# Micro 4804 SX/SY

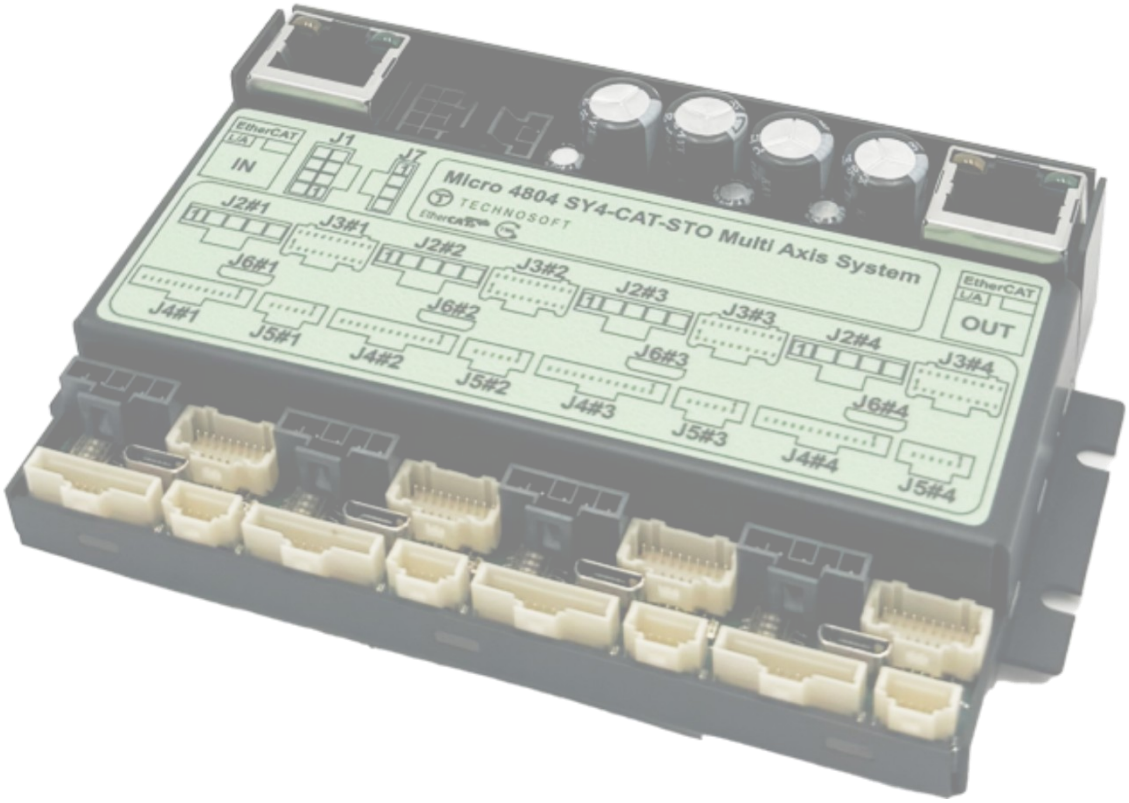
## Multi Axis System, CAN / EtherCAT

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

TECHNOSOFT

MOTION TECHNOLOGY

**Intelligent Servo Drives**




# Technical Reference



P091.020.Micro4804.SX.SY.STO.UM.0325

## Table of contents

# Read This First

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## *About This Manual*

This book is a technical reference manual for:

| Product Name | Part Number | Description | Communication |
|---|---|---|---|
| **Micro 4804 SY4** | P020.202.E404 | 4 axis compact motion system | RS232; USB; EtherCAT® |
| **Micro 4804 SX4** | P020.102.E404 | | RS232; USB; CAN |
| **Micro 4804 SY3** | P020.202.E403 | 3 axis compact motion system | RS232; USB; EtherCAT® |
| **Micro 4804 SX3** | P020.102.E403 | | RS232; USB; CAN |
| **Micro 4804 SY4-STO** | P020.203.E404 | 4 axis compact motion system, STO | RS232; USB; EtherCAT® |
| **Micro 4804 SX4-STO** | P020.103.E404 | | RS232; USB; CAN |
| **Micro 4804 SY3-STO** | P020.203.E403 | 3 axis compact motion system, STO | RS232; USB; EtherCAT® |
| **Micro 4804 SX3-STO** | P020.103.E403 | | RS232; 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 **EasySetUp** software for drive commissioning
- **Step 3 Motion programming** using one of the options:
  - **CANopen master**[1] or an **EtherCAT® master**[2]
  - The drives **built-in motion controller** executing a Technosoft Motion Language (**TML**) program developed using Technosoft **EasyMotion Studio** software
  - A TML_LIB motion library for PCs (Windows or Linux)[3]
  - A TML_LIB motion library for PLCs[3]
  - 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

## *Trademarks*

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

[1] When Micro 4804 SX4 drive is set in CANopen mode

[2] When Micro 4804 SY4 drive is used

[3] Available for Micro 4804 SX4

## Related Documentation

***Micro 4804 SX4-CAN Multi Axis System, Datasheet (P020.102.E404)***

***Micro 4804 SY4-CAT Multi Axis System, Datasheet (P020.202.E404)***

***Micro 4804 SX3-CAN Multi Axis System, Datasheet (P020.102.E403)***

***Micro 4804 SY3-CAT Multi Axis System, Datasheet (P020.202.E403)***

***Micro 4804 SX4-CAN-STO Multi Axis System, Datasheet (P020.103.E404)***

***Micro 4804 SY4-CAT-STO Multi Axis System, Datasheet (P020.203.E404)***

***Micro 4804 SX3-CAN-STO Multi Axis System, Datasheet (P020.103.E403)***

***Micro 4804 SY3-CAT-STO Multi Axis System, Datasheet (P020.203.E403)***

– describes the hardware connections of the Micro 4804 Multi Axis System 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 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.*

***iPOS family Safe Torque Off (STO) Operating instructions ( 091.099.STO.Operating.Instructions.xxxx)*** – describes the principles of STO function, the applied standards, the safety-related data and the electrical data. It presents the requested information for installation and commissioning of STO function

***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.xxxx)*** **–** 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/<br>Email: sales@technosoftmotion.com |
| Ask questions about product operation or report suspected problems (see Note) | Tel: +41 (0)32 732 5500<br>Email: support@technosoftmotion.com |
| Make suggestions about, or report errors in documentation. | Mail: Technosoft SA<br>Avenue des Alpes 20<br>CH-2000 Neuchatel, NE<br>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:<br>**2014/30/EU** **Electromagnetic Compatibility (EMC) Directive**<br>**2014/35/EU** **Low Voltage Directive (LVD)**<br>**93/68/EEC** **CE Marking Directive** |
| | **Conflict minerals statement -** Technosoft declares that the company does not purchase 3T&G (tin, tantalum, tungsten & gold) directly from mines or smelters...<br>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 Multi-Axis System** is a fully digital, intelligent servo drive solution that integrates the latest DSP technology with an advanced motion controller. This results in outstanding drive performance within a compact form. The system is available in 3- or 4-axis configurations, with an optional Safety Torque Off (STO) feature.

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 SY drives ae equipped with an EtherCAT® communication interface that provides support for:

- **FoE (File-over-EtherCAT)**
- **EoE (Ethernet-over-EtherCAT)**
- **CoE (CAN application protocol over EtherCAT)**

All Micro 4804 SX 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.

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

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.

**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 multi-axis systems suitable for the control of **rotary and linear brushless, brushed and 2 or 3-phase step motors**
- 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
- **Output current per axis:**
  - **Nominal:** 5.7$A_{RMS}$ / 8A amplitude for PMSM motors
    7A for DC / BLDC / Step motors
  - **Peak:** 11.3$A_{RMS}$ / 16A amplitude
- **Thermal Protection**: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 105°C
- **STO**[1]: 2 safe torque-off inputs, safety integrity level (SIL3/Cat3/PLe) acc. to EN61800-5-1; -2/ EN61508-3; -4/ EN ISO 13849-1.
- **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:** position or speed profiles, Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV), Cyclic Synchronous Torque (CST) and 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 per axis:**
  - 1 x analogue input, 12-bit, software selectable: 0-5V or ±10V; Reference, Feedback or General purpose
  - 3 x digital inputs: 2 for limit switches + one Enable[2] / general-purpose[1], NPN, pull-up on-board to +5V. Pull to GND to activate
  - 3 x configurable 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** (dual-loop support) **per axis:**
  - **1 x Hall sensor interface** (digital or linear)

[1] Available only for STO executions (P020.103.E404, P020.103.E403, P020.203.E404 and P020.203.E403)

[2] Available only for non-STO executions (P020.102.E404, P020.102.E403, P020.202.E404 and P020.202.E403)

- **Feedback#1 and Feedback#2 can be:**
  - **Incremental encoder A / B** (index Z only for Feedback #1): differential or single-ended;
  - **Absolute encoder:** differential or single-ended encoder. Supported protocols: SSI, BiSS, EnDAT, TAMAGAWA, Panasonic, Nikon, Sanyo Denki
- **EtherCAT® supported protocols** for CAT systems:
  - **FoE** – File over EtherCAT – for setup/TML functions and firmware update
  - **EoE** – Ethernet over EtherCAT – for Easy Motion communication over EtherCAT
  - **CoE –** CAN application protocol over EtherCAT - in conformance with CiA 402 device profile
- **16Kwords SRAM** memory per axis for data acquisition
- **24Kwords E2ROM** per axis to store setup data, TML motion programs, cam tables and other user data
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- **>98% voltage efficiency, >98% power efficiency**
- Feature that **detects breakage** of **Hall wires** and/or of **incremental/absolute encoder wires**
- **Protections per axis:**
  - Short-circuit between motor phases
  - Short-circuit from motor phases to ground
  - Over-voltage
  - Under-voltage
  - Over-current
  - Over-temperature
  - Communication error
  - Control error

## 2.3 Identification Labels

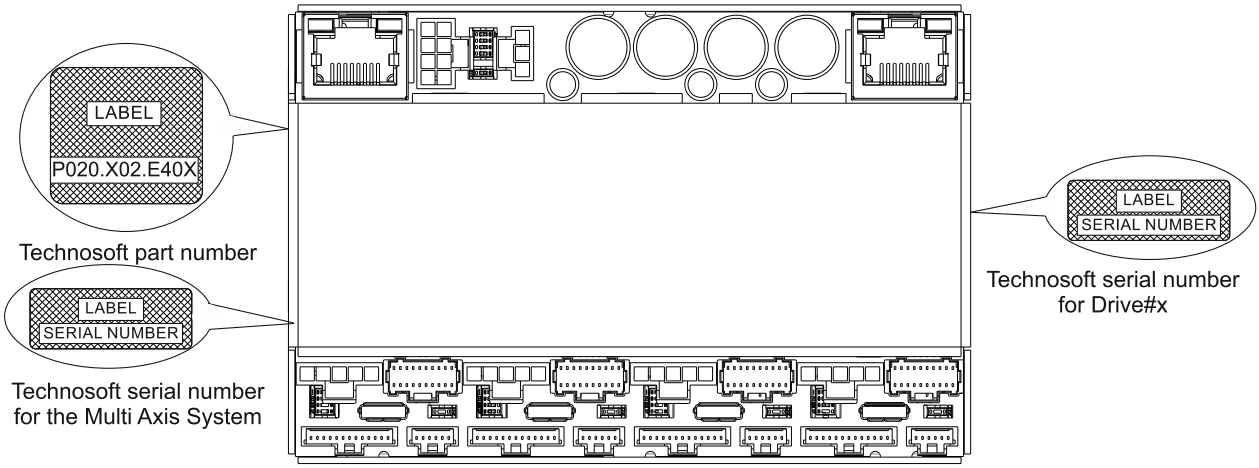



*Figure 1* ***Micro 4804 Multi Axis System identification labels***

The **Micro 4804 Multi-Axis System** can have the following part numbers and names on the identification label:

- ***P020.202.E404*** – *Micro 4804 SY4* – 4 Axis Motion System, EtherCAT®
- ***P020.102.E404*** – *Micro 4804 SX4* – 4 Axis Motion System, CAN
- ***P020.202.E403*** – *Micro 4804 SY3* – 3 Axis Motion System, EtherCAT®
- ***P020.102.E403*** – *Micro 4804 SX3* – 3 Axis Motion System, CAN
- ***P020.203.E404*** – *Micro 4804 SY4-STO* – 4 Axis Motion System, EtherCAT®, STO
- ***P020.103.E404*** – *Micro 4804 SX4-STO* – 4 Axis Motion System, CAN, STO
- ***P020.203.E403*** – *Micro 4804 SY3-STO* – 3 Axis Motion System, EtherCAT®, STO
- ***P020.103.E403*** – *Micro 4804 SX3-STO* – 3 Axis Motion System, CAN, STO

## 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 | Stepper 2 phase | Stepper 3 phase |
| 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[5] | ✓ | | | ✓ | ✓ | | | |
| None | ✓ | | | ✓ | | | | |
| None | | ✓ | | ✓ | | | | |
| None | | | ✓ | | | ✓ | | |
| None | | | | | | | ✓ | ✓ |

### 2.4.2 Dual loop configurations

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 sensors | | | | Motor types | | | | | Load sensors |
|---|---|---|---|---|---|---|---|---|---|
| Encoder[1] | Digital Halls | Linear Halls | Tacho | Brushless PMSM[2] | Brushless BLDC[3] | Brushed DC Voice coils | Stepper 2 phase | Stepper 3 phase | Encoder[6] |
| 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[7] |
| None | | ✓ | | ✓ | | | | | Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[8] |
| None | | | ✓ | | | ✓ | | | Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki |
| None | | | | | | | ✓ | ✓ | None |

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] Only differential on Feedback 2
[5] SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki are differential, but single-ended option is also accepted
[6] Load encoder is on Feedback 2 / 1, if motor encoder is on Feedback 1 / 2
[7] Load encoder can be only on Feedback 1
[8] Load encoder can be only on Feedback 2

# 3 Hardware Installation

## 3.1 Micro 4804 SY Multi Axis System Dimensions

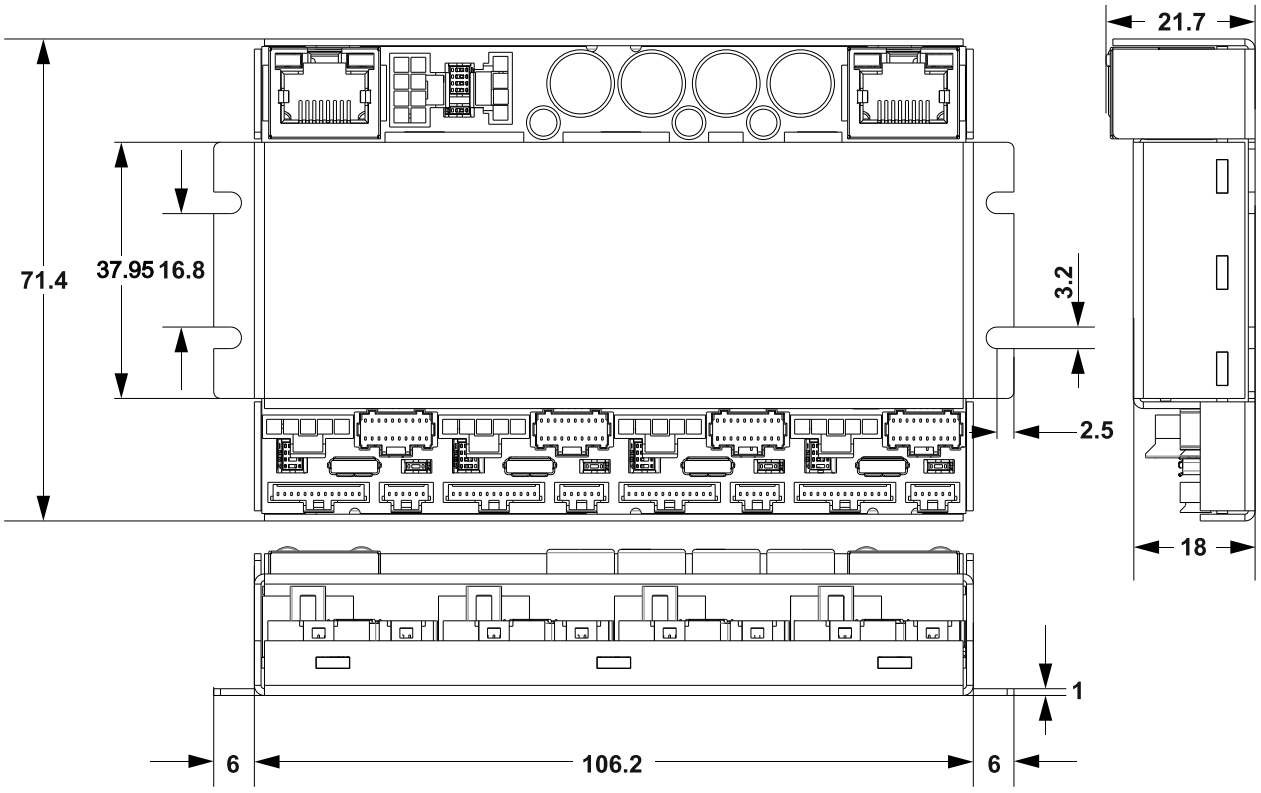



Figure 2 **Micro 4804 SY Multi Axis System dimensions**

## 3.2 Micro 4804 SX Multi Axis System Dimensions

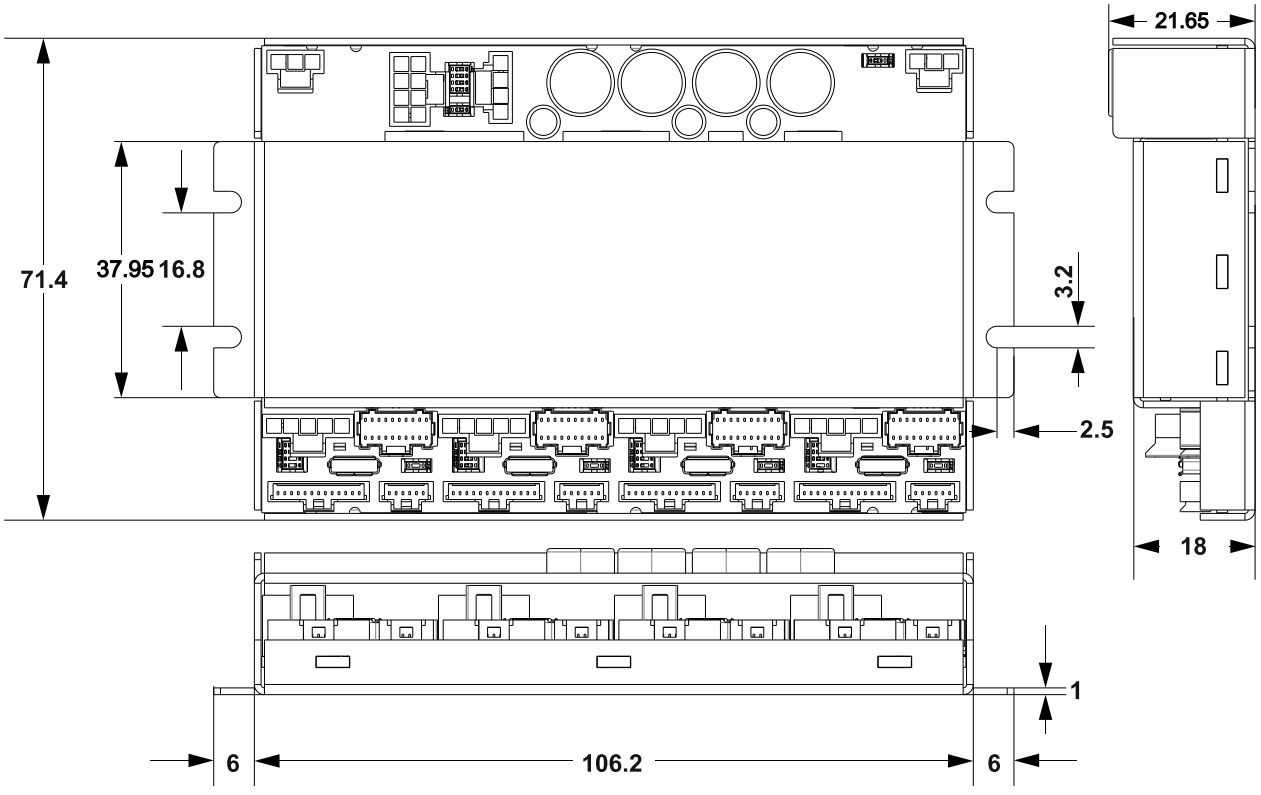
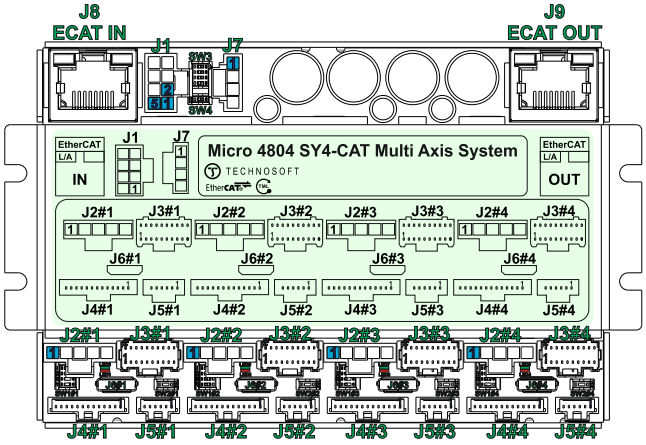



