ERROR indicator specified in Table 4. ERROR Indicator States".

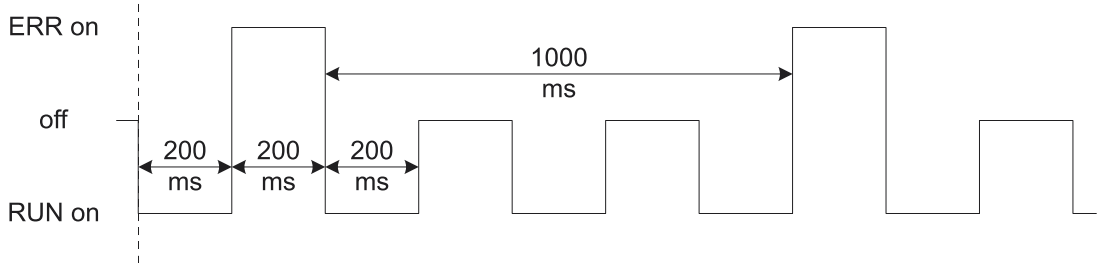


Figure 3-74. *STATUS indicator Example*

Table 3. *RUN Indicator States*

Indicator states	Slave State	Description
Off	INITIALISATION	The drive is in state INIT
Blinking	PRE-OPERATIONAL	The drive is in state PRE-OEPRATIONAL
Single Flash	SAFE-OPERATIONAL	The drive is in state SAFE-OPERATIONAL
On	OPERATIONAL	The drive is in state OPERATIONAL

Table 4. *ERROR Indicator States*

ERR state	Error name	Description
On	Application controller failure	An critical communication or application controller error has occurred
Double Flash	Process Data Watchdog Timeout/ EtherCAT Watchdog Timeout	An application watchdog timeout has occurred.
Single Flash	Local Error	Slave device application has changed the EtherCAT state autonomously, due to local error (see ETG.1000 part 6 EtherCAT State Machine). Error Indicator bit is set to 1 in AL Status register.
Blinking	Invalid Configuration	General Configuration Error
Flickering	Booting Error	Booting Error was detected. INIT state reached, but Error Indicator bit is set to 1 in AL Status register
Off	No error	The EtherCAT communication of the device is in working condition

For a more detailed description of EtherCAT® LED functionalities please read ETG.1300 S (R) V1.0.1 available at www.EtherCAT.org

3.19 Axis ID Selection and Operation Mode

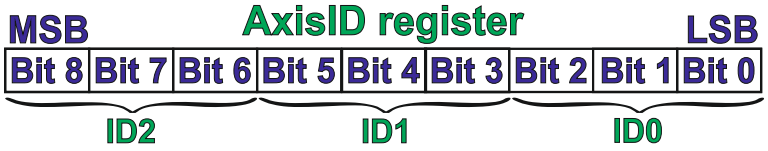
3.19.1 Axis ID Selection for Micro 4804 MZ/LZ/PZ - CAT

The **Micro 4804 MZ/PZ/LZ - CAT** drive support all EtherCAT standard addressing modes. In case of device addressing mode based on node address, the drive sets the *configured station alias* address with its AxisID value. The drive's AxisID value is configured after power-on by one of the following methods:

- **Software**, Using EasyMotion Studio II, set a specific AxisID value in the range of 1-255 within the AxisID settings under the setup section.

- **Hardware**, In EasyMotion Studio II, select the 'H/W' option under AxisID settings in the setup section, then choose a value between 1 and 255 using J1 pins 10, 21, and 22.
The AxisID is set by providing a voltage to the AxisID pins (ID0, ID1 and ID2) according to Table 5 – AxisID register.

Table 5- **AxisID Register for Micro 4804 MZ/PZ/LZ - CAT**



Nominal[V]	Minimum[V]	Maximum[V]	IDx* Bits	IDx* Value
0.000	0.00	0.53	**000**	**0**
1.057	0.53	1.41	**001**	**1**
1.756	1.41	2.01	**010**	**2**
2.254	2.01	2.43	**011**	**3**
2.600	2.43	2.75	**100**	**4**
2.894	2.75	3.01	**101**	**5**
3.128	3.01	3.22	**110**	**6**
3.319	3.22	3.35	**111**	**7**
AxisID = 64*(ID2 Value) + 8*(ID1 Value) + (ID0 Value)				

*where ”x” can be 1, 2 or 3

Remarks:

1. *The drive's axis or address number is determined by the hardware pins when 'H/W' is selected in the Drive Setup under the AxisID field, or when the setup is invalid.*
2. *If the AxisID pins are not connected (floating) the AxisID value can’t be determined.*
3. *If all “IDx” pins are connected to GND, the AxisID value is 255 and the EtherCAT register called “configured station alias” will be 0*
4. *If Bit 8=1 the AxisID is set to 255 and the EtherCAT register called “configured station alias” will be 0.*
5. *All pins are sampled at power-up, and the drive is configured accordingly.*

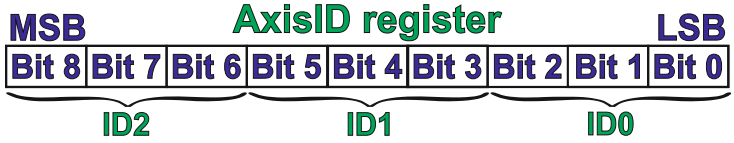
3.19.2 Axis ID Selection and Operation Mode for Micro 4804 MZ/PZ/LZ - CAN

The drive's AxisID value is configured after power-on by one of the following methods:

- **Software**, Using EasyMotion Studio II, set a specific AxisID value in the range of 1-255 within the AxisID settings under the setup section.