*Figure 3* ***Micro 4804 SX Multi Axis System dimensions***

## 3.3 Connectors and Pinouts

### 3.3.1 Pinouts for Micro 4804 SY4-CAT Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J5#x

| | | | |
|---|---|---|---|
| Reserved | - | Reserved. Do not connect. |

## J6#x, J8, J9

| Port | Name | Type | Description |
|---|---|---|---|
| J8 | ECAT IN | I | EtherCAT standard RJ45 Ethernet IN port. |
| J9 | ECAT OUT | O | EtherCAT standard RJ45 Ethernet OUT port. |
| J6#x | USB | I/O | Standard Micro USB for PC data transfer |

## SW

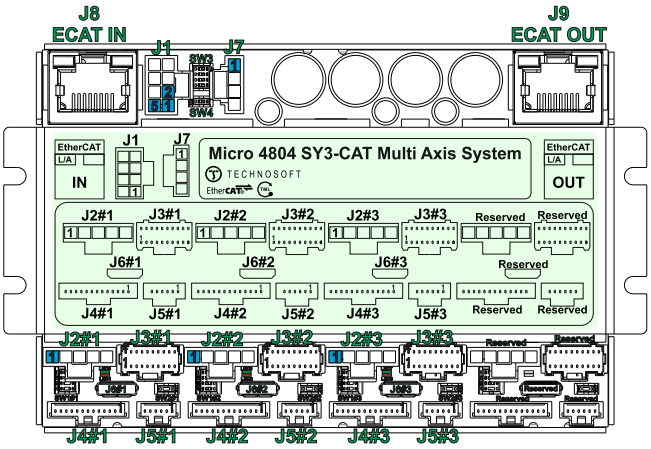
| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x– Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |
| **LEDs** | |
| **LED1, LED2, LED3, LED4** | Red EtherCAT® **ERROR** indicator. |
| **LED5, LED6, LED7, LED8** | Green EtherCAT® **RUN** indicator. |

**SW3 & SW4 - AxisID Selection**

| SW4 | SW3 | | | | Drive AxisID | | | |
|---|---|---|---|---|---|---|---|---|
| | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4 |
| off | off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | off | on | on | 25 | 26 | 27 | 28 |
| off | off | on | off | off | 33 | 34 | 35 | 36 |
| off | off | on | off | on | 41 | 42 | 43 | 44 |
| off | off | on | on | off | 49 | 50 | 51 | 52 |
| off | off | on | on | on | 57 | 58 | 59 | 60 |
| off | on | off | off | off | 65 | 66 | 67 | 68 |
| off | on | off | off | on | 73 | 74 | 75 | 76 |
| off | on | off | on | off | 81 | 82 | 83 | 84 |
| off | on | off | on | on | 89 | 90 | 91 | 92 |
| off | on | on | off | off | 97 | 98 | 99 | 100 |
| off | on | on | off | on | 105 | 106 | 107 | 108 |
| off | on | on | on | off | 113 | 114 | 115 | 116 |
| off | on | on | on | on | 121 | 122 | 123 | 124 |
| on | off | off | off | off | 129 | 130 | 131 | 132 |
| on | off | off | off | on | 137 | 138 | 139 | 140 |
| on | off | off | on | off | 145 | 146 | 147 | 148 |
| on | off | off | on | on | 153 | 154 | 155 | 156 |
| on | off | on | off | off | 161 | 162 | 163 | 164 |
| on | off | on | off | on | 169 | 170 | 171 | 172 |
| on | off | on | on | off | 177 | 178 | 179 | 180 |
| on | off | on | on | on | 185 | 186 | 187 | 188 |
| on | on | off | off | off | 193 | 194 | 195 | 196 |
| on | on | off | off | on | 201 | 202 | 203 | 204 |
| on | on | off | on | off | 209 | 210 | 211 | 212 |
| on | on | off | on | on | 217 | 218 | 219 | 220 |
| on | on | on | off | off | 225 | 226 | 227 | 228 |
| on | on | on | off | on | 233 | 234 | 235 | 236 |
| on | on | on | on | off | 241 | 242 | 243 | 244 |
| on | on | on | on | on | 249 | 250 | 251 | 252 |

- Where “x” is *1, 2, 3 or 4 for Micro 4804 SY4-CAT (P020.202.E404)*

## 3.3.2 Pinouts for Micro 4804 SY3-CAT Multi Axis System




### J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

### J2#x

| 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 for motor cable shielding |

### J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

### J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

### J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

### J5#x

| | | |
|---|---|---|
| Reserved | - | Reserved. Do not connect. |

### J6#x, J8, J9

| Port | Name | Type | Description |
|---|---|---|---|
| J8 | ECAT IN | I | EtherCAT standard RJ45 Ethernet IN port. |
| J9 | ECAT OUT | O | EtherCAT standard RJ45 Ethernet OUT port. |
| J6#x | USB | I/O | Standard Micro USB for PC data transfer |

### SW

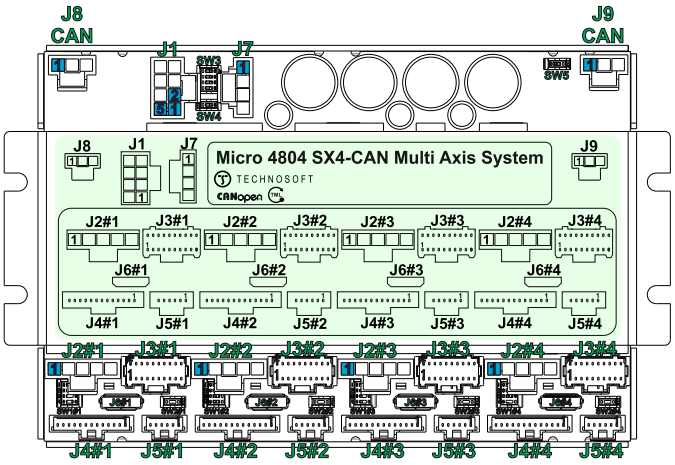
| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x– Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |
| **LEDs** | |
| LED1, LED2, LED3, LED4 | Red EtherCAT® **ERROR** indicator. |
| LED5, LED6, LED7, LED8 | Green EtherCAT® **RUN** indicator. |

**SW3 & SW4 - AxisID Selection**

| SW4 | SW3 | | | | Drive AxisID | | |
|---|---|---|---|---|---|---|---|
| | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 |
| off | off | off | off | off | 1 | 2 | 3 |
| off | off | off | off | on | 9 | 10 | 11 |
| off | off | off | on | off | 17 | 18 | 19 |
| off | off | off | on | on | 25 | 26 | 27 |
| off | off | on | off | off | 33 | 34 | 35 |
| off | off | on | off | on | 41 | 42 | 43 |
| off | off | on | on | off | 49 | 50 | 51 |
| off | off | on | on | on | 57 | 58 | 59 |
| off | on | off | off | off | 65 | 66 | 67 |
| off | on | off | off | on | 73 | 74 | 75 |
| off | on | off | on | off | 81 | 82 | 83 |
| off | on | off | on | on | 89 | 90 | 91 |
| off | on | on | off | off | 97 | 98 | 99 |
| off | on | on | off | on | 105 | 106 | 107 |
| off | on | on | on | off | 113 | 114 | 115 |
| off | on | on | on | on | 121 | 122 | 123 |
| on | off | off | off | off | 129 | 130 | 131 |
| on | off | off | off | on | 137 | 138 | 139 |
| on | off | off | on | off | 145 | 146 | 147 |
| on | off | off | on | on | 153 | 154 | 155 |
| on | off | on | off | off | 161 | 162 | 163 |
| on | off | on | off | on | 169 | 170 | 171 |
| on | off | on | on | off | 177 | 178 | 179 |
| on | off | on | on | on | 185 | 186 | 187 |
| on | on | off | off | off | 193 | 194 | 195 |
| on | on | off | off | on | 201 | 202 | 203 |
| on | on | off | on | off | 209 | 210 | 211 |
| on | on | off | on | on | 217 | 218 | 219 |
| on | on | on | off | off | 225 | 226 | 227 |
| on | on | on | off | on | 233 | 234 | 235 |
| on | on | on | on | off | 241 | 242 | 243 |
| on | on | on | on | on | 249 | 250 | 251 |

- Where “x” is *1, 2 or 3 for Micro 4804 SY3-CAT (P020.202.E403)*

### 3.3.3 Pinouts for Micro 4804 SX4-CAN Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J5#x

| | | | |
|---|---|---|---|
| Reserved | - | Reserved. Do not connect. |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J6#x

| | | |
|---|---|---|
| USB | I/O | Standard Micro USB for PC data transfer |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J8, J9

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

## SW

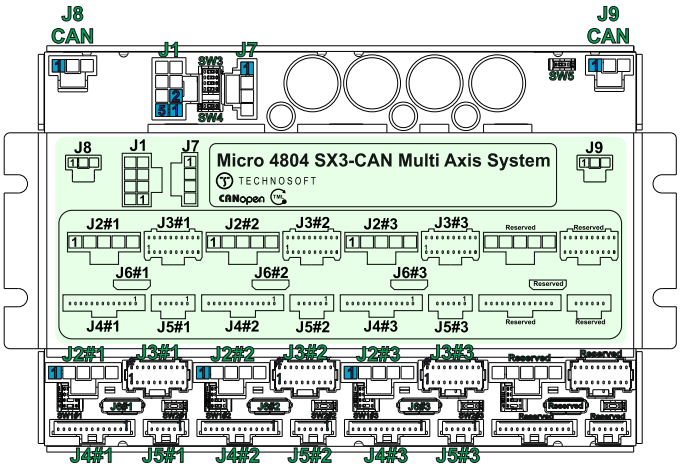
| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x – Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |
| **SW5 – CAN Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals. |
| **SW4 – Protocol selection** | |
| 1 | **OFF –** CANOpen mode<br>**ON –** TMLCAN mode |

**SW3 - AxisID selection**

| SW3 | | | | Drive AxisID | | | |
|---|---|---|---|---|---|---|---|
| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4 |
| off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | on | on | 25 | 26 | 27 | 28 |
| off | on | off | off | 33 | 34 | 35 | 36 |
| off | on | off | on | 41 | 42 | 43 | 44 |
| off | on | on | off | 49 | 50 | 51 | 52 |
| off | on | on | on | 57 | 58 | 59 | 60 |
| on | off | off | off | 65 | 66 | 67 | 68 |
| on | off | off | on | 73 | 74 | 75 | 76 |
| on | off | on | off | 81 | 82 | 83 | 84 |
| on | off | on | on | 89 | 90 | 91 | 92 |
| on | on | off | off | 97 | 98 | 99 | 100 |
| on | on | off | on | 105 | 106 | 107 | 108 |
| on | on | on | off | 113 | 114 | 115 | 116 |
| on | on | on | on | 121 | 122 | 123 | 124 |

- *Where "x" is 1, 2, 3 or 4 for Micro 4804 SX4-CAN (P020.102.E404)*

### 3.3.4 Pinouts for Micro 4804 SX3-CAN Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J5#x

| | | |
|---|---|---|
| Reserved | - | Reserved. Do not connect. |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J6#x

| | | |
|---|---|---|
| USB | I/O | Standard Micro USB for PC data transfer |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J8, J9

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

## SW

| SW1#x – Feedback Resistors selection | |
|---|---|
| **Position** | **Description** |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |

| SW2#x – Feedback Resistors selection | |
|---|---|
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |

| SW5 – CAN Resistors selection | |
|---|---|
| 1 | ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals. |

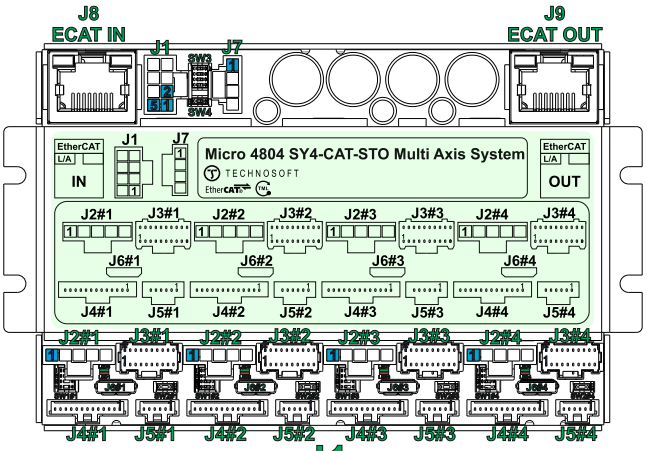
| SW4 – Protocol selection | |
|---|---|
| 1 | **OFF –** CANOpen mode<br>**ON –** TMLCAN mode |

**SW3 - AxisID selection**

| SW3 | | | | Drive AxisID | | |
|---|---|---|---|---|---|---|
| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 |
| off | off | off | off | 1 | 2 | 3 |
| off | off | off | on | 9 | 10 | 11 |
| off | off | on | off | 17 | 18 | 19 |
| off | off | on | on | 25 | 26 | 27 |
| off | on | off | off | 33 | 34 | 35 |
| off | on | off | on | 41 | 42 | 43 |
| off | on | on | off | 49 | 50 | 51 |
| off | on | on | on | 57 | 58 | 59 |
| on | off | off | off | 65 | 66 | 67 |
| on | off | off | on | 73 | 74 | 75 |
| on | off | on | off | 81 | 82 | 83 |
| on | off | on | on | 89 | 90 | 91 |
| on | on | off | off | 97 | 98 | 99 |
| on | on | off | on | 105 | 106 | 107 |
| on | on | on | off | 113 | 114 | 115 |
| on | on | on | on | 121 | 122 | 123 |

- *Where "x" is 1, 2, or 3 for Micro 4804 SX3-CAN (P020.102.E403)*

### 3.3.5 Pinouts for Micro 4804 SY4-CAT-STO Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J6#x, J8, J9

| Port | Name | Type | Description |
|---|---|---|---|
| J8 | ECAT IN | I | EtherCAT standard RJ45 Ethernet IN port. |
| J9 | ECAT OUT | O | EtherCAT standard RJ45 Ethernet OUT port. |
| J6#x | USB | I/O | Standard Micro USB for PC data transfer |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5 | I | 5-48V digital NPN general-purpose input |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J5#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | STO2- | I | Safe Torque Off input 2, negative return (opto-isolated, 0V) |
| 2 | STO2+ | I | Safe Torque Off input 2, positive input (opto-isolated, 18÷40V) |
| 3 | PE | - | Earth connection |
| 4 | | | |
| 5 | STO1+ | I | Safe Torque Off input 1, positive input (opto-isolated, 18÷40V) |
| 6 | STO1- | I | Safe Torque Off input 1, negative return (opto-isolated, 0V) |

Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation

Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation

## SW

| SW1#x – Feedback Resistors selection | |
|---|---|
| **Position** | **Description** |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x– Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |

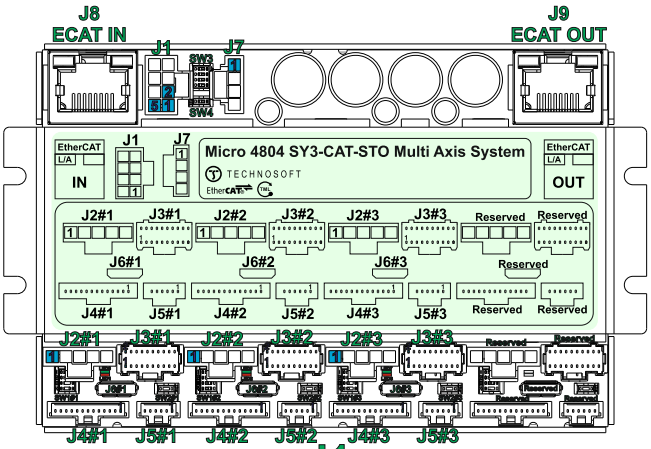
| LEDs | | |
|---|---|---|
| LED1, LED2, LED3, LED4 | Red | EtherCAT® **ERROR** indicator. |
| LED5, LED6, LED7, LED8 | Green | EtherCAT® **RUN** indicator. |

**SW3 & SW4 - AxisID Selection**

| SW4 | SW3 | | | | Drive AxisID | | | |
|---|---|---|---|---|---|---|---|---|
| | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4 |
| off | off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | off | on | on | 25 | 26 | 27 | 28 |
| off | off | on | off | off | 33 | 34 | 35 | 36 |
| off | off | on | off | on | 41 | 42 | 43 | 44 |
| off | off | on | on | off | 49 | 50 | 51 | 52 |
| off | off | on | on | on | 57 | 58 | 59 | 60 |
| off | on | off | off | off | 65 | 66 | 67 | 68 |
| off | on | off | off | on | 73 | 74 | 75 | 76 |
| off | on | off | on | off | 81 | 82 | 83 | 84 |
| off | on | off | on | on | 89 | 90 | 91 | 92 |
| off | on | on | off | off | 97 | 98 | 99 | 100 |
| off | on | on | off | on | 105 | 106 | 107 | 108 |
| off | on | on | on | off | 113 | 114 | 115 | 116 |
| off | on | on | on | on | 121 | 122 | 123 | 124 |
| on | off | off | off | off | 129 | 130 | 131 | 132 |
| on | off | off | off | on | 137 | 138 | 139 | 140 |
| on | off | off | on | off | 145 | 146 | 147 | 148 |
| on | off | off | on | on | 153 | 154 | 155 | 156 |
| on | off | on | off | off | 161 | 162 | 163 | 164 |
| on | off | on | off | on | 169 | 170 | 171 | 172 |
| on | off | on | on | off | 177 | 178 | 179 | 180 |
| on | off | on | on | on | 185 | 186 | 187 | 188 |
| on | on | off | off | off | 193 | 194 | 195 | 196 |
| on | on | off | off | on | 201 | 202 | 203 | 204 |
| on | on | off | on | off | 209 | 210 | 211 | 212 |
| on | on | off | on | on | 217 | 218 | 219 | 220 |
| on | on | on | off | off | 225 | 226 | 227 | 228 |
| on | on | on | off | on | 233 | 234 | 235 | 236 |
| on | on | on | on | off | 241 | 242 | 243 | 244 |
| on | on | on | on | on | 249 | 250 | 251 | 252 |

- Where “x” is *1, 2, 3 or 4 for Micro 4804 SY4-CAT STO (P020.203.E404)*

### 3.3.6 Pinouts for Micro 4804 SY3-CAT-STO Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J6#x, J8, J9

| Port | Name | Type | Description |
|---|---|---|---|
| J8 | ECAT IN | I | EtherCAT standard RJ45 Ethernet IN port. |
| J9 | ECAT OUT | O | EtherCAT standard RJ45 Ethernet OUT port. |
| J6#x | USB | I/O | Standard Micro USB for PC data transfer |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J5#x

| Pin | Name | Type | Description | |
|---|---|---|---|---|
| 1 | STO2- | I | Safe Torque Off input 2, negative return (opto-isolated, 0V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 2 | STO2+ | I | Safe Torque Off input 2, positive input (opto-isolated, 18÷40V) | |
| 3 | PE | - | Earth connection | |
| 4 | | | | |
| 5 | STO1+ | I | Safe Torque Off input 1, positive input (opto-isolated, 18÷40V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 6 | STO1- | I | Safe Torque Off input 1, negative return (opto-isolated, 0V) | |

## SW

| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x– Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |

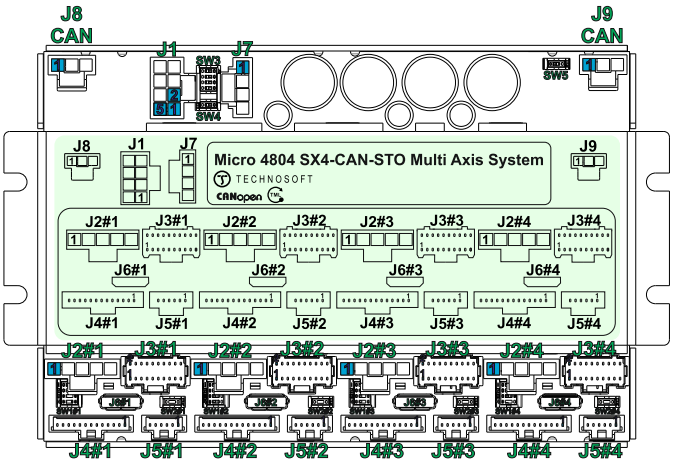
| LEDs | | |
|---|---|---|
| LED1, LED2, LED3, LED4 | Red | EtherCAT® **ERROR** indicator. |
| LED5, LED6, LED7, LED8 | Green | EtherCAT® **RUN** indicator. |

**SW3 & SW4 - AxisID Selection**

| SW4 | SW3 | | | | Drive AxisID | | |
|---|---|---|---|---|---|---|---|
| | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 |
| off | off | off | off | off | 1 | 2 | 3 |
| off | off | off | off | on | 9 | 10 | 11 |
| off | off | off | on | off | 17 | 18 | 19 |
| off | off | off | on | on | 25 | 26 | 27 |
| off | off | on | off | off | 33 | 34 | 35 |
| off | off | on | off | on | 41 | 42 | 43 |
| off | off | on | on | off | 49 | 50 | 51 |
| off | off | on | on | on | 57 | 58 | 59 |
| off | on | off | off | off | 65 | 66 | 67 |
| off | on | off | off | on | 73 | 74 | 75 |
| off | on | off | on | off | 81 | 82 | 83 |
| off | on | off | on | on | 89 | 90 | 91 |
| off | on | on | off | off | 97 | 98 | 99 |
| off | on | on | off | on | 105 | 106 | 107 |
| off | on | on | on | off | 113 | 114 | 115 |
| off | on | on | on | on | 121 | 122 | 123 |
| on | off | off | off | off | 129 | 130 | 131 |
| on | off | off | off | on | 137 | 138 | 139 |
| on | off | off | on | off | 145 | 146 | 147 |
| on | off | off | on | on | 153 | 154 | 155 |
| on | off | on | off | off | 161 | 162 | 163 |
| on | off | on | off | on | 169 | 170 | 171 |
| on | off | on | on | off | 177 | 178 | 179 |
| on | off | on | on | on | 185 | 186 | 187 |
| on | on | off | off | off | 193 | 194 | 195 |
| on | on | off | off | on | 201 | 202 | 203 |
| on | on | off | on | off | 209 | 210 | 211 |
| on | on | off | on | on | 217 | 218 | 219 |
| on | on | on | off | off | 225 | 226 | 227 |
| on | on | on | off | on | 233 | 234 | 235 |
| on | on | on | on | off | 241 | 242 | 243 |
| on | on | on | on | on | 249 | 250 | 251 |

- Where “x” is *1, 2 or 3 for Micro 4804 SY3-CAT STO (P020.203.E403)*

### 3.3.7 Pinouts for Micro 4804 SX4-CAN-STO Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J6#x

| | | |
|---|---|---|
| USB | I/O | Standard Micro USB for PC data transfer |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J5#x

| Pin | Name | Type | Description | |
|---|---|---|---|---|
| 1 | STO2- | I | Safe Torque Off input 2, negative return (opto-isolated, 0V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 2 | STO2+ | I | Safe Torque Off input 2, positive input (opto-isolated, 18÷40V) | |
| 3 | PE | - | Earth connection | |
| 4 | | | | |
| 5 | STO1+ | I | Safe Torque Off input 1, positive input (opto-isolated, 18÷40V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 6 | STO1- | I | Safe Torque Off input 1, negative return (opto-isolated, 0V) | |

## J8, J9

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

## SW

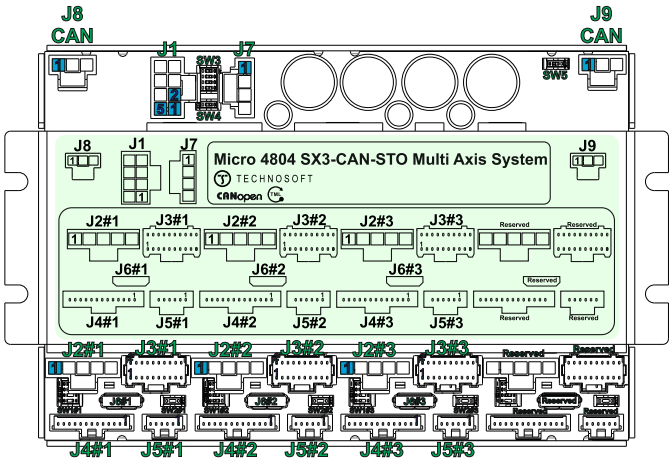
| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x – Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |
| **SW5 – CAN Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals. |
| **SW4 – Protocol selection** | |
| 1 | **OFF –** CANOpen mode<br>**ON –** TMLCAN mode |

**SW3 - AxisID selection**

| SW3 | | | | Drive AxisID | | | |
|---|---|---|---|---|---|---|---|
| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4 |
| off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | on | on | 25 | 26 | 27 | 28 |
| off | on | off | off | 33 | 34 | 35 | 36 |
| off | on | off | on | 41 | 42 | 43 | 44 |
| off | on | on | off | 49 | 50 | 51 | 52 |
| off | on | on | on | 57 | 58 | 59 | 60 |
| on | off | off | off | 65 | 66 | 67 | 68 |
| on | off | off | on | 73 | 74 | 75 | 76 |
| on | off | on | off | 81 | 82 | 83 | 84 |
| on | off | on | on | 89 | 90 | 91 | 92 |
| on | on | off | off | 97 | 98 | 99 | 100 |
| on | on | off | on | 105 | 106 | 107 | 108 |
| on | on | on | off | 113 | 114 | 115 | 116 |
| on | on | on | on | 121 | 122 | 123 | 124 |

- *Where "x" is 1, 2, 3 or 4 for Micro 4804 SX4-CAN-STO (P020.103.E404)*

### 3.3.8 Pinouts for Micro 4804 SX3-CAN-STO Multi Axis System




## J1

| Pin | Name | Type | Description |
|---|---|---|---|
| 1,2,3 | +Vmot | I | Positive terminal of the motor supply: 7 to 48 $V_{DC}$. Internally connected to all drives $+V_{mot}$ pins. |
| 4 | PE | - | Earth connection. |
| 5,6,7 | GND | - | Ground return. Internally connected to other GND pins. |
| 8 | PE | - | Earth connection |

## J2#x

| 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 for motor cable shielding |

## J3#x

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | GND | - | Ground return. Internally connected to other GND pins. |
| 2 | Hall1 | I | Digital Hall, or Linear Hall sensor 1. |
| 3 | +5V | O | 5V supply for all feedback sensors. |
| 4 | Hall2 | I | Digital Hall, or Linear Hall sensor 2. |
| 5 | +5V | O | 5V supply for all feedback sensors. |
| 6 | Hall3 | I | Digital Hall, or Linear Hall sensor 3. |
| 7 | EncA1+/EncA1 Dt1+/Dt1 | I | Encoder 1 A+ / Data+ diff. input or single-ended input. Set SW1 pin 1 for differential. |
| 8 | GND | - | Ground return. |
| 9 | EncA1-/Dt1- | I | Encoder 1 A-/Data- diff. input. Set SW1 pin 1 for differential. |
| 10 | +5V | O | 5V supply for all feedback sensors. |
| 11 | EncB1+/EncB1 Clk1+/Clk1 | I | Encoder 1 B+ / Clock+ diff. input or single-ended input. Set SW1 pin 2 for differential. |
| 12 | EncA2+/EncA2 Dt2+/Dt2 | I | Incr. encoder 2 A / Data+ diff. input or single-ended input. Set SW1 pin 4 for differential. |
| 13 | EncB1-/ Clk1- | I | Encoder 1 B- / Clock- diff. input. Set SW1 pin 2 for differential. |
| 14 | EncA2-/Dt2- | I | Incr. encoder 2 A- / Data - diff. input. Set SW1 pin 4 for differential. |
| 15 | Z1+ | I | Incr. encoder 1 Z / Z+ diff. input or single-ended input. Set SW1 pin 3 for differential. |
| 16 | EncB2+/EncB2 Clk2+/Clk2 | I/O | Encoder 2 B+ / Clock+ diff. input or single-ended input. Set SW2 pin1 for differential. |
| 17 | Z1- | I | Incr. encoder 1 Z- diff. input. Set SW1 pin 3 for differential. |
| 18 | EncB2-/ Clk2- | I | Encoder 2 B- / Clock- diff. input. Set SW2 pin1 for differential. |
| 19 | GND | - | Ground return. |
| 20 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |

## J6#x

| | | |
|---|---|---|
| USB | I/O | Standard Micro USB for PC data transfer |

## J7

| Pin | Name | Type | Description |
|---|---|---|---|
| 1 | Rsvd | - | Reserved. Do not connect. |
| 2 | GND | - | Ground return. Internally connected to other GND pins. |
| 3 | +Vlog | I | Positive terminal of the logic supply input: 6 to 48 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 4 | PE | - | Earth connection |

## J4#x

| 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 $V_{DC}$. Internally connected to other $+V_{log}$ pins. |
| 5 | IN2/LSP | I | 5-48V digital NPN input. Positive limit switch input. |
| 6 | IN3/LSN | I | 5-48V digital NPN input. Negative limit switch input. |
| 7 | I/O0 | I/O | 5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0 |
| 8 | I/O1 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1 |
| 9 | I/O4 | I/O | 5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4 |
| 10 | IN5/Enable | I | 5-48V digital NPN input. Drive Enable input. |
| 11 | GND | - | Ground return. Internally connected to other GND pins. |
| 12 | AnalogIn | I | Analog input (range software selectable 0-5V or ±10V) |
| 13 | +5V | O | Supply for all feedback sensors. |

## J5#x

| Pin | Name | Type | Description | |
|---|---|---|---|---|
| 1 | STO2- | I | Safe Torque Off input 2, negative return (opto-isolated, 0V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 2 | STO2+ | I | Safe Torque Off input 2, positive input (opto-isolated, 18÷40V) | |
| 3 | PE | - | Earth connection | |
| 4 | | | | |
| 5 | STO1+ | I | Safe Torque Off input 1, positive input (opto-isolated, 18÷40V) | Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation |
| 6 | STO1- | I | Safe Torque Off input 1, negative return (opto-isolated, 0V) | |

## J8, J9

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

## SW

| SW1#x – Feedback Resistors selection | |
|---|---|
| Position | Description |
| 1 | ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins. |
| 2 | ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins. |
| 3 | ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins. |
| 4 | ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins. |
| **SW2#x – Feedback Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins. |
| **SW5 – CAN Resistors selection** | |
| 1 | ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals. |
| **SW4 – Protocol selection** | |
| 1 | **OFF –** CANOpen mode<br>**ON –** TMLCAN mode |

**SW3 - AxisID selection**

| SW3 | | | | Drive AxisID | | |
|---|---|---|---|---|---|---|
| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 |
| off | off | off | off | 1 | 2 | 3 |
| off | off | off | on | 9 | 10 | 11 |
| off | off | on | off | 17 | 18 | 19 |
| off | off | on | on | 25 | 26 | 27 |
| off | on | off | off | 33 | 34 | 35 |
| off | on | off | on | 41 | 42 | 43 |
| off | on | on | off | 49 | 50 | 51 |
| off | on | on | on | 57 | 58 | 59 |
| on | off | off | off | 65 | 66 | 67 |
| on | off | off | on | 73 | 74 | 75 |
| on | off | on | off | 81 | 82 | 83 |
| on | off | on | on | 89 | 90 | 91 |
| on | on | off | off | 97 | 98 | 99 |
| on | on | off | on | 105 | 106 | 107 |
| on | on | on | off | 113 | 114 | 115 |
| on | on | on | on | 121 | 122 | 123 |

- *Where "x" is 1, 2, or 3 for Micro 4804 SX3-CAN-STO (P020.103.E403)*

## 3.4 Mechanical Mounting

The *Micro 4804 Multi Axis System* 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 are:

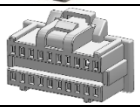
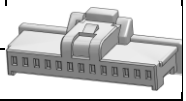
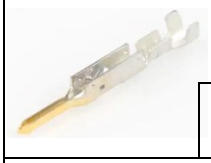
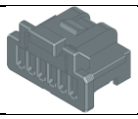
| Image | Connector | Description | Manufacturer | Part Number |
|---|---|---|---|---|
|  | - | Self-clinching nuts M3 | PennEngineering® (PEM®) | KF2-M3-ET |
|  | - | Screws M3x10 | Bossard | BN610-M3x10 |

### 3.4.1 Cable sets

To simplify the evaluation of the Micro 4804 Multi-Axis System, a complete cable set is available. Please refer to the following part numbers when placing orders:

| Part Number | Description |
|---|---|
| P038.020.C020 | CCS Micro 4804 SY4-CAT (Complete cable set 100 cm) |
| P038.020.C021 | CCS Micro 4804 SX4-CAN (Complete cable set 100 cm) |
| P038.021.C022 | CCS Micro 4804 SY4-CAT-STO (Complete cable set 100 cm) |
| P038.021.C023 | CCS Micro 4804 SX4-CAN-STO (Complete cable set 100 cm) |

## 3.5 Mating Connectors for Micro 4804 Multi-Axis System

| Image | Connector | Description | Manufacturer | Part Number | Image |
|---|---|---|---|---|---|
|  | **J1** | Nano-Fit Receptacle Housing, TPA Capable, 2.50mm Pitch, Dual Row, 8 Circuits, Black, Glow-Wire Capable | Molex | 1053081208 |  |
| | **J2#x** | 1x5 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 5 circuits | Molex | 1053071205 | |
|  | **J3#x** | 2x10 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 20 Circuits | Molex | 5011892010 |  |
| | **J4#x** | 1x13 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 13 Circuits | Molex | 5013301300 | |
|  | **J7, J8[1], J9[1]** | 1x3 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 3 circuits | Molex | 1053071203 |  |
| | **J6#x** | USB cable, Cable USB A Male - Micro B Male, 1m, shielded, black, 9.6mm plastic width | Tensility International Corp | 1002333 | |
|  | **J1, J7, J8[1], J9[1], J2#x** | Pre-Crimped wires for Nano-Fit Cable Assembly, Nano-Fit Crimp Terminal Socket to Nano-Fit Crimp Terminal Socket, 300mm | Molex | 0797582140 |  |
| | **J3#x, J4#x, J5#x[2]** | Pre-Crimped wires for Pico-Clasp Cable Assembly, Pico-Clasp Crimp Terminal Socket to Pico-Clasp Crimp Terminal Socket, 300mm | Molex | 0797581019 | |
|  | **J1, J7, J8[1], J9[1], J2#x** | Pins for Nano-Fit Nano-Fit Crimp Terminal, Female, 0.76µm Gold (Au) Plating, Lubricated, 24-26 AWG | Molex | 1053001400 |  |
| | **J3#x, J4#x, J5#x[2]** | Pins for Pico-Clasp 1.00mm Pitch, Pico-Clasp Female Crimp Terminal, Gold Plating 0.10µm, 28-32 AWG, Reel | Molex | 5011937000 | |
|  | **J3#x, J4#x, J5#x[2]** | Crimp tool Pico-Clasp Crimp Tool, Ratchet, Molex Pico-Clasp 501193 & 501334 Series 32-28AWG Contacts | Molex | 638191500 |  |
| | **J1, J7, J8[1], J9[1], J2#x** | Crimp tool Nano Fit Crimp Tool, Ratchet, Molex Nano-Fit 105300 Series 26-24AWG Socket Contacts, 207129 Series | Molex | 638276000 | |
|  | **J5#x[2]** | 1x6 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 6 Circuits | Molex | 5013300600 | |

- Where "x" can be:
  - *1, 2, 3 or 4 for P020.102.E404, P020.202.E404, P020.103.E404 and P020.203.E404*
  - *1, 2, or 3 for P020.102.E403, P020.202.E403, P020.103.E403 and P020.203.E403*

[1] Only for the Micro 4804 SX Multi Axis System

[2] Only needed for the STO executions: P020.103.E404, P020.103.E403, P020.203.E404 and P020.203.E403