- **Hardware**, In EasyMotion Studio II, select the 'H/W' option under AxisID settings in the setup section, then choose a value between 1 and 255 using J1 pins 10, 21, and 22.

Table 6- **AxisID Register for Micro 4804 MZ/PZ/LZ - CAN**



Nominal[V]	Minimum[V]	Maximum[V]	IDx* Bits	IDx* Value
0.000	0.00	0.53	**000**	**0**
1.057	0.53	1.41	**001**	**1**
1.756	1.41	2.01	**010**	**2**
2.254	2.01	2.43	**011**	**3**
2.600	2.43	2.75	**100**	**4**
2.894	2.75	3.01	**101**	**5**
3.128	3.01	3.22	**110**	**6**
3.319	3.22	3.35	**111**	**7**
TMLCAN mode**: AxisID = (64*ID2_Value - 128) + (8*ID1_Value) + ID0_Value**				
CANopen mode**: AxisID = (64*ID2_Value) + (8*ID1_Value) + ID0_Value**				

*where ”x” can be 1, 2 or 3

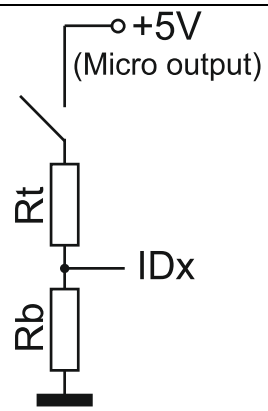
Remarks:

1. *If **Bit 7 (ID2) = 1** -> **TMLCAN** mode is selected.*
2. *If **Bit 7 (ID2) = 0** -> **CANopen** mode is selected.*
3. *Bit 8 (MSB of ID2) is ignored, and always considered as “0”.*
4. *The maximum AxisID value is 127 (Bit 0 … Bit 6).*
5. *If the AxisID pins are not connected, the AxisID value can’t be determined.*
6. *If all “IDx” pins are connected to GND the AxisID value is 255.*
7. *If the CANOpen mode is selected and the AxisID value is 255, drive will be in “LSS inactive” state and the Green LED will flash at 1 second intervals.*

** where “x” can be 1, 2 or 3*

3.19.3 Hardware Axis ID implementation for Micro 4804 MZ/PZ/LZ

To obtain the voltages and corresponding values for the AxisID pins ('IDx'), the following connection scheme and resistor values can be used:



IDx* Bits	IDx* Value	Top resistor - Rt	Bottom resistor - Rb
000	0	- (infinite)	5.1 Kohm
001	1	20 Kohm	5.1 Kohm
010	2	10 Kohm	5.1 Kohm
011	3	6.8 Kohm	5.1 Kohm
100	4	5.1 Kohm	5.1 Kohm
101	5	3.9 Kohm	5.1 Kohm
110	6	3.3 Kohm	5.1 Kohm
111	7	2.7 Kohm	5.1 Kohm

To connect the AxisID pins to a DIP switch for selecting any available Axis ID values, use the following connection scheme and resistor values:

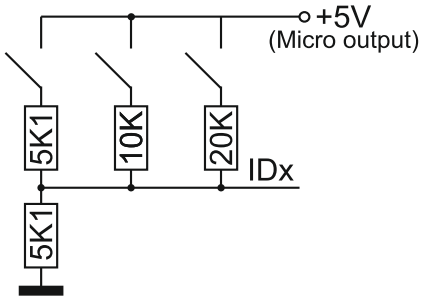


Figure 3-75. *AxisID pins connection to a DIP switch*

To connect the AxisID pins to a HEX switch for selecting from all available Axis ID values, use the following connection setup and resistor values:

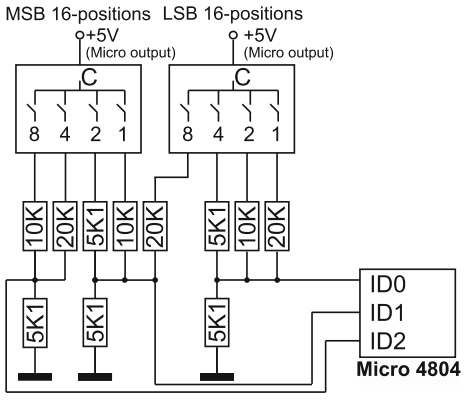


Figure 3-76. *How to connect the AxisID pins to a HEX switch*

Remark *: It is recommended to use resistors with a tolerance of +/-5% or higher for all the connections.*

3.19.4 Axis ID Selection for Micro 4804 CZ - CAT

The **Micro 4804 CZ - CAT** drive support all EtherCAT standard addressing modes. In case of device addressing mode based on node address, the drive sets the *configured station alias* address with its AxisID value. The drive's AxisID value is configured after power-on by one of the following methods:

- **Software**, using EasyMotion Studio II, set a specific AxisID value in the range of 1-255 within the AxisID settings under the setup section.

- **Hardware**, in EasyMotion Studio II, select the 'H/W' option under AxisID settings in the setup section, then choose a value between 1 and 255 using SW1.