## 3.6 Connection diagrams

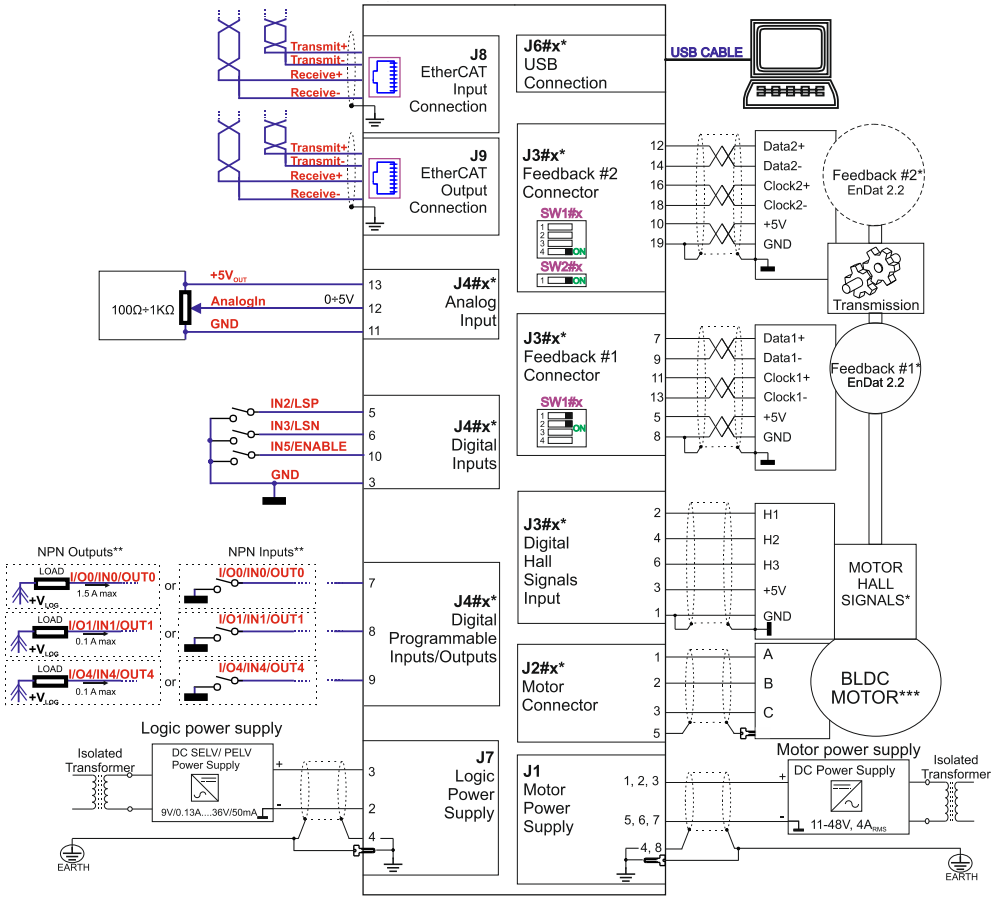



Figure 4 Micro 4804 SY-CAT Multi Axis System Connection diagram

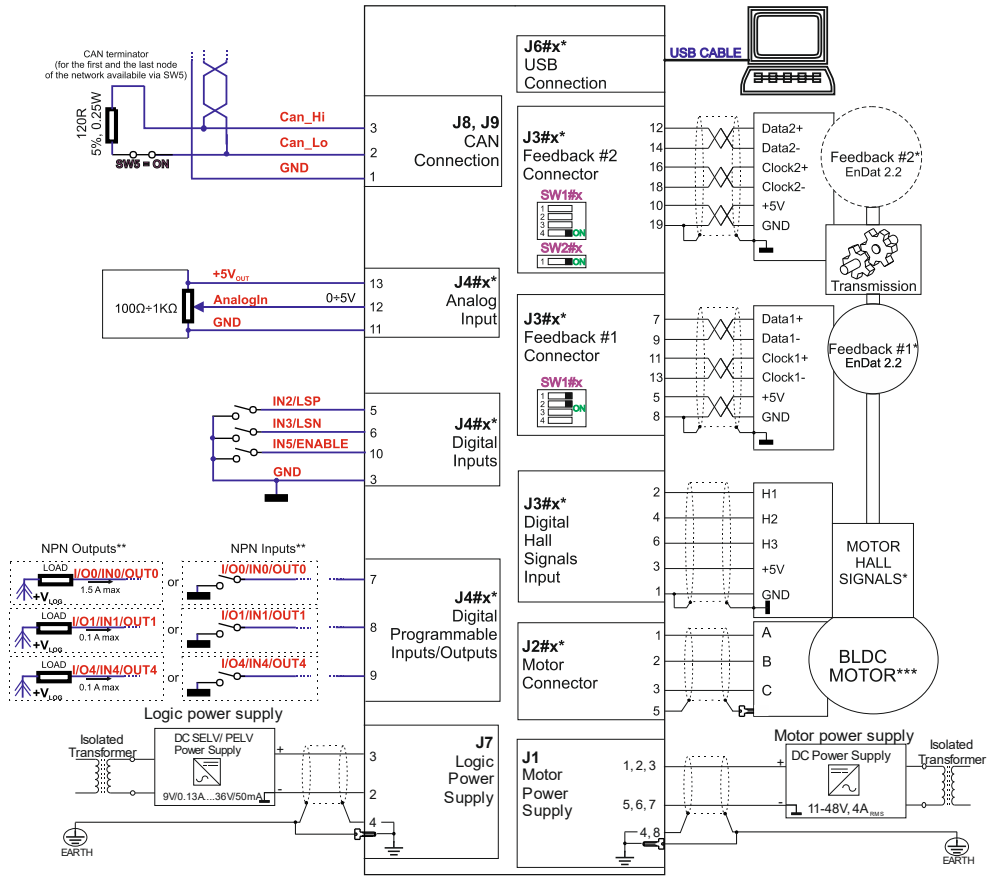



*Figure 5 Micro 4804 SX-CAN Multi Axis System Connection diagram*

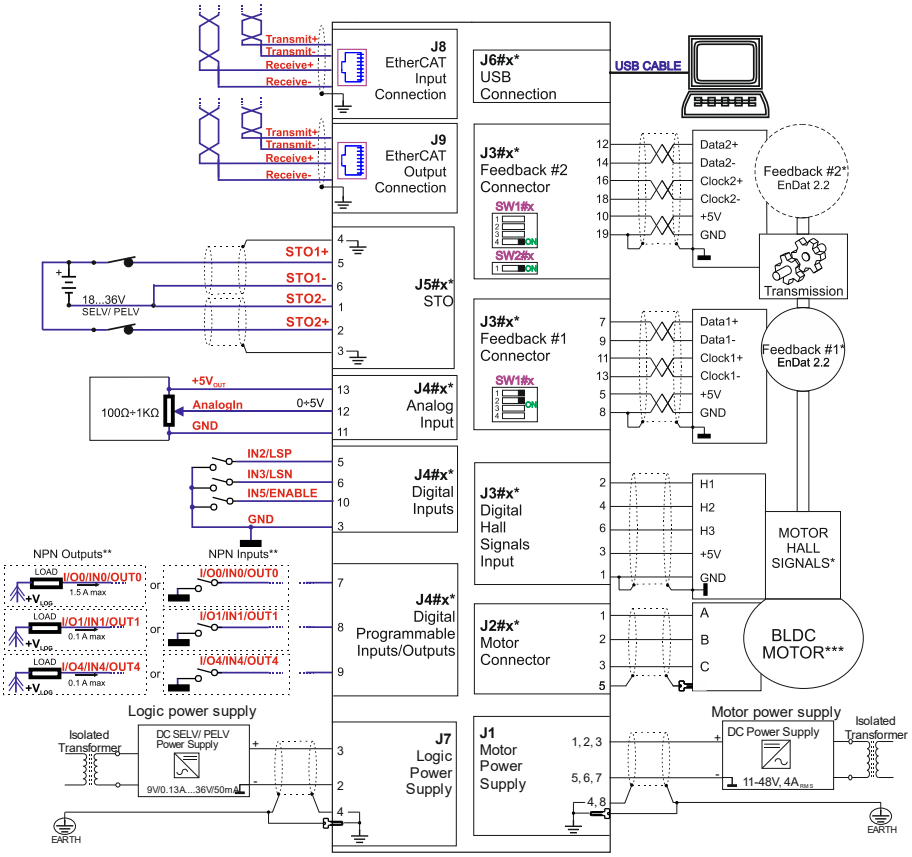



*Figure 6 Micro 4804 SY-CAT-STO Multi Axis System Connection diagram*

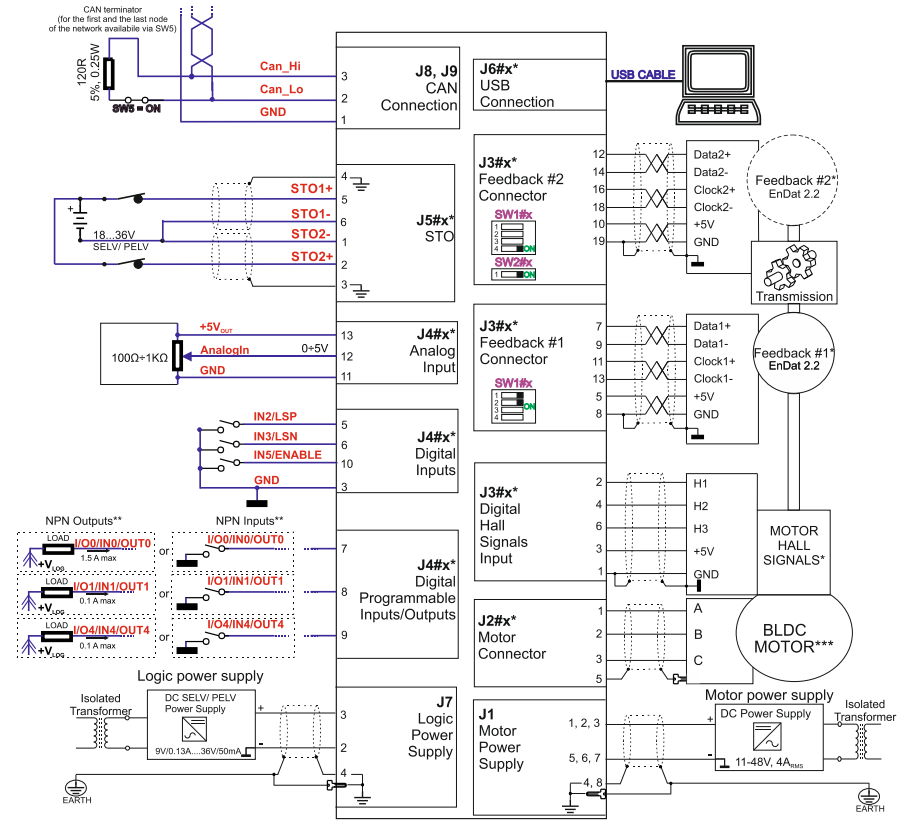



*Figure 7 Micro 4804 SX-CAN-STO Multi Axis System Connection diagram*

* Where “x” can be:

- *1, 2, 3 or 4 for P020.102.E404, P020.202.E404, P020.103.E404 and P020.203.E404*
- *1, 2, or 3 for P020.102.E403, P020.202.E403, P020.103.E403 and P020.203.E403*

** For other available feedback / motor options, check the detailed diagrams below

*** Pins are software selectable individually as NPN inputs/outputs

## 3.7 Digital I/O Connection

### 3.7.1 NPN inputs

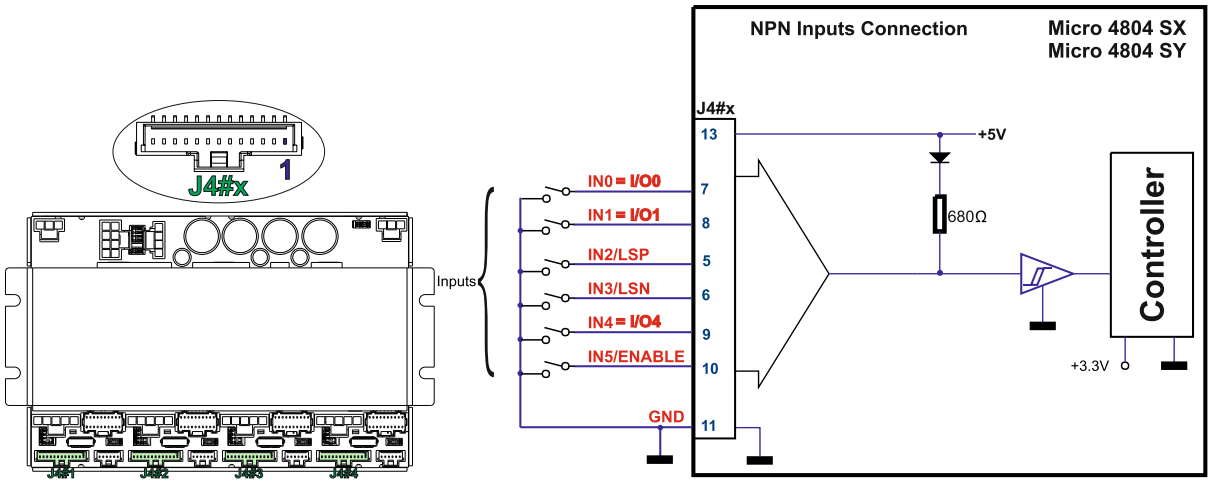



*Figure 8* **Digital NPN Inputs connection**

***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 individually software selectable as either NPN inputs or outputs.*
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

### 3.7.2 NPN outputs

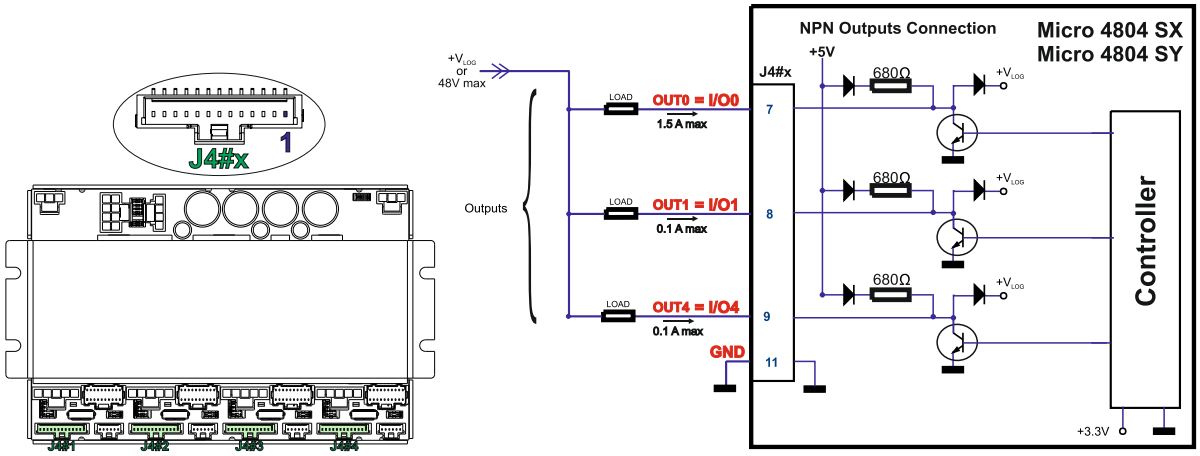



*Figure 9* **Digital NPN Outputs connection**

***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 individually software selectable as either NPN inputs or outputs.*

## 3.8 Analog Inputs Connection

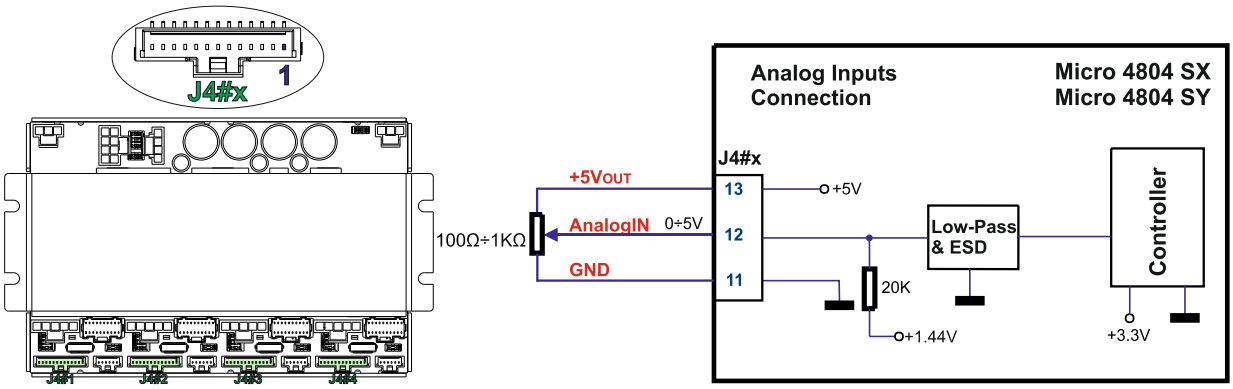



*Figure 10* ***0-5V*** **Analog inputs connection**

***Remarks:***

1. *The analog input range is configurable by software: 12-bit 0-5V or ±10V: 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.*

### 3.8.1 Solenoid driver connection for motor brake

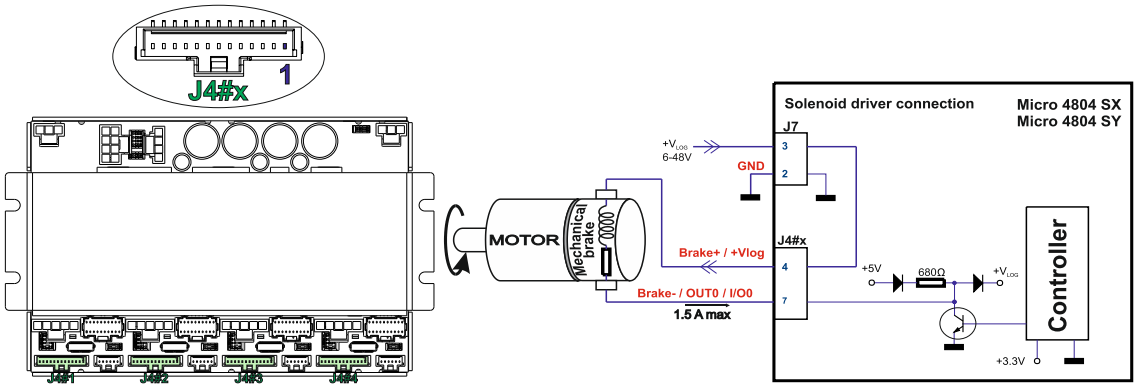



*Figure 11* **Solenoid driver connection**

***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:*

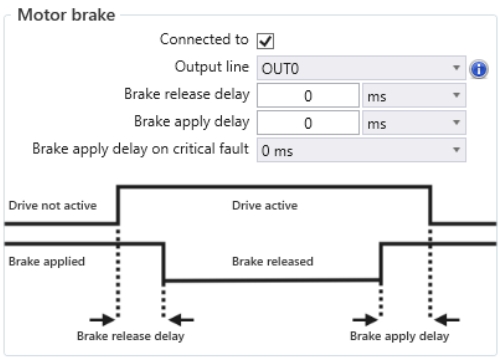



*Figure 12* **Motor brake checkbox in EasyMotion Studio II**

#### 3.8.1.1 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.

## 3.9 Motor connections

### 3.9.1 Brushless Motor connection

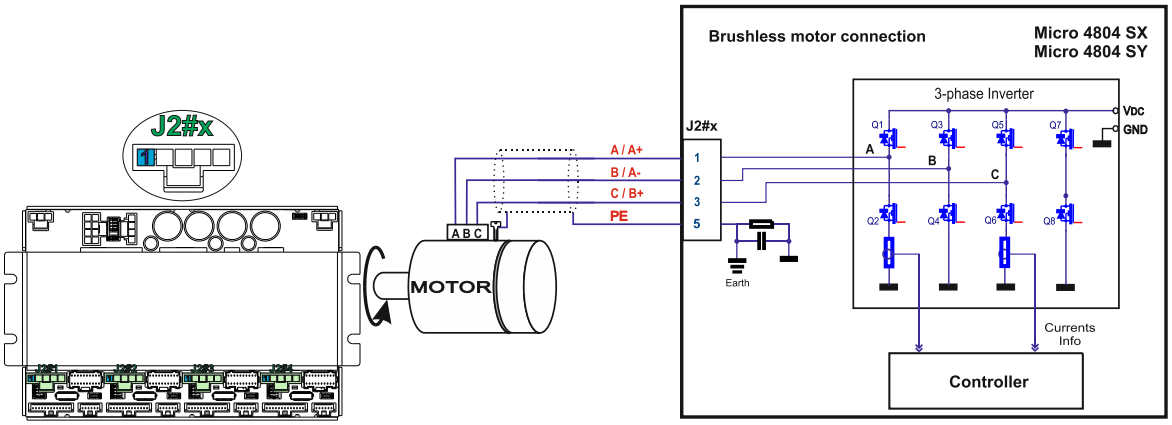



*Figure 13* **Brushless motor connection**

### 3.9.2 DC Motor connection

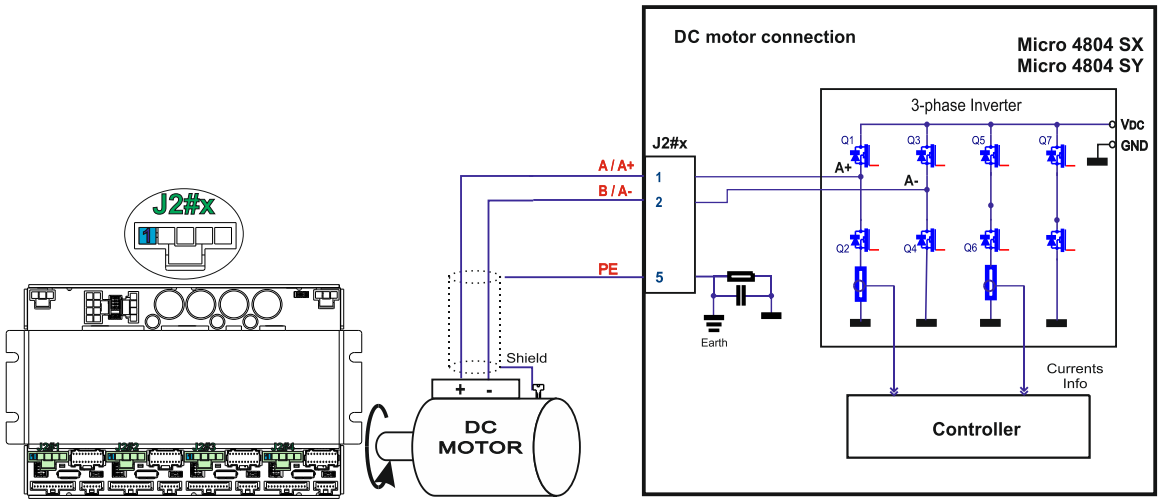



*Figure 14* **DC Motor connection**

### 3.9.3 2-phase Step Motor connection

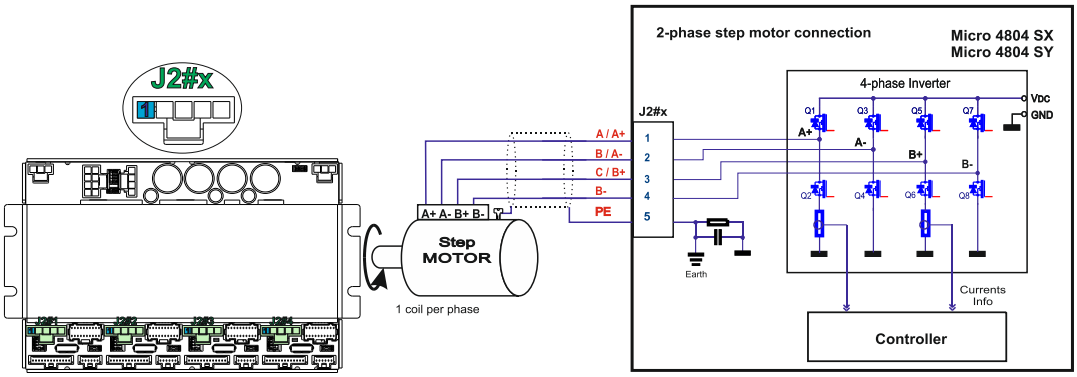



***Figure 15.*** *2-phase step motor connection, one coil per phase*

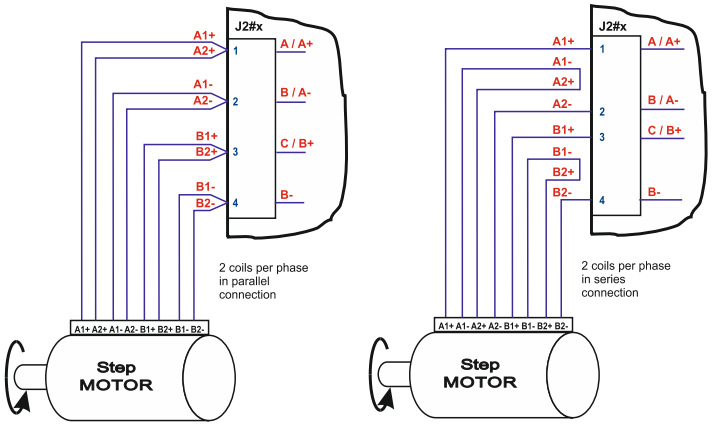



***Figure 16.*** *2-phase step motor connection, two coils per phase*

### 3.9.4 3-Phase Step Motor connection

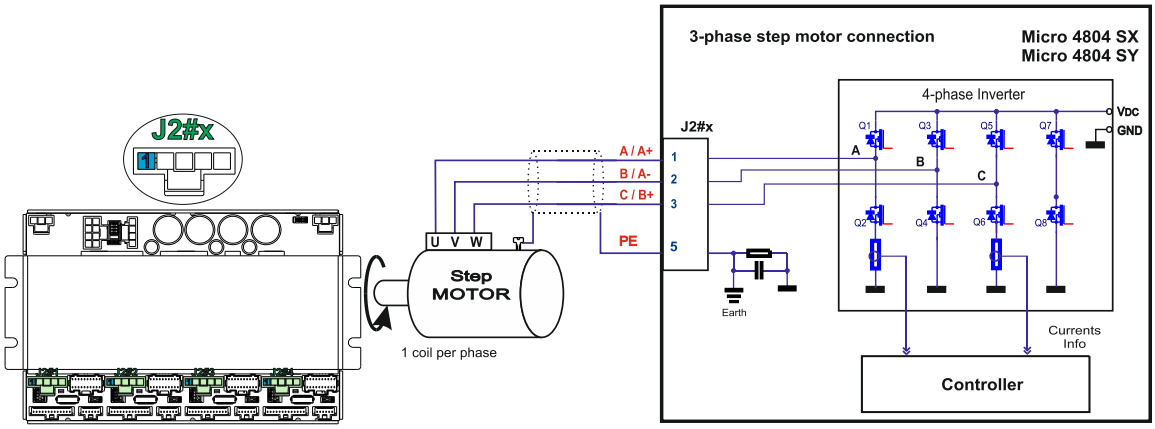



***Figure 17.*** *3-phase step motor connection*

#### 3.9.4.1 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.
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 Multi Axis System 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.
d) The shield must be connected to PE (protective earth) – J2#x pin 5 and it is recommended to be also connected to the motor chassis.

## 3.10 Feedback connections

### 3.10.1 Feedback #1 - Single-ended Incremental Encoder Connection

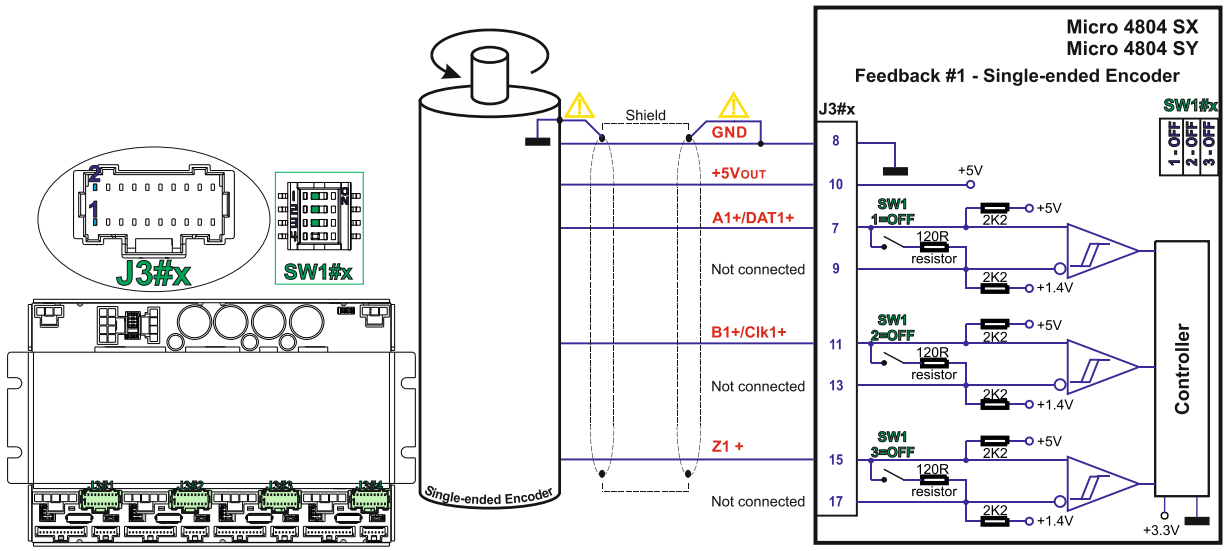



*Figure 18* **Feedback #1 - Single-ended Incremental Encoder Connection**

**CAUTION!** ***DO NOT CONNECT UNTERMINATED WIRES TO PINS J3#x.9, J3#x.13 AND J3#x.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.***

### 3.10.2 Feedback #1 - Differential Incremental Encoder Connection

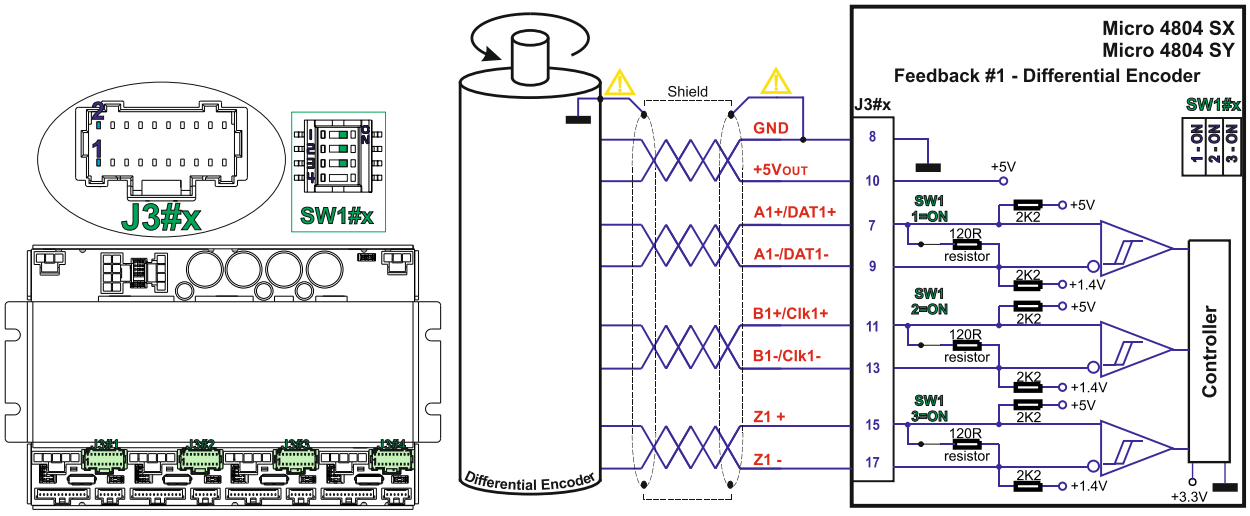



*Figure 19* **Feedback #1 - Differential Incremental Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis System Feedback #1 differential connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x switches 1,2 and 3 on "ON" position.*
2. *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.***

### 3.10.3 Feedback #2 - Single-ended Incremental Encoder Connection

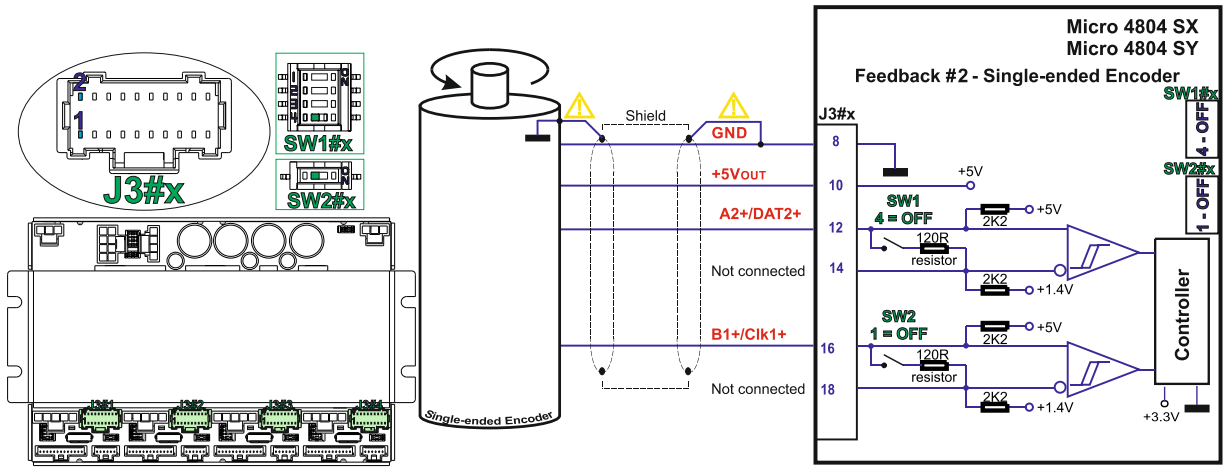



*Figure 20* **Feedback #2 - Single-ended Incremental Encoder Connection**

| | |
|---|---|
| **CAUTION!** | ***DO NOT CONNECT UNTERMINATED WIRES TO PINS J3#x.14 AND J3#x.18. THEY MIGHT PICK UP UNWANTED NOISE AND GIVE FALSE ENCODER READINGS.***<br>***Encoder cable shield must be connected to system GND to avoid disturbances / noise induced by nearby cables.*** |

### 3.10.4 Feedback #2 - Differential Incremental Encoder Connection

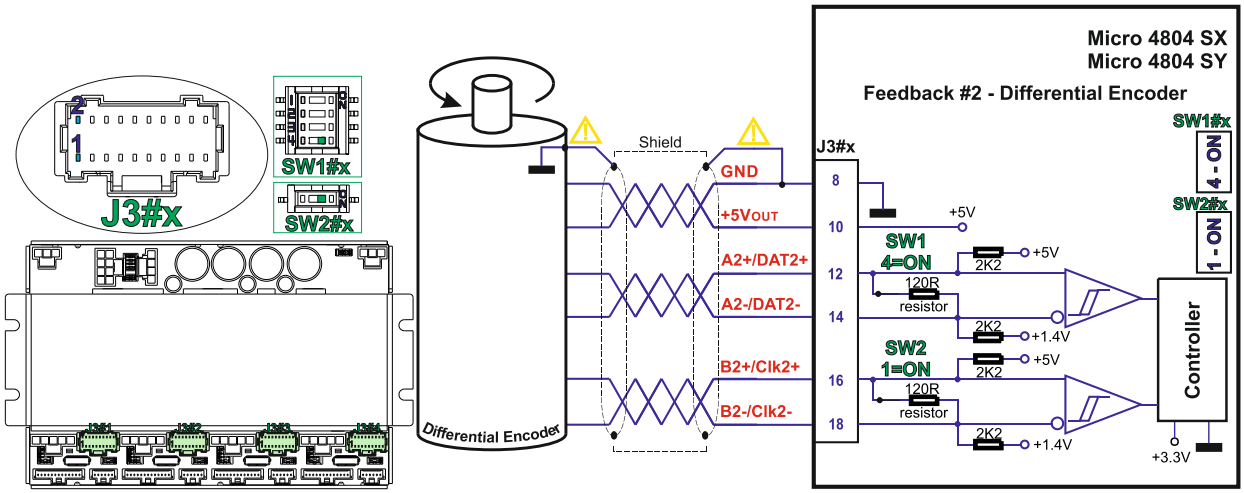



*Figure 21* **Feedback #2 - Differential Incremental Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis System Feedback#2 differential connection, termination resistors are internally added by putting the SW1#x switch 4 and SW2#x switch 1 on "ON" position.*
2. *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.*** |

### 3.10.5 Feedback #1 – Absolute Encoder Connection: SSI, BiSS, EnDAT

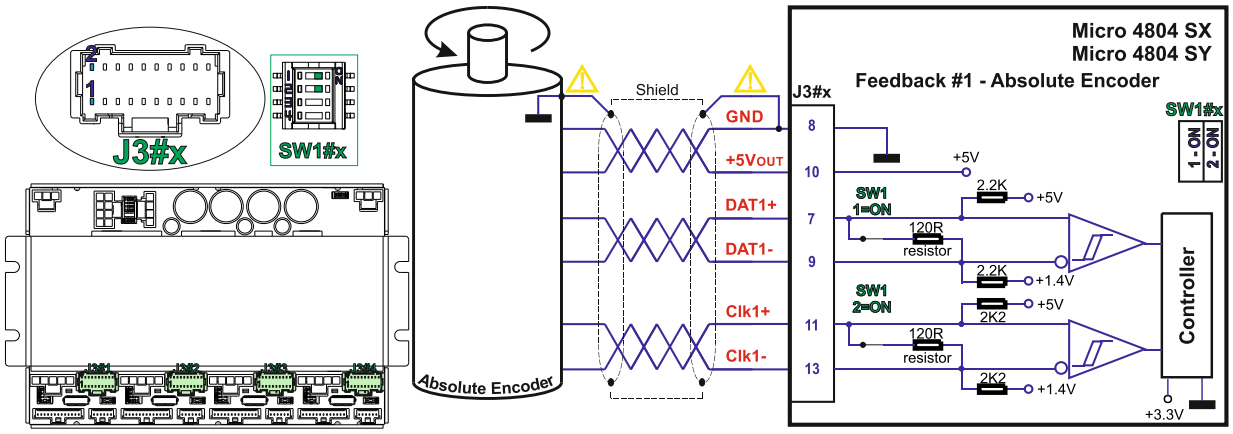



*Figure 22* **Feedback #1 – Absolute Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis system Feedback#1 absolute connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x switches 1 and 2 on "ON" position.*
2. *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.*** |

### 3.10.6 Feedback #1 – Absolute Encoder Connection: Panasonic, Tamagawa, Nikon, Sanyo Denki

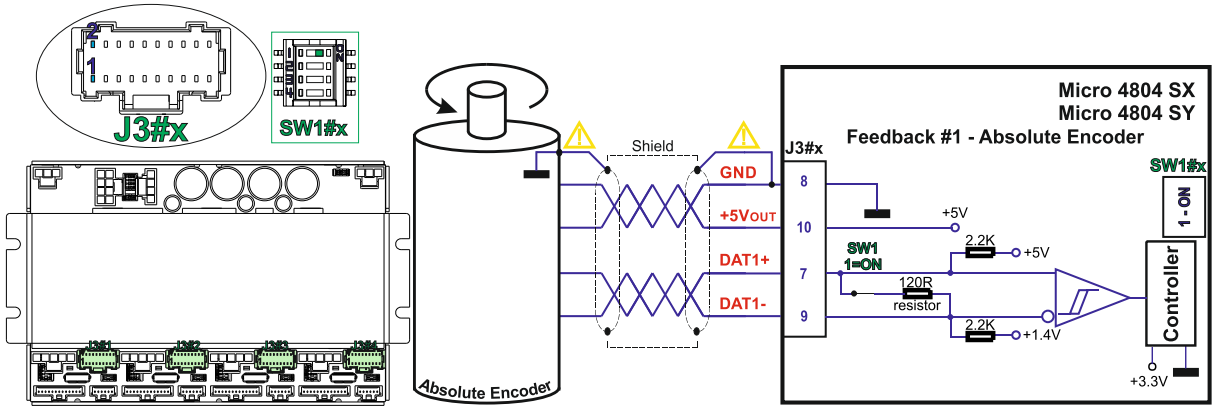



*Figure 23* **Feedback #1 – Absolute Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis system Feedback#1 absolute connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x switch 1 on "ON" position.*
2. *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.*** |

### 3.10.7 Feedback #2 – Absolute Encoder Connection: SSI, BiSS, EnDAT

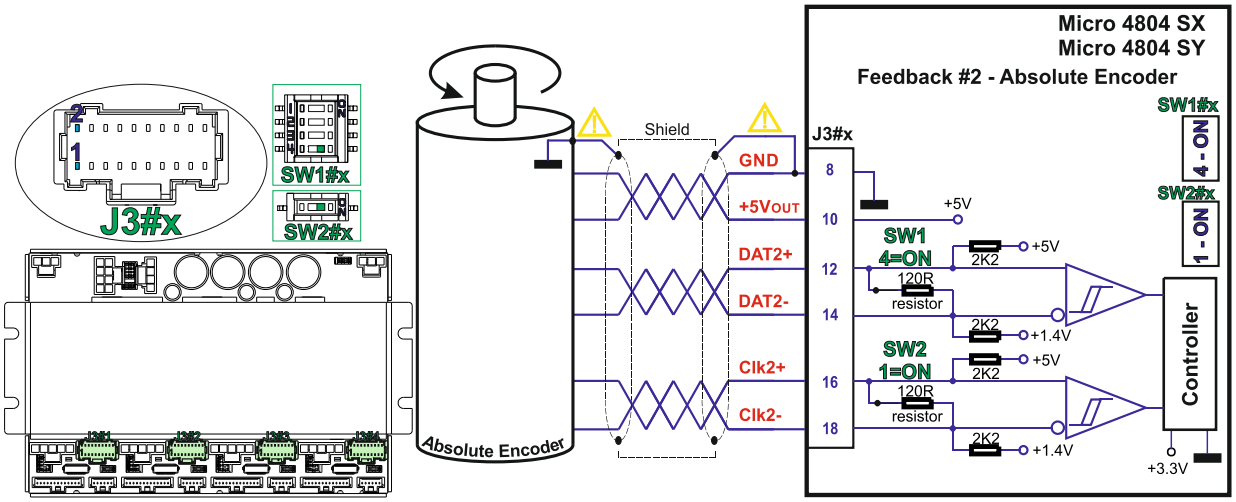



*Figure 24* **Feedback #2 – Absolute Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis System Feedback#2 absolute connection for SSI, BiSS and EnDAT, termination resistors are internally added by putting the SW1#x position 4 and SW2#x position 1 on "ON" position.*
2. *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.*** |