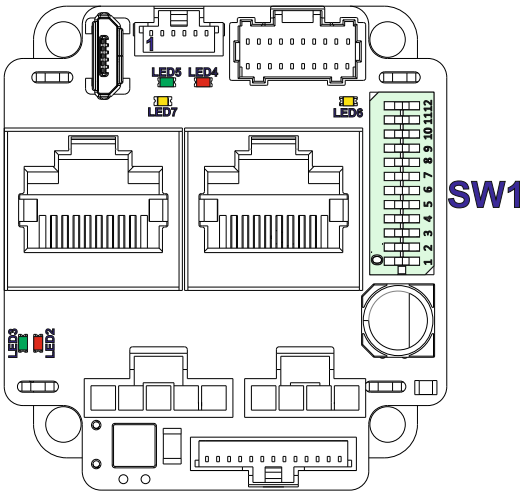


Figure 3-77 **Sliding switch for Micro 4804 CZ-CAT**

SW1

Position	Description
1	AxisID register Bit 0.
2	AxisID register Bit 1.
3	AxisID register Bit 2.
4	AxisID register Bit 3.
5	AxisID register Bit 4.
6	AxisID register Bit 5.

ON: Bit x = 1.
OFF: Bit x = 0.
The maximum AxisID value is 63.
When all Bits are set to 0, AxisID value is 255.

Table 7 ***Axis ID switch settings for Micro 4804 CZ-CAT***

Remarks:

1. *The drive's axis or address number is determined by the hardware pins when 'H/W' is selected in the Drive Setup under the AxisID field, or when the setup is invalid.*
2. *When Axis ID is 255, the EtherCAT register called "configured station alias" will be 0.*
3. *All pins are sampled at power-up, and the drive is configured accordingly.*

3.19.5 Axis ID Selection and Operation Mode for Micro 4804 CZ - CAN

The drive AxisID value is set after power on by:

- **Software**, using EasyMotion Studio II, set a specific AxisID value in the range of 1-255 within the AxisID settings under the setup section.

- **Hardware**, in EasyMotion Studio II, select the 'H/W' option under AxisID settings in the setup section, then choose a value between 1 and 255 using SW1.

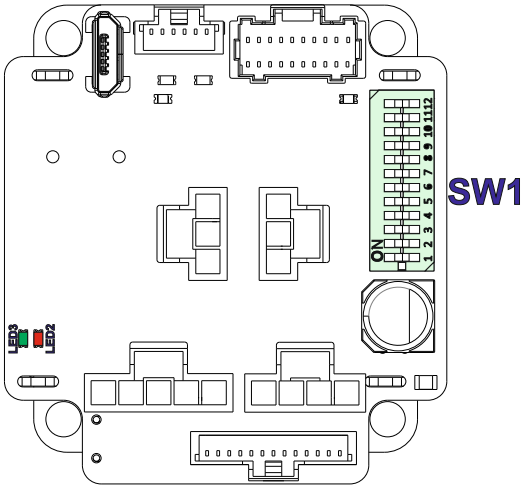


Figure 3-78 **Sliding switch for Micro 4804 CZ-CAN**

SW1

Position	Description
1	AxisID register Bit 0.
2	AxisID register Bit 1.
3	AxisID register Bit 2.
4	AxisID register Bit 3.
5	AxisID register Bit 4.
6	ON = TMLCAN mode is selected OFF = CANOpen mode is selected

ON: Bit x = 1.
OFF: Bit x = 0.
The maximum AxisID value is 31.
When all Bits are set to 0, AxisID value is 255.
In CANOpen mode, if the AxisID is set to 255, the drive enters the "LSS inactive" state. In this state, the Green LED will flash at 1-second intervals.

Table 8 ***Axis ID switch settings for Micro 4804 CZ-CAN***

4 Electrical Specifications

All parameters measured under the following conditions (unless otherwise specified):

- V_{LOG} = 24 V_{DC}; V_{MOT} = 48V_{DC}; F_{PWM} = 20 kHZ
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude) for Micro 4804 MZ/LZ = 4.2A
- Load current (sinusoidal amplitude) for Micro 4804 PZ/CZ = 5.6A

4.1 Operating Conditions

		Min.	Typ.	Max.	Units
Ambient temperature[1]		0		+40	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (referenced to sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm

4.2 Storage Conditions

		Min.	Typ.	Max.	Units
Ambient temperature		-40		100	ºC
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
	Original packaging			±15	kV

4.3 Mechanical Mounting

		Min.	Typ.	Max.	Units
Airflow		natural convection [3], closed box			
Spacing required for horizontal mounting	Between adjacent drives		10		mm
	Between drives and nearby walls		10		mm
	Space needed for drive removal		20		mm
	Between drives and roof-top		30		mm
Insertion force	Using recommended mating connectors		20		N
Extraction force			8		N

4.4 Environmental Characteristics

			Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size (Without connectors)	Micro 4804 MZ/LZ	38.35 x 25 x 9.71			mm
			~1.51 x 0.98 x 0.38			inch
		Micro 4804 PZ	38.3 x 26.8 x 11.3			mm
			~1.51 x 1.05 x 0.44			inch
		Micro 4804 CZ-CAN	40 x 43.5 x 22.88			mm
			~1.57 x 1.71 x 0.9			inch
		Micro 4804 CZ-CAT	40.6 x 38.6 x 25.45			mm
			~1.6 x 1.5 x 1.0			inch
Weight	Micro 4804 MZ/LZ		8			g
	Micro 4804 PZ		-			
	Micro 4804 CZ-CAN		-			
	Micro 4804 CZ-CAT		22.3			
Cleaning agents	Dry cleaning is recommended		Only Water- or Alcohol- based			
Protection degree	According to IEC60529, UL508		IP20			-
Dissipated power	Idle			1.5		W
	Operating			2.8		
Global Efficiency				98		%

[1] Operating temperature at higher temperatures is possible with reduced current and power ratings

[2] Micro 4804 can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.

[3] In case of forced cooling (conduction or ventilation) the spacing requirements may drop down to mechanical tolerances as long as the ambient temperature is kept below the maximum operating limit

4.5 Logic Supply Input (+V_{LOG})

		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	6	24	48	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	4.9		60	V_{DC}
	Absolute maximum values, continuous	-0.5		63	V_{DC}
	+V_{LOG} = 12V		90	150	mA
	+V_{LOG} = 24V		60	90	
	+V_{LOG} = 48V		45	60	
Voltage Measurement	Total Error			1.5	%
Utilization Category	Acc. to 60947-4-1 (I_{PEAK}<=1.05*I_{NOM})	DC-1			

4.6 Motor Supply Input (+V_{MOT})

		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	7		48	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	6		60	V_{DC}
	Absolute maximum values, continuous	-0.5		63	V_{DC}
Supply current	Idle		25		mA
	Operating	-15	±3	+15	A
	Absolute maximum value, short-circuit condition (Duration ≤ 10ms) †			16.5	
Voltage Measurement	Total Error			1.5	%
Utilization Category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})	DC-3			

4.7 Motor Outputs (A/A+, B/A-, C/B+,Cr/B-)

				Min.	Typ.	Max.	Units
Nominal current	PMSM motors sinusoidal amplitude	Micro 4804 MZ/LZ				4.2	A
		Micro 4804 PZ				5.6	
		Micro 4804 CZ				5.6	
	PMSM motors sinusoidal RMS	Micro 4804 MZ/LZ				3	A_{RMS}
		Micro 4804 PZ[1]				4	
		Micro 4804 CZ				4	
	DC/BLDC/STEP motors continuous	Micro 4804 MZ/LZ[2]				3.65	A
		Micro 4804 PZ[32]				4.85	
		Micro 4804 CZ				4.85	
Peak current	maximum 2.5s			-14		+14	A
Short-circuit protection threshold				±16.5		±18	A
Short-circuit protection delay				2		4	µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance				0.1		V
Voltage efficiency					92		%
Off-state leakage current					0.3	1	mA
Motor inductance (phase-to-phase)	Recommended value, for ripple ±5% of measurement range; +V_{MOT} = 48 V		F_{PWM} = 20 kHz		900		µH
			F_{PWM} = 40 kHz		480		
			F_{PWM} = 60 kHz		320		
			F_{PWM} = 80 kHz		240		
			F_{PWM} = 100 kHz		200		
	Absolute minimum value, limited by short-circuit protection; +V_{MOT} = 48 V		F_{PWM} = 20 kHz		270		µH
			F_{PWM} = 40 kHz		150		
			F_{PWM} = 60 kHz		100		
			F_{PWM} = 80 kHz		80		
			F_{PWM} = 100 kHz		60		
Motor electrical time-constant (L/R)	Recommended value, for ±5% current measurement error due to ripple		F_{PWM} = 20 kHz		330		µs
			F_{PWM} = 40 kHz		170		
			F_{PWM} = 60 kHz		140		
			F_{PWM} = 80 kHz		80		
			F_{PWM} = 100 kHz		66		
Current measurement accuracy	FS = Full Scale				±2	±3	%FS

[1] Limited to 3A_{RMS} / 4.2A amplitude nominal using the recommended mating connectors;
[2] For current values >3A_{RMS} pins needs to be soldered instead of socketed

4.8 Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5)

			Min.	Typ.	Max.	Units
Mode compliance				NPN		
Default state	Input floating (wiring disconnected)			Logic HIGH		
Input voltage	Logic “LOW”	IN0, IN1, IN4, IN5/ENA		1.4	1.8	V
	Logic “HIGH”		3.1	2.5		
	Hysteresis		0.9	1.1	1.4	
	Logic “LOW”	IN2/LSP, IN3/LSN		1.4	1.6	
	Logic “HIGH”		4	3.5		
	Hysteresis			0.6		
	Floating voltage (not connected)			4.5		
	Absolute maximum, continuous		-5		+55	
Input current	Logic “LOW”; Pulled to GND			9	10	mA
	Logic “HIGH”; Pulled to +24V				0.4	
Input frequency			0		500	kHz
Minimum pulse			1			µs
ESD protection	Human body model		±2			kV