### 3.10.8 Feedback #2 – Absolute Encoder Connection: Panasonic, Tamagawa, Nikon, Sanyo Denki

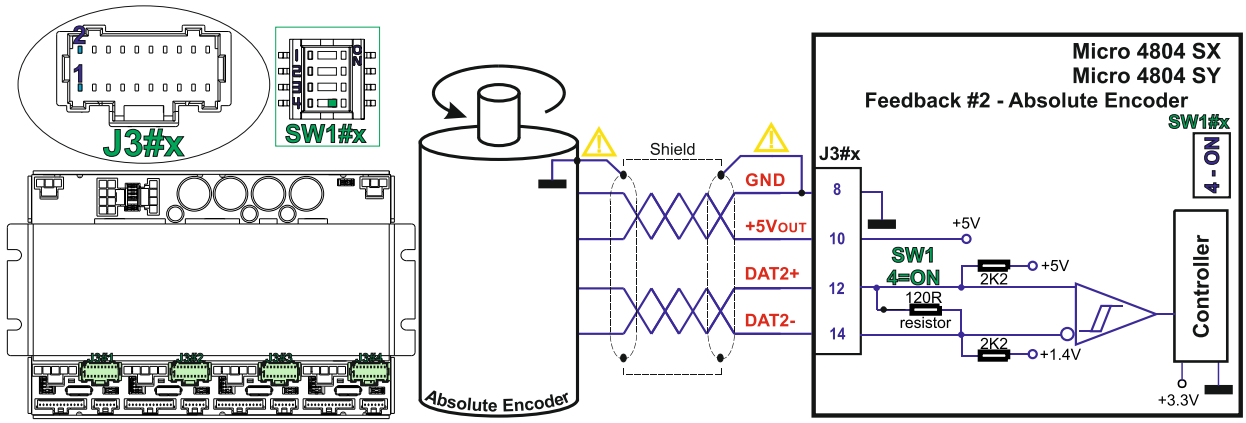



*Figure 25* **Feedback #2 – Absolute Encoder Connection**

***Remarks:***

1. *For Micro 4804 Multi Axis System Feedback#2 absolute connection for Panasonic, Tamagawa, Nikon and Sanyo Denki, termination resistors are internally added by putting the SW1#x position 4 on "ON" position.*
2. *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.*** |

### 3.10.9 Linear (Analog) Hall Connection

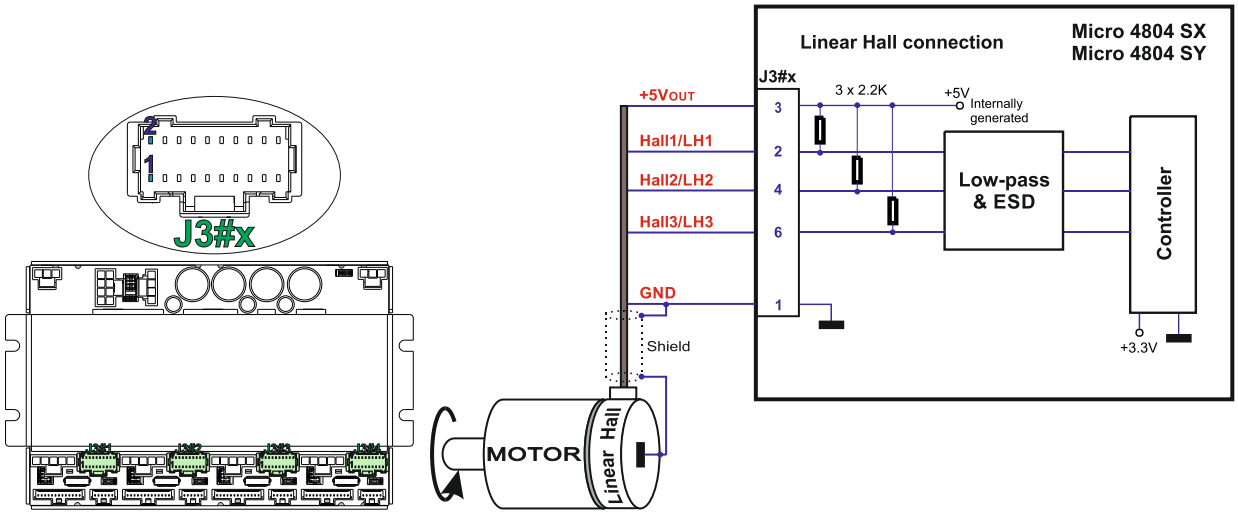



*Figure 26* **Linear Hall connection**

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

### 3.10.10 Digital Hall Connection for Motor + Hall + Incremental Encoder

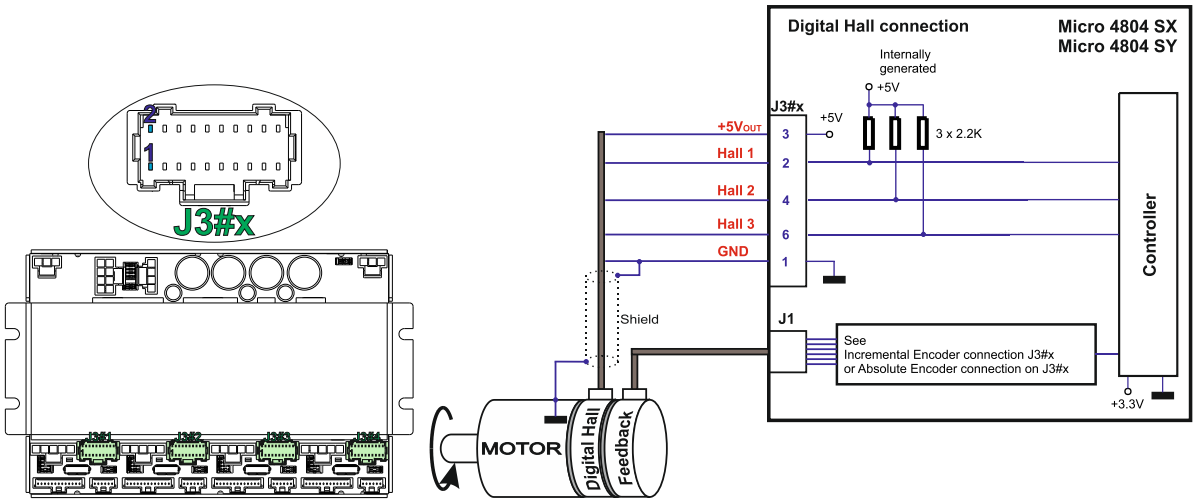



*Figure 27* **Digital Hall connection**

***Remarks:***

1. *This connection is required when using Hall start method BLDC or PMSM and also for the Trapezoidal commutation method. The digital halls are not used in this case as a feedback measurement device. The actual motor control is done with an incremental encoder.*
2. *The Micro 4804 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 a differential encoder connection, if only just one wire is missing from a pair the breakage can't be detected.

### 3.10.11 Digital Hall Connection for direct motor control without an encoder

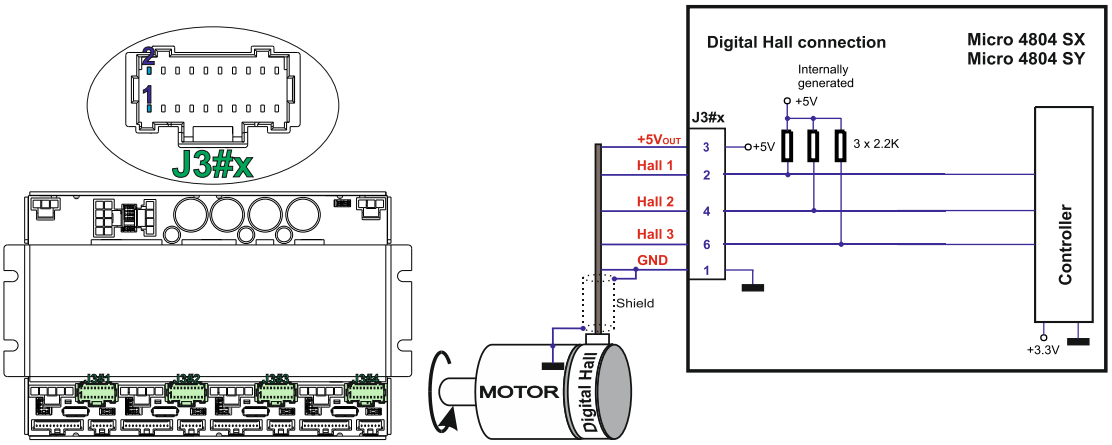



*Figure 28* **Digital Hall connection**

***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 Micro 4804 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.*** |

#### 3.10.11.1 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.

d) Internally generated 5V supply has nominal voltage 5.2V, thus allowing longer and smaller (thinner) cabling for feedback devices supplied with 5V and requiring high current consumption, such that the voltage drop across wiring can be up to 0.1V (both on +5 and on GND) without affecting the feedback device supply quality

## 3.11 Power Supply Connection

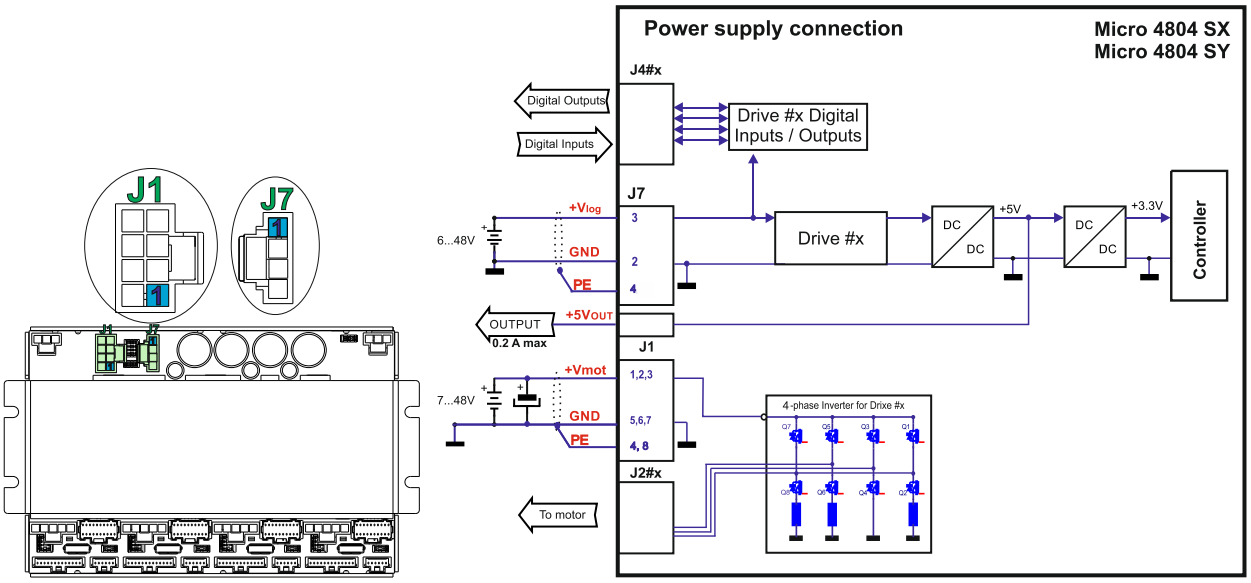



*Figure 29* **Supply connection for Micro 4804 SX / SY**

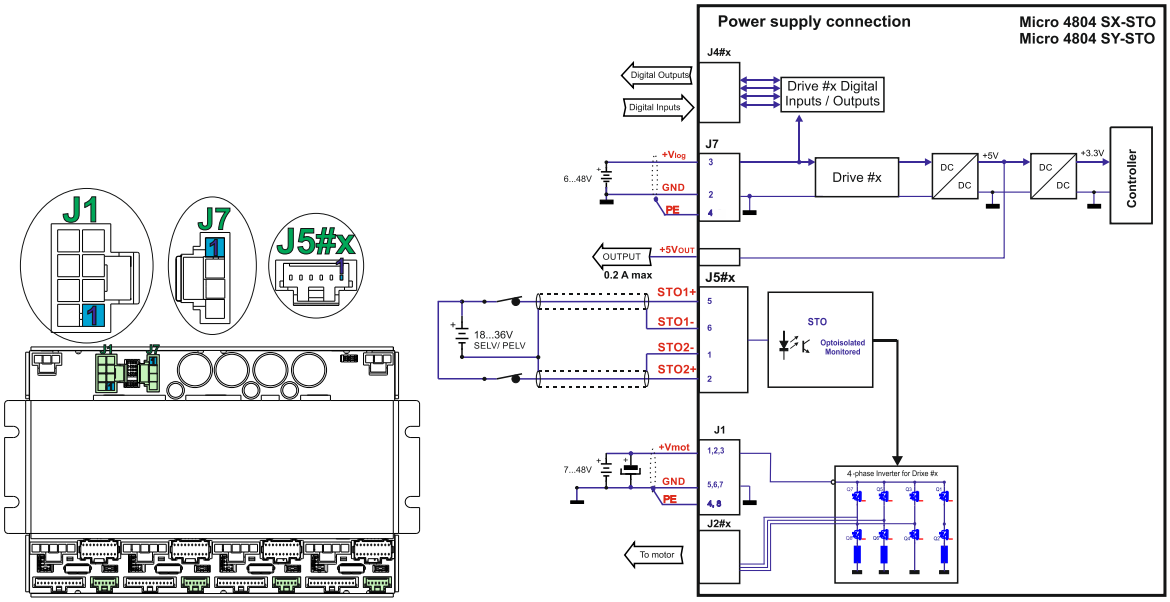



*Figure 30* **Supply connection for Micro 4804 SX / SY - STO**

***Remarks:***

1. *The Micro 4804 requires two supply voltages: $+V_{LOG}$ for logic power and $+V_{MOT}$ for motor power. Additionally, a third supply voltage is needed for the STO circuit, applicable only to specific models - P020.103.E404, P020.103.E403, P020.203.E404, and P020.203.E403.*
2. *The STO and $+V_{LOG}$ inputs can share the same power source if the supply voltage ranges between 18 to 36V DC and is provided by a SELV/PELV power supply.*
3. *When the STO inputs are left unconnected, the motor outputs will be disabled. This provides a dual redundant hardware protection that cannot be overdriven by the software or other hardware components.*
4. *To enable PWM output, the STO circuit must receive a minimum of 18V.*
5. *The J7 connector is internally linked to all $+V_{LOG}$ inputs and GND across all axis.*
6. *An external electrolytic capacitor may be added between $+V_{MOT}$ and GND, to help reduce over-voltage during load braking/ reversals. For more details, refer to paragraph 3.11.1.2.*

#### 3.11.1.1 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.
b) 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.
c) If the motor power supply cable is shielded, it must be connected to PE – J1 pins 4, 8 and it is recommended to be also connected to the motor chassis. The logic power supply cable shield must be connected to GND at both ends.

#### 3.11.1.2 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:

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

where:

$J_M$ – total rotor inertia [kgm$^2$]
$J_L$ – total load inertia as seen at motor shaft after transmission [kgm$^2$]
$\omega_M$ – 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 $\omega_M$ 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).

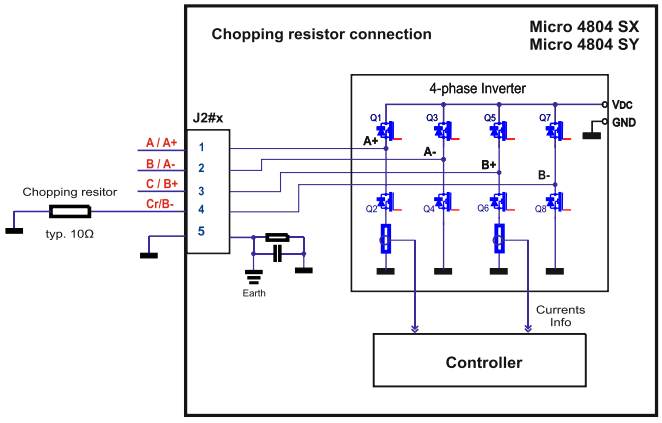
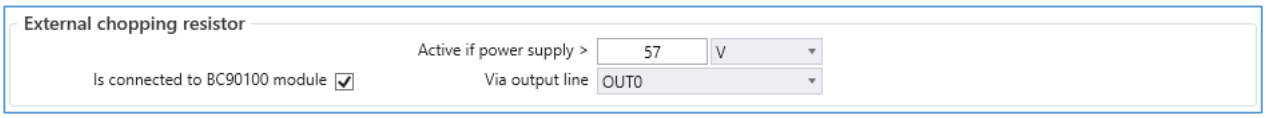



***Figure 31.*** *Chopping resistor connection*

**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 Studio II:




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. Take into consideration also the tolerance of the supply, such that UCHOP is a few volts above the maximum supply including tolerance. 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).*

### 2.1 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.*** |

## 3.12 USB connection

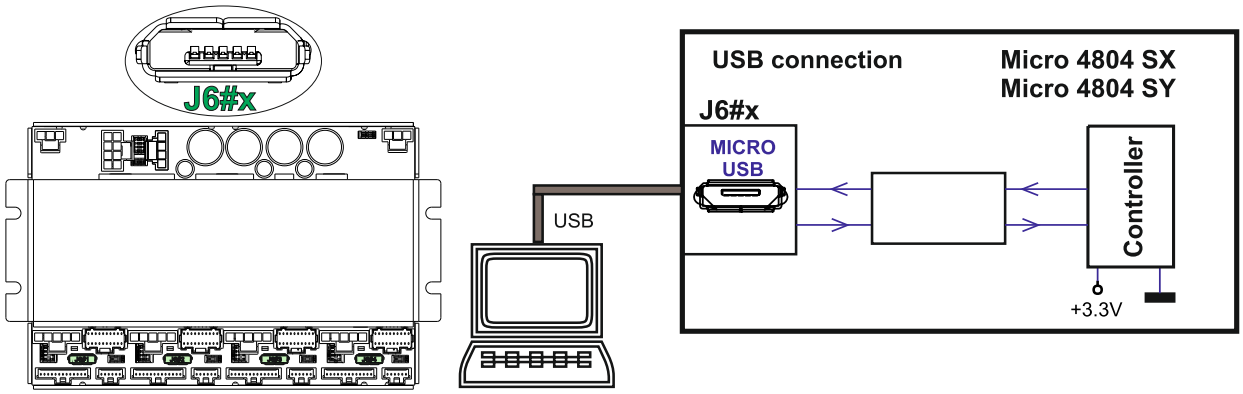



*Figure 32* **USB connection**

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.*

## 3.13 Serial RS-232 connection

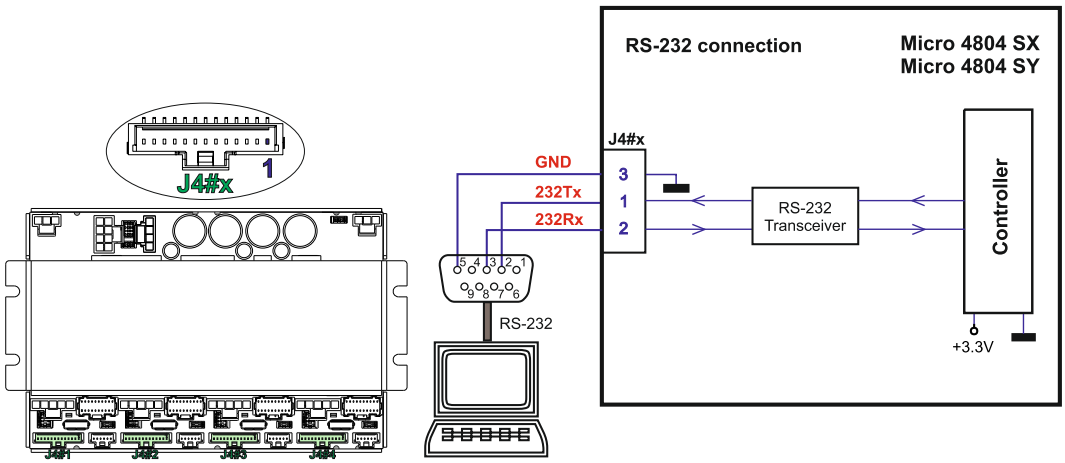



*Figure 33.* ***Serial RS-232 connection***

***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.*

### 3.13.1.1 Recommendation for wiring

a) 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.
b) Always power-off all the Micro 4804 supplies before inserting/removing the RS-232 serial connector
c) 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**

## 3.14 CAN-bus connection

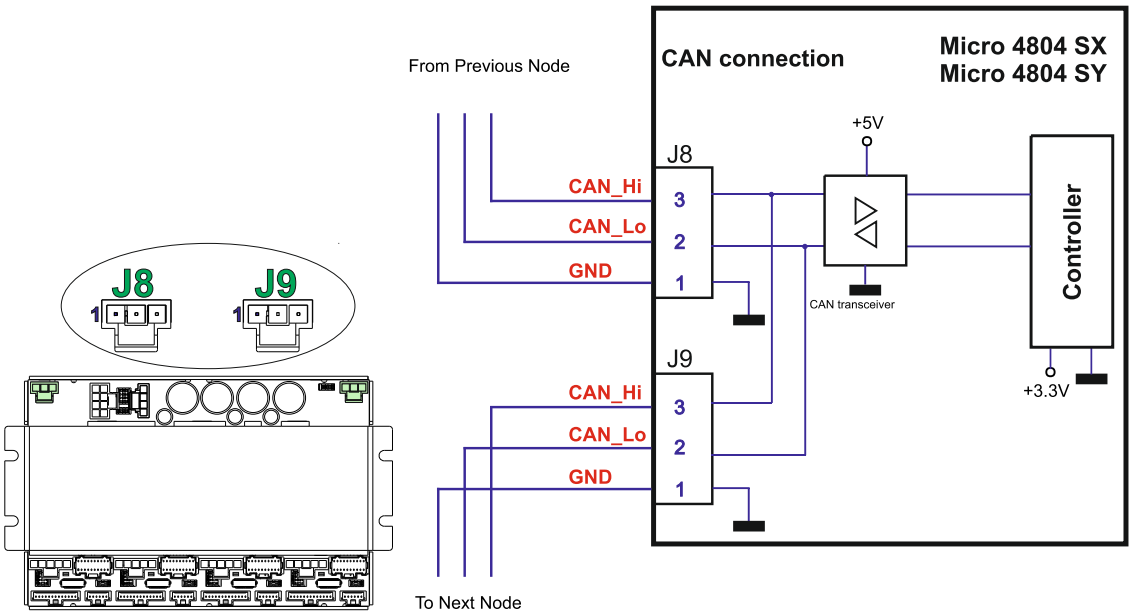



*Figure 34.* ***CAN connection***

***Remarks:***

1. *The CAN network requires a 120-Ohm terminator between CAN-Hi and CAN-Lo signals available via SW5.*
2. *CAN signals are not isolated from other Micro 4804 circuits.*
3. *EasyMotion Studio can communicate in parallel with RS232 communication while CAN communication is active*

### 3.14.1.1 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.

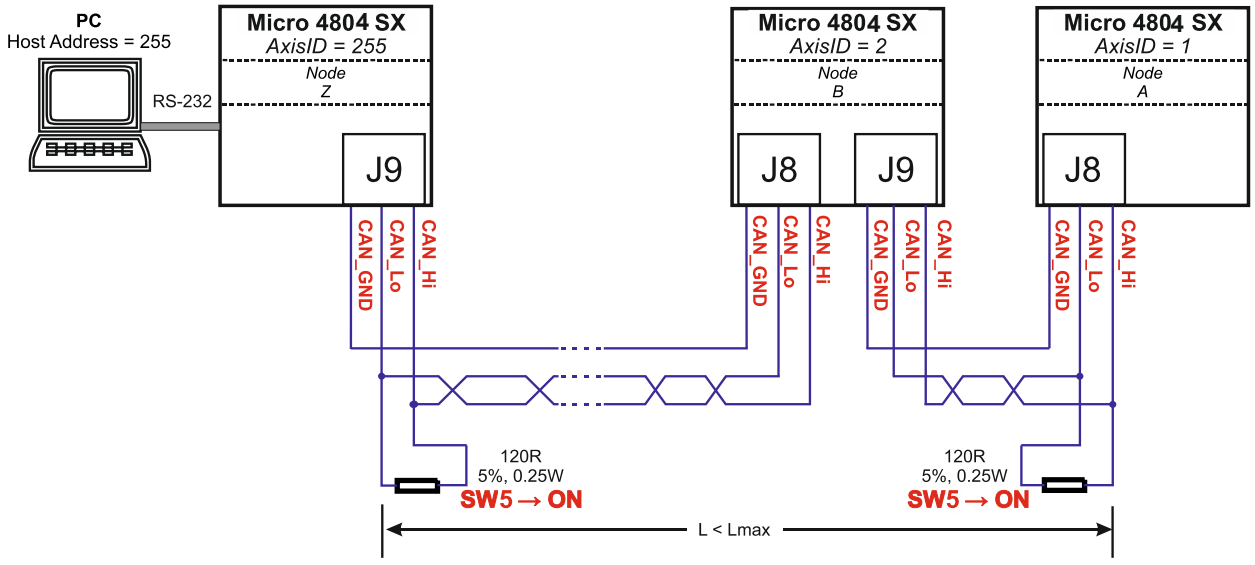



*Figure 35.* ***Multiple-Axis CAN network***

## 3.15 EtherCAT Connection

### 3.15.1 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 recommended 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. More important, the added shielding improves susceptibility / immunity to external EMI, which otherwise can lead (in extreme cases) to packet loss.
- 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** 36* 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** 37* 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.

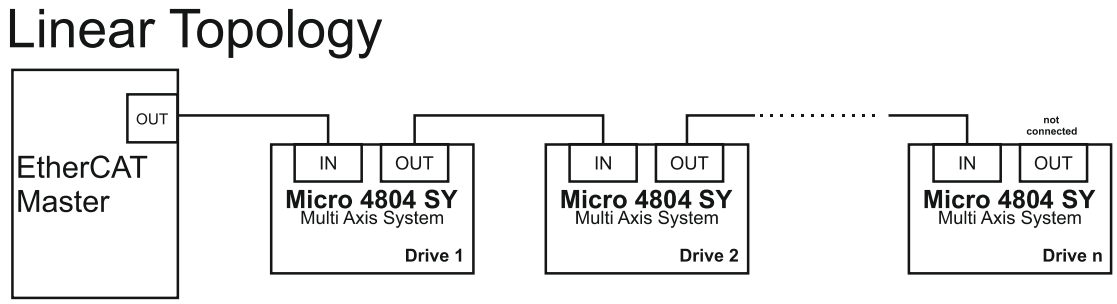



*Figure 36* **EtherCAT network linear topology**

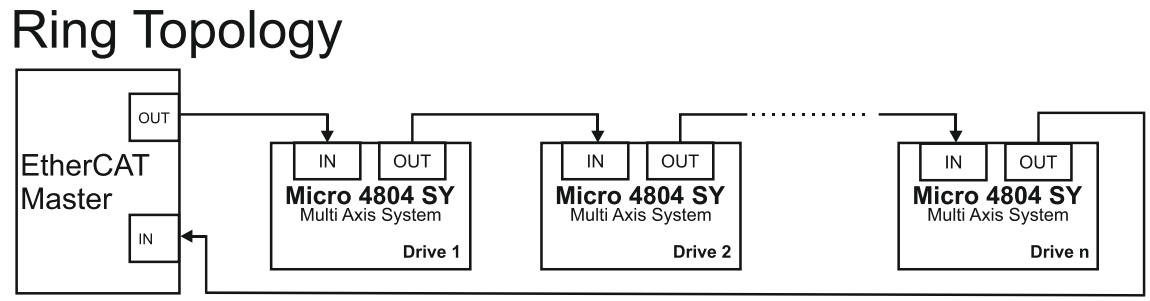



*Figure 37* **EtherCAT network ring topology**

- 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.

***Remark:** EasyMotion Studio can communicate in parallel with RS232 or USB communication while EtherCAT communication is active*

## 3.16 Disabling Autorun (for SX system); Disabling the setup table (for SY system)

### 3.16.1 Disabling Autorun (for SX system)

When an Micro 4804 SX4 is set in TMLCAN operation mode, by default after power-on it enters automatically in Autorun mode. In this mode, if the drive has in its local EEPROM a valid TML application (motion program), this is automatically executed as soon as the motor supply $V_{MOT}$ is turned on.

In order to disable Autorun mode, there are 3 methods:

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

b) Hardware1 – set the drive temporarily in CANopen mode via SW2. 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 (Figure **38**). 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.

### 3.16.2 Disabling the setup table at startup (for SY system)

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).

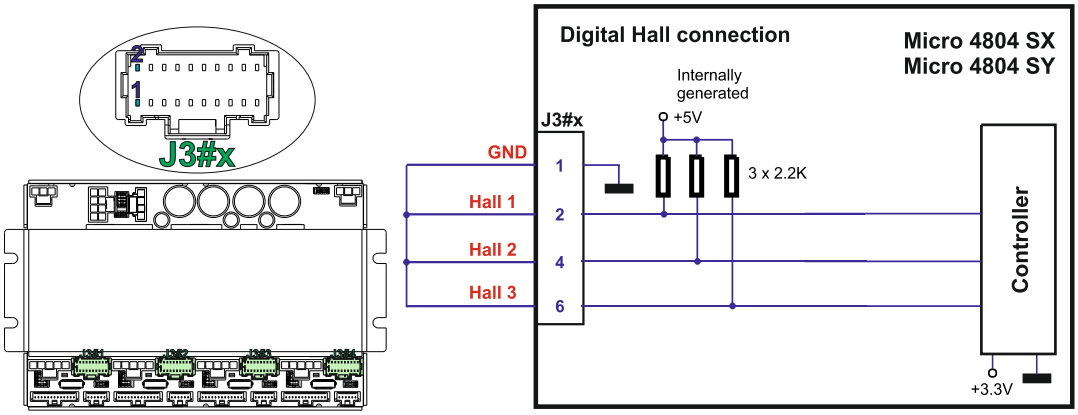



*Figure 38* **Temporary connection during power-on to invalidate the Setup table for Micro 4804**

## 3.17 LED Indicators for Micro 4804 SY

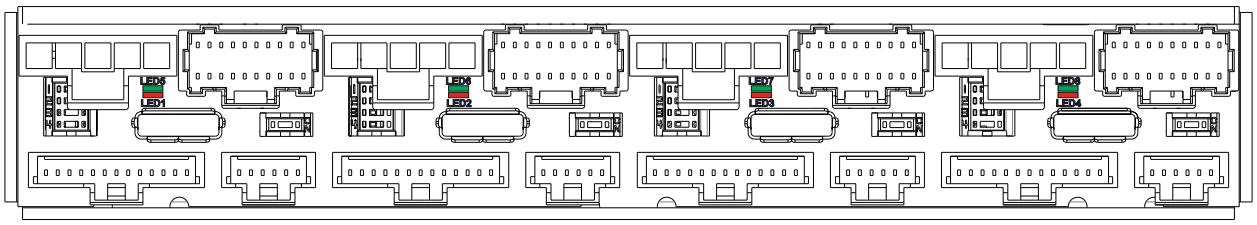


*Figure 39* **LED indicators**

| LED | LED name | LED color | Function |
|---|---|---|---|
| **1, 2, 3, 4** | **EtherCAT® ERROR** | red | EtherCAT® **ERROR** indicator. |
| **5, 6, 7, 8** | **EtherCAT® RUN** | green | EtherCAT® **RUN** indicator. |

The RUN states are shown with a 180-degree phase shift relative to the ERROR states, as illustrated in Figure 40. STATUS indicator Example. The specific behavior of the RUN indicator is detailed in Table 1. RUN Indicator States, while the behavior of the ERROR indicator is outlined in Table 2. ERROR Indicator States.

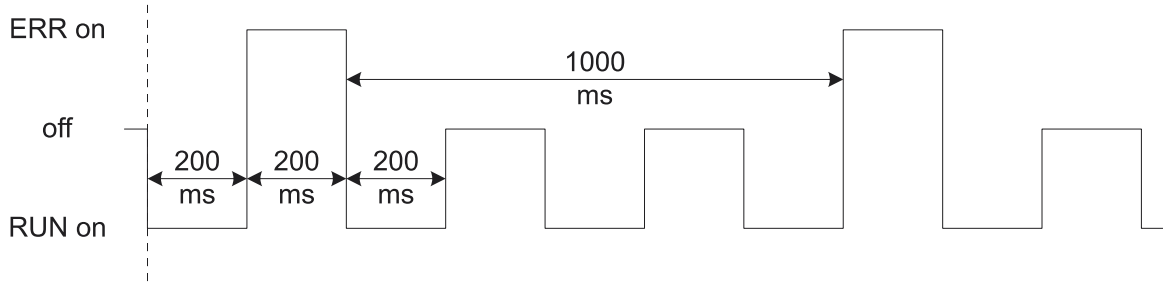



***Figure 40.*** *STATUS indicator Example*

***Table 1.*** *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 2.*** *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

## 3.18 Axis ID Selection

### 3.18.1 AxisID selection for Micro 4804 SX

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 set **SW3** according to **Table 3.3 – AxisID selection for Micro 4804 SX system**.

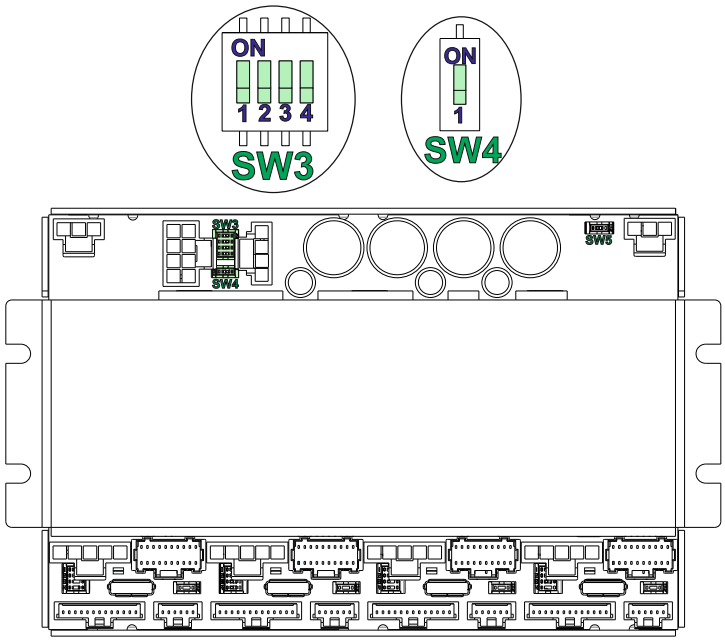



*Figure 41* ***Axis ID switches for Micro 4804 SX***

*Table 3.3 –* ***AxisID selection for Micro 4804 SX system***

| SW3 - AxisID Selection | | | | | | | |
|---|---|---|---|---|---|---|---|
| SW3 | | | | Drive AxisID | | | |
| Position 1 | Position 2 | Position 3 | Position 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4* |
| off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | on | on | 25 | 26 | 27 | 28 |
| off | on | off | off | 33 | 34 | 35 | 36 |
| off | on | off | on | 41 | 42 | 43 | 44 |
| off | on | on | off | 49 | 50 | 51 | 52 |
| off | on | on | on | 57 | 58 | 59 | 60 |
| on | off | off | off | 65 | 66 | 67 | 68 |
| on | off | off | on | 73 | 74 | 75 | 76 |
| on | off | on | off | 81 | 82 | 83 | 84 |
| on | off | on | on | 89 | 90 | 91 | 92 |
| on | on | off | off | 97 | 98 | 99 | 100 |
| on | on | off | on | 105 | 106 | 107 | 108 |
| on | on | on | off | 113 | 114 | 115 | 116 |
| on | on | on | on | 121 | 122 | 123 | 124 |

* Not availabile for Micro 4804 SX3 systems

The communication protocol can be set by the **SW4** switch:

- **ON** = **TMLCAN** mode is selected;
- **OFF** = **CANopen** mode is selected.

***Remarks:***

1. *The drive axis/address number is set when H/W is selected in Drive Setup under AxisID field or when the Setup is invalid.*
2. *The default Axis ID for all Micro 4804 SX is 255. If the CANOpen mode is selected and the AxisID value is 255, drive will be in "LSS inactive" state.*
3. *All pins are sampled at power-up, and the drive is configured accordingly.*

### 3.18.2 AxisID selection for Micro 4804 SY

The Micro 4804 SY Multi Axis System 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 set **SW3 & SW4** according to **Table 3.4 - AxisID selection for Micro 4804 SY system**.