4.9 Digital Outputs (OUT0, OUT1, OUT4)

				Min.	Typ.	Max.	Units
Mode compliance - All outputs (OUT0, OUT1, OUT4)					NPN 24V		
Default state - Not supplied (+V_{LOG} floating)					High-Z (floating)		
Output voltage	Logic “LOW”; output current = 1.5A for OUT0/ 0.05A for the other digital outputs					0.4	V
	Logic “HIGH”; output current = 0, no load			4	4.5	5	
	Logic “HIGH”, external load to +V_{LOG}				V_{LOG}		
	Absolute maximum, continuous (free-wheeling diodes to +V_{LOG} to GND)			-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1s) †			-1		V_{LOG}+1	
Output current	Logic “LOW”, sink current	Continuous, 5s max	OUT1, OUT4			0.1	A
			OUT0			2	
		Peak, 0.5s max	OUT1, OUT4			0.15	A
			OUT0			2	
	Logic “HIGH”, source current; external load to GND; V_{OUT} >= 2.0V					5	mA
	Logic “HIGH”, leakage current; external load to +V_{LOG}; V_{OUT} = $V_{LOG\ max}$ =40V				0.05	0.1	mA
Minimum pulse width				0.5			µs
ESD protection - Human body model				±15			kV

4.10 Digital Hall Inputs (Hall1, Hall2, Hall3)

			Min.	Typ.	Max.	Units
Mode compliance		TTL / CMOS / Open-collector or analog (linear) 0…5V				
Default state		Input floating (wiring disconnected)	4.5	4.7	5	V
Input voltage	Digital	Logic “LOW”		1.5	1.7	
		Logic “HIGH”	3	2.5		
		Floating voltage (not connected)		0.5		
	Analogue		0	0.5…4.5	4.95	
Input current		Logic “LOW”; Pull to GND		2.3		mA
		Logic “HIGH”; Internal 2.2KΩ pull-up to +5V		0		
Minimum pulse width				70		µs
ESD protection		Human body model		±15		kV

4.11 Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-)

		Min.	Typ.	Max.	Units
Single-ended mode compliance	Leave A1-, B1-, Z1-, A2-, B2- floating	TTL/CMOS/Open-collector (NPN)			
Single-ended threshold	A1+, B1+, Z1+, A2+, B2+	1.2	1.3	1.5	V
Single-ended input current	Input pulled to GND against on-board 2.2 KΩ pull-up to +5V		2.2	2.5	mA
Differential mode compliance	For full RS422 compliance, see[1]	TIA/EIA-422-A			
Input voltage	Hysteresis	±0.03	±0.05	±0.2	V
	Differential mode	-15		+15	
	Common-mode range (A+ to GND, etc.)	-7		+12	
Input impedance, differential	A+, A2+, B+, B2+, Z+		2.2		kΩ
	A-, A2-, B-, B2-, Z-		4.4		
Input frequency	Differential mode	0		15	MHz
Minimum pulse width	Differential mode	33			ns
ESD Protection	Human body model	±30			kV

4.12 Analog Input (REF,FDBK)

		Min.	Typ.	Max.	Units
4.12.1 0…5V Mode					
Input voltage	Operational range	0		4.95	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1s) †			±36	
Input impedance	To 1.447V		20		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[2]
Bandwidth (-3dB)	Software selectable	0		1.5	kHz
ESD protection	Human body model	±2			kV
4.12.2 ±10V Mode					
Differential voltage range			±10		V
Common-mode voltage range	Referenced to GND	-12	0…10	+50	V
Input impedance	To 1.447V		20		kΩ
Resolution			12		bits
Integral linearity				0.036	%FS[2]
Offset error	Common-mode voltage = 0…10 V		±0.2	±0.5	%FS[2]
Gain error	Common-mode voltage = 0…10 V		±0.5	±3	%FS[2]
Bandwidth (-3dB)	Software selectable	0		5.5	kHz

4.13 SSI/BiSS/Panasonic/ EnDAT/Nikon/Sanyo Denki encoder interface

		Min.	Typ.	Max.	Units
Differential mode compliance(CLOCK, DATA)		TIA/EIA-422			
CLOCK Output voltage	Differential; 50Ω differential load	2.0	2.5	5.0	V
	Common-mode, referenced to GND	2.3	2.5	2.7	
CLOCK frequency	Software selectable	1000, 2000, 3000,4000			kHz
DATA Input hysteresis	Differential mode	±0.1	±0.2	±0.5	V
Data input impedance	Termination resistor on-board		120		Ω
DATA Input common mode range	Referenced to GND	-7		+12	V
	Absolute maximum, surge (duration ≤ 1s) †	-25		+25	
DATA format	Software selectable	Binary / Gray			
		Single-turn / Multi-turn			
		Counting direction			
DATA resolution	Single-turn			56	bit
	Multi-turn and single-turn			56	
If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution					

[1] Full RS-422 compatibility, as well as noise rejection improvement an 120Ω resistor must be connected across each signal pair (A+/A-, B+/ B-, Z+/Z-) – for Micro 4804 CZ check SW1 settings

[2] "FS" stands for "Full Scale"

4.14 Supply Output (+5V)

		Min.	Typ.	Max.	Units
+5V output voltage	Current sourced = 250mA	4.8	5	5.2	V
+5V output current6F				450	mA
Short-circuit protection		Yes			
Over-voltage protection		NOT protected			
ESD protection	Human body model 0.1nF 1.5 kΩ	±2			kV

4.15 RS-232

		Min.	Typ.	Max.	Units
Compliance	TIA/EIA-232-C				
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV

4.16 USB

		Min.	Typ.	Max.	Units
Compliance	USB 2.0 device (slave)				
End-point type	Emulated	UART (RS-232)			
ESD protection	Human body model	±1			kV