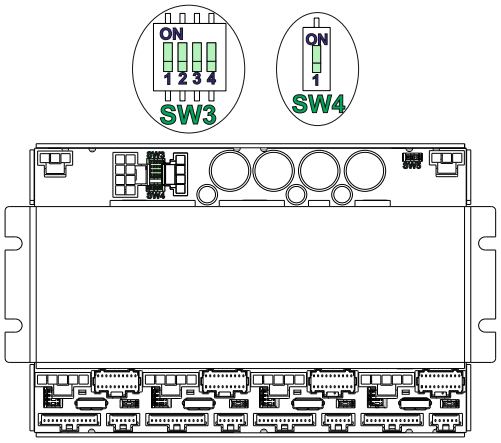



*Figure 42* ***Axis ID switches for Micro 4804 SY***

***Table 3.4 - AxisID selection for Micro 4804 SY system***

| SW3 & SW4 - AxisID Selection | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SW4 | SW3 | | | | Drive AxisID | | | |
| | Pin 1 | Pin 2 | Pin 3 | Pin 4 | Drive #1 | Drive #2 | Drive #3 | Drive #4* |
| off | off | off | off | off | 1 | 2 | 3 | 4 |
| off | off | off | off | on | 9 | 10 | 11 | 12 |
| off | off | off | on | off | 17 | 18 | 19 | 20 |
| off | off | off | on | on | 25 | 26 | 27 | 28 |
| off | off | on | off | off | 33 | 34 | 35 | 36 |
| off | off | on | off | on | 41 | 42 | 43 | 44 |
| off | off | on | on | off | 49 | 50 | 51 | 52 |
| off | off | on | on | on | 57 | 58 | 59 | 60 |
| off | on | off | off | off | 65 | 66 | 67 | 68 |
| off | on | off | off | on | 73 | 74 | 75 | 76 |
| off | on | off | on | off | 81 | 82 | 83 | 84 |
| off | on | off | on | on | 89 | 90 | 91 | 92 |
| off | on | on | off | off | 97 | 98 | 99 | 100 |
| off | on | on | off | on | 105 | 106 | 107 | 108 |
| off | on | on | on | off | 113 | 114 | 115 | 116 |
| off | on | on | on | on | 121 | 122 | 123 | 124 |
| on | off | off | off | off | 129 | 130 | 131 | 132 |
| on | off | off | off | on | 137 | 138 | 139 | 140 |
| on | off | off | on | off | 145 | 146 | 147 | 148 |
| on | off | off | on | on | 153 | 154 | 155 | 156 |
| on | off | on | off | off | 161 | 162 | 163 | 164 |
| on | off | on | off | on | 169 | 170 | 171 | 172 |
| on | off | on | on | off | 177 | 178 | 179 | 180 |
| on | off | on | on | on | 185 | 186 | 187 | 188 |
| on | on | off | off | off | 193 | 194 | 195 | 196 |
| on | on | off | off | on | 201 | 202 | 203 | 204 |
| on | on | off | on | off | 209 | 210 | 211 | 212 |
| on | on | off | on | on | 217 | 218 | 219 | 220 |
| on | on | on | off | off | 225 | 226 | 227 | 228 |
| on | on | on | off | on | 233 | 234 | 235 | 236 |
| on | on | on | on | off | 241 | 242 | 243 | 244 |
| on | on | on | on | on | 249 | 250 | 251 | 252 |

* Not availabile for Micro 4804 SY3 systems

***Remarks:***

1. *The drive axis/address number is set when H/W is selected in Drive Setup under AxisID field or when the Setup is invalid.*
2. *The default Axis ID for all Micro 4804 SY is 255. 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 Electrical Specifications

- All parameters measured under the following conditions (unless otherwise specified):
- $V_{LOG}$ = 24 VDC; $V_{MOT}$ = 48 VDC; $F_{PWM}$ = 20 kHZ
- Ambient temperature = 25°C (typical values) / 0°C…40°C (min/max values)
- Supplies start-up / shutdown sequence: -any-
- Load current = nominal
- Data is provided for each axis of the system

### 3.19.1 Operating Conditions

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

### 3.19.2 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 | | | ±5 | kV |
| | Original packaging | | | ±15 | kV |

### 3.19.3 Mechanical Mounting

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Airflow | natural convection, closed box | | | | |
| Spacing required between adjacent drives | | 10 | | | mm |
| Spacing required above drive | For counter-connectors & cable bending | 30 | 80 | | |

### 3.19.4 Environmental Characteristics

| | | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Size (Length x Width x Height) | Global size | Micro 4804 SY3-CAT | 118.2 x 71.4 x 21.7 | | | mm |
| | | Micro 4804 SY4-CAT | | | | |
| | | Micro 4804 SY3-CAT-STO | ~4.65 x 2.81 x 0.85 | | | inch |
| | | Micro 4804 SY4-CAT-STO | | | | |
| | | Micro 4804 SX3-CAN | 118.2 x 71.4 x 21.65 | | | mm |
| | | Micro 4804 SX4-CAN | | | | |
| | | Micro 4804 SX3-CAN-STO | ~4.65 x 2.81 x 0.85 | | | inch |
| | | Micro 4804 SX4-CAN-STO | | | | |
| Weight | Micro 4804 SY3-CAT | | 150 | | | g |
| | Micro 4804 SY4-CAT | | 159 | | | |
| | Micro 4804 SY3-CAT-STO | | 161 | | | |
| | Micro 4804 SY4-CAT-STO | | 174 | | | |
| | Micro 4804 SX3-CAN | | 141 | | | |
| | Micro 4804 SX4-CAN | | 150 | | | |
| | Micro 4804 SX3-CAN-STO | | 152 | | | |
| | Micro 4804 SX4-CAN-STO | | 165 | | | |
| Cleaning agents | Dry cleaning is recommended | | Only Water- or Alcohol- based | | | |
| Protection degree | According to IEC60529 | | IP20 | | | - |

### 3.19.5 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 | | 50 | $V_{DC}$ |
| | Absolute maximum values, continuous | | -0.5 | | 53 | $V_{DC}$ |
| Supply current | +$V_{LOG}$ = 12V | | | 90 | 150 | mA |
| | +$V_{LOG}$ = 24V | | | 60 | 90 | |
| | +$V_{LOG}$ = 48V | | | 45 | 60 | |
| Utilization category | | Acc. to 60947-4-1 ($I_{PEAK}$<=1.05*$I_{NOM}$) | DC-1 | | | |

[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.

### 3.19.6 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 | | 50 | $V_{DC}$ |
| | Absolute maximum values, continuous | -0.5 | | 53 | $V_{DC}$ |
| Supply current | Idle | | 0.3 | | mA |
| | Operating | -16 | ±7 | +16 | A |
| Voltage Measurement error | | | ±0.15 | ±0.25 | V |
| Utilization category | Acc. to 60947-4-1 ($I_{PEAK}$<=4.0*$I_{NOM}$) | DC-3 | | | |

### 3.19.7 Motor Outputs (A/A+, B/A-, C/B+, CR/B-)

| | | | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Nominal current | PMSM motors sinusoidal amplitude | | | | | ±8 | A |
| | PMSM motors sinusoidal RMS | | | | | 5.7 | $A_{RMS}$ |
| | DC/BLDC/STEP motors continuous | | | | | 7 | A |
| Peak current | maximum 4 seconds | | | -16 | | +16 | A |
| Short-circuit protection threshold | | | | | ±25 | ±28 | A |
| Short-circuit protection delay | | | | 2.6 | | 3.5 | µs |
| On State voltage drop | Nominal output current; including typical mating connector contact resistance | | | | 50 | 70 | mV |
| Off State leakage current | | | | | 0.3 | 1 | mA |
| Current measurement | Accuracy (FS = Full Scale) | | | | ±1 | ±1.5 | %FS |
| | Noise (current ≤ 2A) | | | | ±4 | ±6 | mA |
| | Noise (current ≥ 2A) | | | | ±30 | ±50 | |
| | Offset drift (compensated @ AxisOn) | | | | | ±0.16 | mA/ºC |
| Motor inductance (phase-to-phase) | Recommended value to avoid spurious short-circuit protection, triggered by ripple | Fast loop[1] | $V_{MOT}$ | | | | µH |
| | | 50µs | 48V | | 133 | | |
| | | 100µs | 48V | | 266 | | |
| | | 50µs | 24V | | 66 | | |
| | | 100µs | 24V | | 133 | | |
| Motor electrical time-constant (L/R) | Recommended value for ±5% current measurement error | $F_{PWM}$ = 20 kHz | | | 330 | | µs |
| | | $F_{PWM}$ = 40 kHz | | | 170 | | |
| | | $F_{PWM}$ = 60 kHz | | | 140 | | |
| | | $F_{PWM}$ = 80 kHz | | | 80 | | |
| | | $F_{PWM}$ = 100 kHz | | | 66 | | |

### 3.19.8 Supply Output (+5V)

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output voltage | Current sourced = 400mA | 5.05 | 5.2 | 5.25 | V |
| Output current[2] | Output voltage ≥ 4.85V | | | 1,200 | mA |
| Short-circuit to GND protection | | Yes / Drive resets at event | | | |
| Over-voltage protection | | NOT protected | | | |
| ESD protection | Human body model | ±1 | | | KV |

### 3.19.9 Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5/ENA[3])

| | | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Mode compliance | | | NPN (sink) | | | |
| Default state | Input floating (wiring disconnected) | | Logic HIGH | | | |
| Input voltage | Logic “LOW” | IN0, IN1, IN4, IN5/ENA[3] | | 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) | | | 4.7 | | |
| | Absolute maximum, continuous | IN2/LSP, IN3/LSN, IN5/ENA[3] | -2 | | +80 | |
| | | IN0, IN1, IN4 | -0.5 | | $V_{LOG}$+0.5 | |
| Input current | Logic “LOW”; Pulled to GND | | | 6.5 | 8 | mA |
| | Logic “HIGH”; Pulled to +24V | | | 0.2 | 0.4 | |
| Input frequency | | | 0 | | 500 | kHz |
| Minimum pulse | | | 1 | | | µs |
| ESD protection (Human body model) | | | ±2 | | | kV |

[1] Fast loop period of 50µs is not possible with all feedback device types.

[2] Specified currents are intended per drive. Each drive has separate +5V outputs

[3] Enable input only for non-STO executions. For STO executions, IN5 functions as a general-purpose input.

### 3.19.10 Digital Outputs (OUT0, OUT1, OUT4)

| | | | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Mode compliance | | | | | NPN (sink) 24V | | |
| Load type | | | | | Resistive, Inductive | | |
| Default state | Not supplied (+$V_{LOG}$ floating) | | | | High-Z (floating) | | |
| | Immediately after power-up | | | | Logic “HIGH” | | |
| Output voltage | Logic “LOW”; output current = 1.5A for OUT0/ 0.05A for OUT1, OUT4 | | | | | 0.4 | V |
| | Logic “HIGH”; output current = 0, no load | | | 4 | 4.7 | 5.2 | |
| | 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, short duration, duty cycle <=1% | 5s max | OUT1, OUT4 | | | 0.1 | A |
| | | | OUT0 | | | 2 | |
| | | 0.5s max | OUT1, OUT4 | | | 0.15 | |
| | | | OUT0 | | | 2.5 | |
| | Logic “LOW”, sink current, continuous; $V_{OUT}$ ≤ 0.4V | | OUT1, OUT4 | | | 0.05 | |
| | | | OUT0 | | | 1.5 | |
| | 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 | | $V_{LOG}$=24V | | 0.18 | 0.2 | mA |
| | | | $V_{LOG}$=48V | | 0.42 | 0.45 | |
| Minimum pulse width | | | | 0.5 | | | µs |
| ESD protection - Human body model | | | | ±25 | | | kV |

### 3.19.11 Encoder Inputs(A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-)[1]

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Single-ended mode compliance | Leave A1-, B1-, Z1-, A2-, B2- floating | TTL / CMOS / Open-collector (NPN sink) | | | |
| Single-ended threshold | A1+, B1+, Z1+, A2+, B2+ | 1.3 | 1.4 | 1.5 | V |
| Single-ended input current | Input pulled to GND against on-board 2.2 KΩ pull-up to +5V | | 2.4 | 2.7 | mA |
| Differential mode compliance | For full RS422 compliance, see[2] | 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 | Common-mode (A1+ to GND, etc.) | | 2.2 | | kΩ |
| | Differential (A1+ to A1-, etc.) | | 4.4 | | |
| Input frequency | Differential mode | 0 | | 15 | MHz |
| Minimum pulse width | Differential mode | 33 | | | ns |
| ESD protection | Human body model | ±30 | | | kV |

### 3.19.12 Hall Inputs (Hall1, Hall2, Hall3)

| | | | Min | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Mode compliance | TTL / CMOS / Open-collector (NPN sink), or analog (linear) 0…5V | | | | | |
| Default state | Input floating (Wiring disconnected) | | 4.5 | 4.8 | 5.2 | V |
| Input voltage | Digital | Logic “LOW” | | 1.5 | 1.7 | |
| | | Logic “HIGH” | 3 | 2.5 | | |
| | | Hysteresis | | 0.5 | | |
| | Analog | | 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 | | | | 66 | | µs |
| ESD protection | Human body model | | | ±15 | | kV |

### 3.19.13 RS-232

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Compliance | | TIA/EIA-232-C | | | |
| Bit rate | Software selectable | 9600 | | 115200 | Baud |
| Output voltage | | ±5 | ±5.7 | | V |
| Short-circuit | 232TX to GND | Guaranteed | | | |
| Input voltage | Absolute maximum, continuous | -30 | | +30 | V |
| ESD protection | Human body model | ±15 | | | kV |

[1] To achieve full RS-422 compatibility and enhance noise rejection, it is necessary to connect an 120Ω resistor across each signal pair (A1+/A1-, B1+/B1-, Z1+/Z1-, A2+/A2-, B2+/B2-). This can be done through SW1 and SW2.

### 3.19.14 Absolute encoder interface: SSI, BISS-C, EnDAT, Tamagawa, Nikon, Sanyo Denki

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Single-ended mode | Not recommended, reduced robustness & speed | | | | |
| Differential mode compliance | For full RS422 compliance, see[1] | TIA/EIA-422-A | | | |
| Output voltage | Differential; 50Ω differential load | 1.5 | 3.3 | | V |
| | Common-mode, referenced to GND | 1 | 1.7 | 3 | |
| CLOCK frequency | Nikon, Sanyo Denki | 2.5, 4 | | | MHz |
| | Panasonic, Tamagawa | 2.5 | | | |
| | All others | 1, 2, 3, 4 | | | |
| Output Short- circuit protection | Common-mode voltage ±15V | Yes, protected | | | |
| DATA format | Software selectable | Binary / Gray | | | |
| | | Single-turn / Multi-turn | | | |
| | | Counting direction | | | |
| | | CRC type | | | |
| DATA resolution | Including CRC, flags, … | | | 64 | Bits |
| | If total resolution >31 bits, some bits must be ignored by software setting to achieve a max. 31 bits resolution | | | | |

### 3.19.15 Analog Inputs (REF / FDBK)

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input voltage | Operational range | 0…5, -10…+10 | | | V |
| | Absolute maximum values, continuous | -22 | | +26 | |
| | Absolute maximum, surge (duration ≤ 1s) | | | ±38 | |
| Input impedance | To 1.44V | | 20 | | kΩ |
| Bandwidth (-3dB) | Software selectable | 0 | | 5.3 | kHz |
| Resolution | | 12 | | | bits |
| Integral linearity | | | | ±1 | bits |
| Offset error | Range -10V … +10V | | ±3 | ±10 | bits |
| | Range 0 …+5V | | ±10 | ±30 | |
| Gain error | Range -10V … +10V | | ±0.3 | ±0.5 | % |
| | Range 0 …+5V | | ±0.5 | ±0.8 | |
| ESD protection | Human body model | ±1.5 | | | kV |

### 3.19.16 EtherCAT® (Micro 4804 SY System)

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Compliance | | IEEE802.3, IEC61158 | | | |
| Software protocols compatibility | | CoE, FoE, EoE, IEC61800-7-301 | | | |
| Transmission line | According to TIA/EIA-568-5-A | 5 | 5e | 6 | Category |
| | | UTP | FTP | STP | Shield |
| Auto | swap + / - inside a pair | Yes (MLT3 encoding) | | | |
| | swap Rx / Tx pairs | Yes (auto-MDI/MDIX) | | | |
| | Swap port0(IN) / port1(OUT) | NO (EtherCAT requirement) | | | |
| Configured Station Alias (using AxisID) | | 1 ÷ 251 (SY3), 1 ÷ 252 (SY4) | | | - |
| ESD protection | Human body model | ±5 | | | kV |

### 3.19.17 CAN-Bus (Micro 4804 SX System)

| | | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Compliance | | | CAN 2.0B, ISO 11898-2 | | | |
| Software protocols compatibility | | | CiA301, CiA305, CiA402, TechnoCAN, TMLcan | | | |
| Bit rate | Software selectable | | 125, 250, 500, 1000 | | | KBaud |
| Node addressing | TMLcan | SW3 selectable | 1÷123 (SX3), 1÷124 (SX4) | | | - |
| | CANopen | | | | | - |
| Voltage | Common-mode, operating | | -12 | | +12 | V |
| | Common-mode, max. continuous | | -58 | | +58 | V |
| | Differential, max. continuous | | -45 | | +45 | V |
| Input impedance | Differential | | 40 | | 90 | KΩ |
| | Common-mode | | 20 | | 45 | KΩ |
| Termination resistor (120Ω) | | | Included – SW5 | | | |
| ESD protection | Human body model | | ±10 | | | kV |

[1] To achieve full RS-422 compatibility and enhance noise rejection, it is necessary to connect an 120Ω resistor across each signal pair (A1+/A1-, B1+/B1-, Z1+/Z1-, A2+/A2-, B2+/B2-). This can be done through SW1 and SW2.

### 3.19.18 Safe Torque OFF (STO1+; STO1-; STO2+; STO2-)[1]

| | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Safety Integrity Level | | | SIL 3 | | |
| Performance Level | | | PL e | | |
| Safety Category | | | Cat 3 | | |
| Reaction time | | | | 30 | ms |
| Ignored diagnostic pulses | Duration | | | 5 | ms |
| | Repetition rate | | | 20 | Hz |
| MTTFd | | | 377 | | years |
| DC | | | 90 | | % |
| PFH | | | 8E-10 | | hours |
| Lifetime | | | 20 | | years |
| $V_{LOG}$ | External power supply | | SELV or PELV | | |
| Pollution Degree | | | | 2 | - |
| | Cabinet / Housing | IP54 | | | - |
| STO wiring | Bundling / Grouping | | Separate wiring for STO1, STO2 | | |
| | Shielding | | Separate shield for STO1, STO2 | | |
| Compatibility | Each STO channels has separate + and - terminals | | PNP (source) or NPN (sink), depending on user connection | | |
| Isolation | | | Each STO channel is opto-isolated | | |
| Voltage, STOx+ to STOx- | Inactive (torque off) | | 0 | 5.6 | V |
| | Active (motor driven) | 18 | 24 | | V |
| | Abs. maximum, continuous | -70 | | +70 | V |
| Voltage | Isolation, STO1 to STO2 | ±2 | | | KV |
| | Isolation, STOx to GND | ±2 | | | KV |
| Current | STOx+ - STOx- = 24V | | 3 | 5 | mA |
| ESD protection | Human body model | ±30 | | | kV |

### 3.19.19 Conformity

| | |
|---|---|
| EU Declaration | 2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS),1907/2006/EC (REACH),<br>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] For the STO executions: P020.103.E404, P020.103.E403, P020.203.E404 and P020.203.E403

# 4 Memory Map

Micro 4804 has 2 types of memory available for user applications: 16Kwords SRAM and 24Kwords E2ROM memory per axis.

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 $E^2$ROM 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*

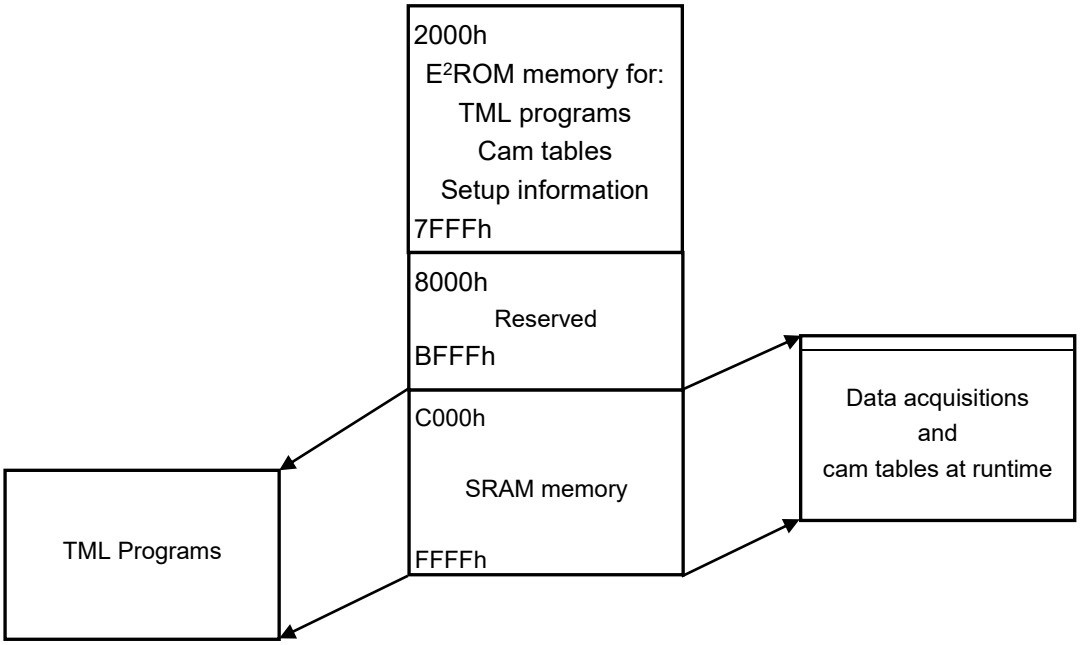



**Figure 43** *Micro 4804 Memory Map*

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