4.17 CAN-Bus for CAN executions

			Min.	Typ.	Max.	Units
Compliance	ISO11898, CiA-301v4.2, CiA 305 v2.2.13, 402v4.1.1					
Bit rate	Software selectable		125		1000	kbps
Bus length	1Mbps				25	m
	500Kbps				100	
	≤ 250Kbps				250	
Resistor	Between CAN-Hi, CAN-Lo		none on-board			
Node addressing	Micro 4804 MZ/PZ/LZ-CAN	Hardware: by "IDx" pins	1-255			TMLCAN
			1-127 & 255(LSS inactive)			CANopen
		Software	1 ÷ 127 (CANopen); 1- 255 (TMLCAN)			
	Micro 4804 CZ-CAN	Hardware: by SW1	1 ÷ 31, 255(LSS inactive in Canopen)			TMLCAN
						CANopen
		Software	1 ÷ 127 (CANopen);1- 255 (TMLCAN)			
Voltage, CAN-Hi or CAN-Lo to GND			-58		58	V
Voltage, CAN-Hi to CAN-Lo			-45		+45	
ESD protection	Human body model		±8			kV

4.18 EtherCAT ports for CAT execution

			Min.	Typ.	Max.	Units
Standards compliance			IEEE802.3, IEC61158			
Transmission line specification[1]	According to TIA/EIA-568-5-A		Cat.5e.UTP			
Pinout	EtherCAT® supports MDI/MDI-X auto-crossover		TIA/EIA-568-A or TIA/EIA-568-B			
Software protocols compatibility			CoE, CiA402, IEC61800-7-301			
Node addressing	Micro 4804 MZ/PZ/LZ-CAT	By Software	1 ÷ 255			-
		By Hardware via "IDx" pins	1 ÷ 255			-
	Micro 4804 CZ-CAT	By Software	1 ÷ 255			
		By Hardware via SW1	1 ÷ 63 & 255			
MAC addressing	EtherCAT® uses no MAC address		none			-
ESD protection	Human body model		±15			kV

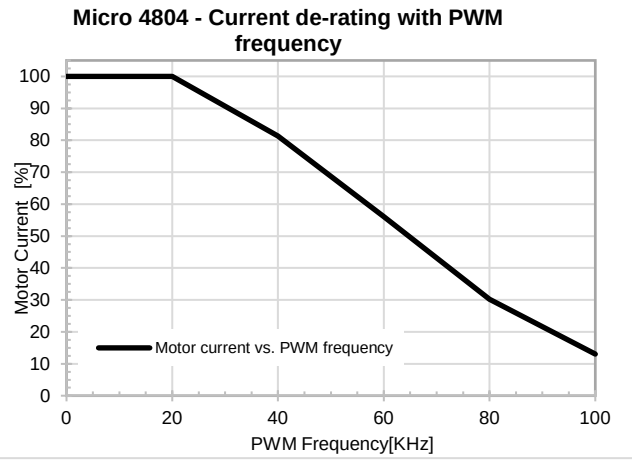
4.19 Conformity

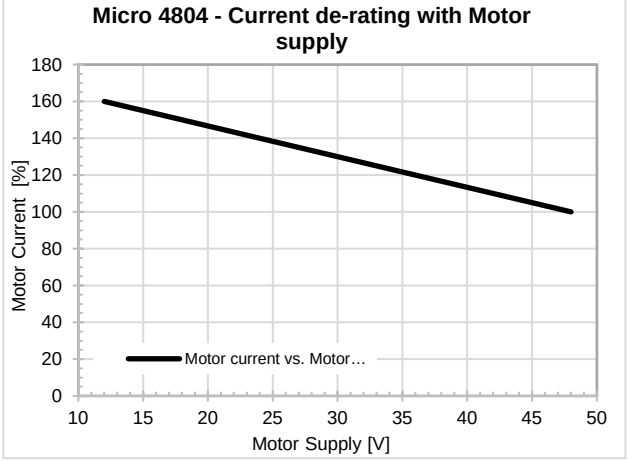
EU Declaration	2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS),1907/2006/EC (REACH), 93/68/EEC (CE Marking Directive), EC 428/2009 (non dual-use item, output frequency limited to 590Hz)

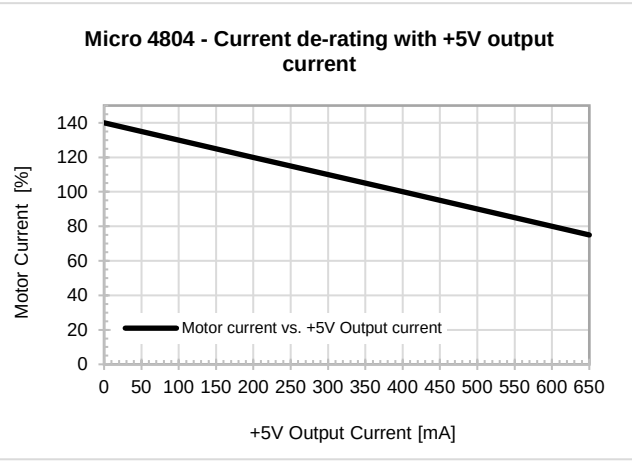
† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

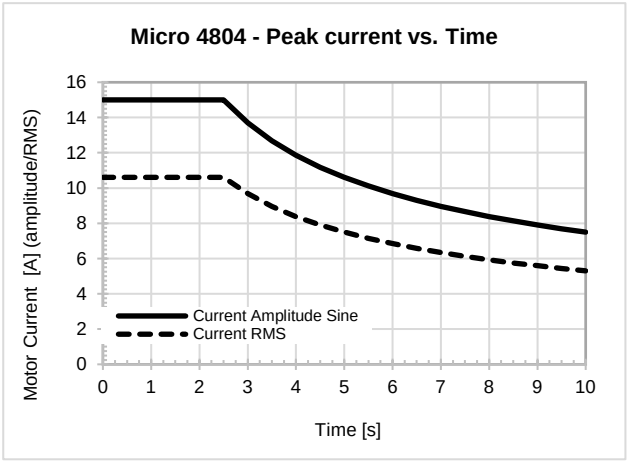
[1] Micro 4804MZ/PZ/LZ-CAT EtherCAT connection requires external magnetics. The Micro 4804 CZ-CAT has the magnetics already included in the drive.

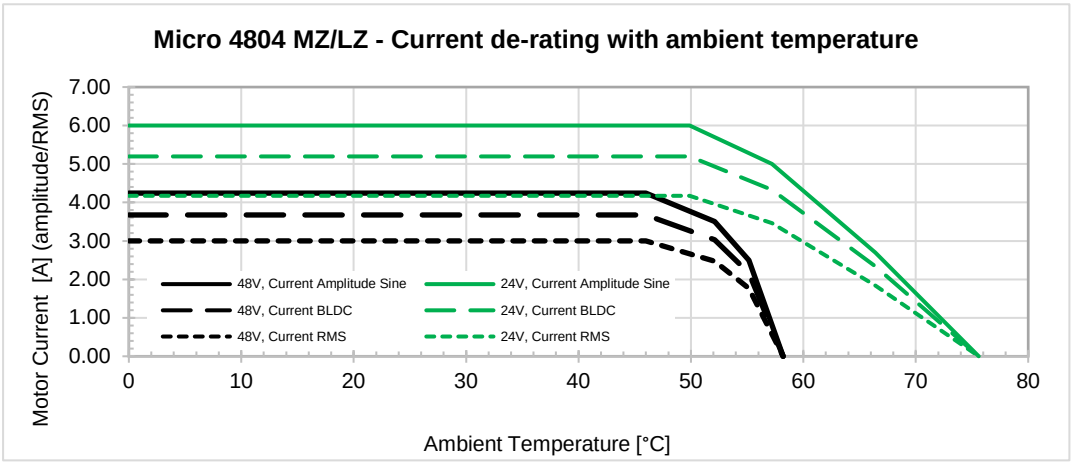
5 De-rating curves

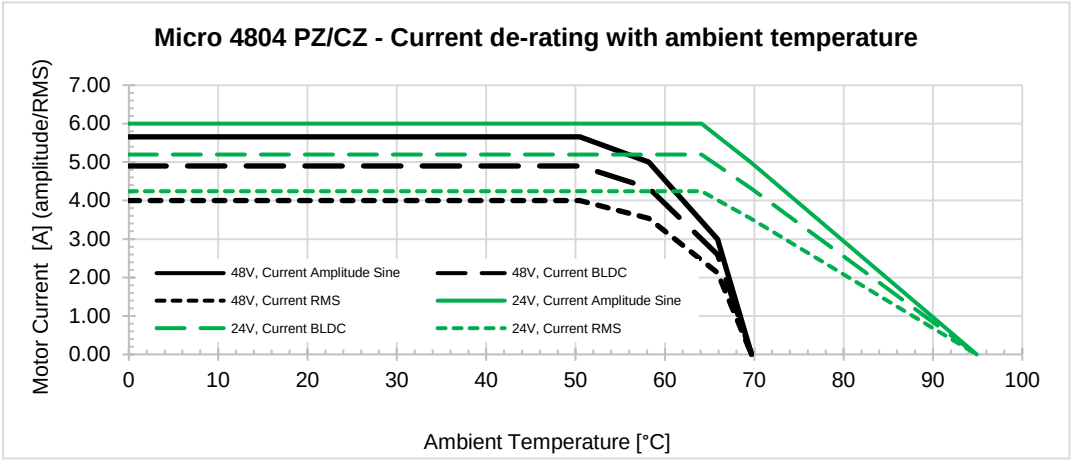


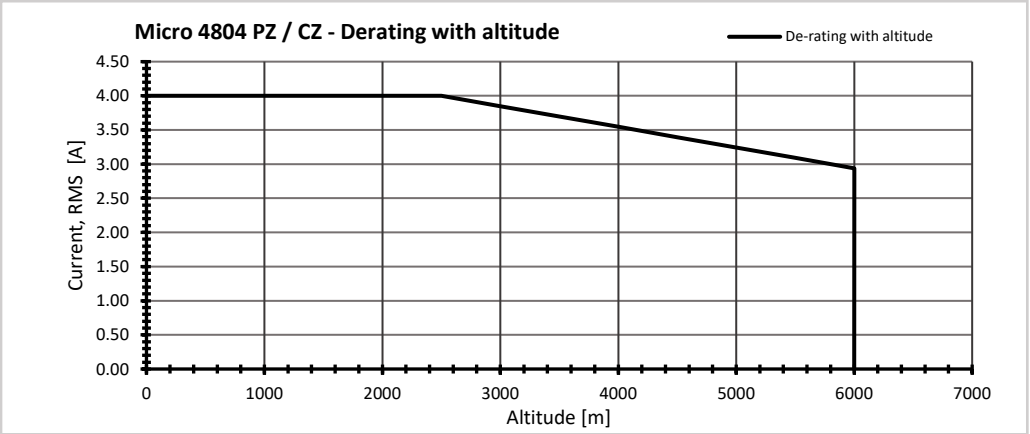


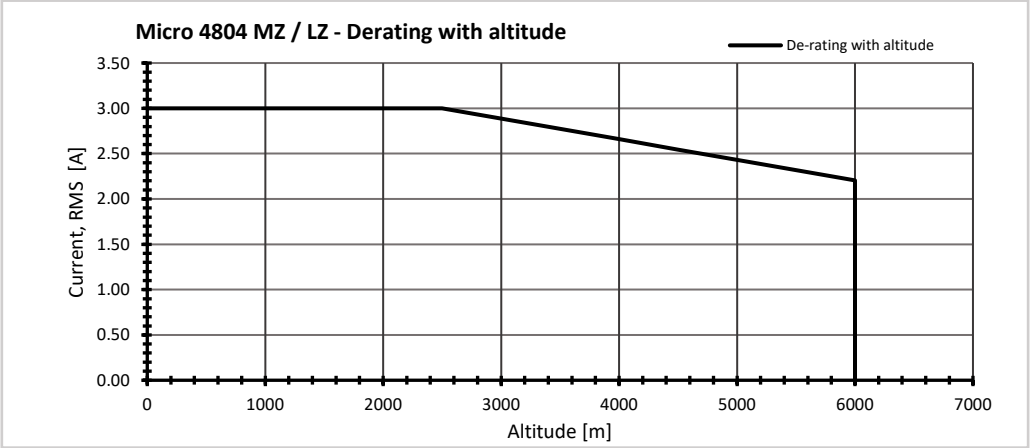









Micro 4804 PZ / CZ - Derating with altitude
De-rating with altitude
Current, RMS [A]
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
1000
2000
3000
4000
5000
6000
7000
Altitude [m]


Micro 4804 MZ / LZ - Derating with altitude
De-rating with altitude
Current, RMS [A]
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
1000
2000
3000
4000
5000
6000
7000
Altitude [m]

6 Memory Map

Micro 4804 has 2 types of memory available for user applications: 16K×16 SRAM and up to 24K×16 serial E²ROM.

The SRAM memory is mapped in the address range: C000h to FFFFh. It can be used to download and run a TML program, to save real-time data acquisitions and to keep the cam tables during run-time.

The E²ROM is mapped in the address range: 2000h to 7FFFh. It is used to keep in a non-volatile memory the TML programs, the cam tables and the drive setup information.

Remark: *EasyMotion Studio handles automatically the memory allocation for each motion application. The memory map can be accessed and modified from the "Memory Settings" dialogue of each application*

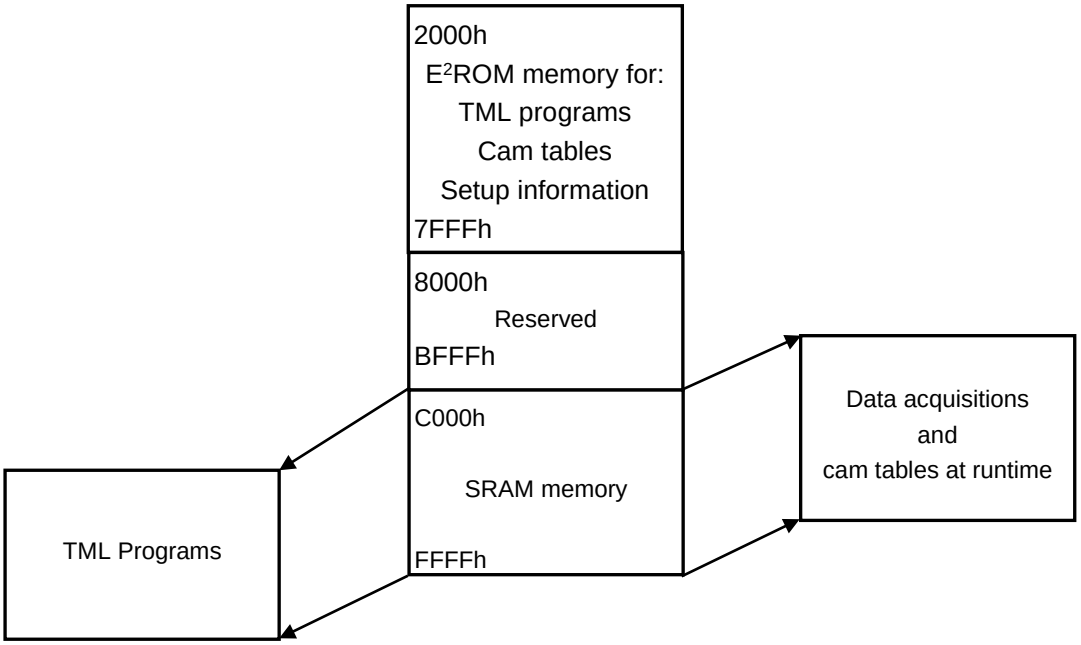


Figure 6-1 *Micro 4804 Memory Map*