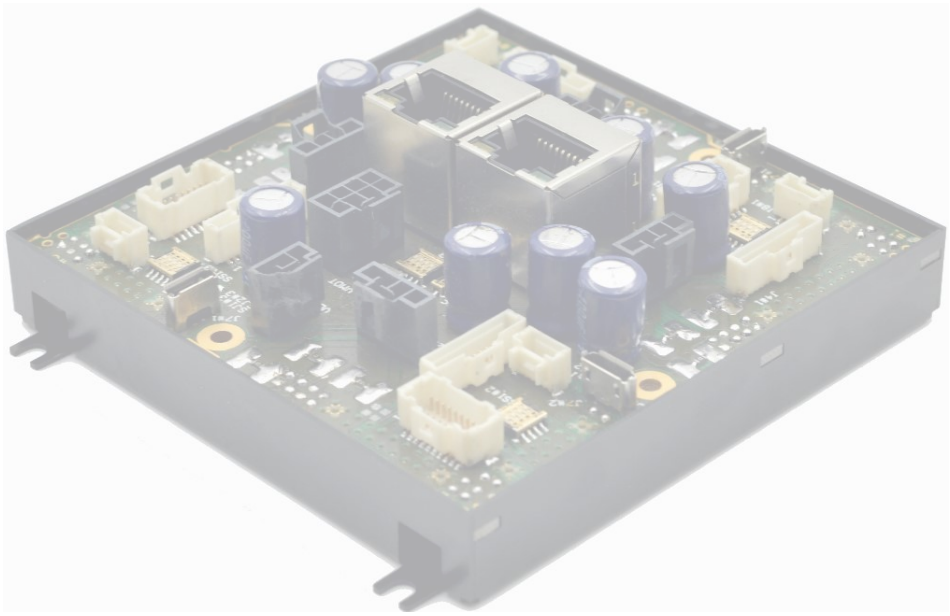
Micro 4803 SX/SY

Multi Axis System, CAN / EtherCAT

Intelligent Servo Drive for DC, Brushless DC and AC Motors

TECHNOSOFT

Intelligent Servo Drives



Technical Reference

P091.020.Micro 4803 SX/SY.UM.1123

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Read This First

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About This Manual

This book is a technical reference manual for:

Product Name	Part Number	Description	Nominal current	Peak Current	Communication
Micro 4803 SY4	P020.200.E404	4 axis compact motion system	$4A_{RMS}$ / 5.6A	$10A_{RMS}$ / 14A	RS232; USB; EtherCAT®
Micro 4803 SX4	P020.100.E404				RS232; USB; CAN

In order to operate the **Micro 4803** 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[1]
  - 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 4803** 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 – 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 4803**– 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 4803 SX4 drive is set in CANopen mode

[2] When Micro 4803 SY4 drive is used

[3] Available for Micro 4803 SX4

Related Documentation

Micro 4803 SX4-CAN Multi Axis System, Datasheet (P020.100.E404)

Micro 4803 SY4-CAT Multi Axis System, Datasheet (P020.200.E404)

– describes the hardware connections of the Micro 4803 Multi Axis System family of intelligent servo drives including the technical data and connectors.

Micro 4803 Hardware revisions and pinout changes (part no P020.001.0101.DOC.01.x0) – decribes the hardware revisions and pinout changes of Micro 4803, the recommended applications and compatible firmware for each revision.

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

Help of the EasySetUp software – describes how to use **EasySetUp** to quickly setup any Technosoft drive for your application using only 2 dialogues. The output of EasySetUp is a set of setup data that can be downloaded into the drive EEPROM or saved on a PC file. At power-on, the drive is initialized with the setup data read from its EEPROM. With EasySetUp it is also possible to retrieve the complete setup information from a drive previously programmed. **EasySetUp can be downloaded free of charge from Technosoft web page**

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

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

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

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

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

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

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

If you Need Assistance …

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

1 Safety information

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

The following safety symbols are used in this manual:

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

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

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

1.1 Warnings

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

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

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

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

1.2 Cautions

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

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

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

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

1.3 Quality system, conformance and certifications

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

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

2 Product Overview

2.1 Introduction

The **Micro 4803** is a family of fully digital intelligent servo drives, based on the latest DSP technology and they offer unprecedented drive performance combined with an embedded motion controller.

Suitable for control of brushless DC, brushless AC (vector control) and DC brushed motors the Micro 4803 drives accept as position feedback incremental encoders, absolute encoders (SSI, BiSS-C, EnDAT, TAMAGAWA, Panasonic, Nikon, Sanyo Denki) and Hall signals (linear or digital).

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 4803 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:

- Setting various motion modes (profiles, PVT, PT, electronic gearing[1] or camming[1], etc.)
- Changing the motion modes and/or the motion parameters
- Executing homing sequences
- Controlling the program flow through:
  - Conditional jumps and calls of TML functions
  - TML interrupts generated on pre-defined or programmable conditions (protections triggered, transitions on limit switch or capture inputs, etc.)
  - Waits for programmed events to occur
- Handling of digital I/O and analogue input signals
- Executing arithmetic and logic operations
- Performing data transfers between axes
- Controlling motion of an axis from another one via motion commands sent between axes
- Sending commands to a group of axes (multicast). This includes the possibility to start simultaneously motion sequences on all the axes from the group
- Synchronizing all the axes from a network

By implementing motion sequences directly at system level you can really distribute the intelligence between the master and the drives in complex multi-axis applications, reducing both the development time and the overall communication requirements. For example, instead of trying to command each movement of an axis, you can program the drives using TML to execute complex motion tasks and inform the master when these tasks are done.

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

Thus, for each axis control the master job may be reduced at: calling TML functions stored in the drive EEPROM and waiting for a message, which confirms the TML functions execution completion.

All Micro 4803 SX4-CAN drives are equipped with a serial RS232, an USB and a CAN 2.0B interface that can be set by hardware pins 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 system may be controlled via a CANopen master. The system 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 system and conforms to Technosoft protocol for exchanging **TML commands via CAN-bus**. When TMLCAN protocol is used, it is not mandatory to have a master. Any drive can be set to operate standalone, and may play the role of a master to coordinate both the network communication/synchronization and the motion application via **TML commands** sent directly to the other drives.

For Micro 4803 commissioning **EasySetUp** or **EasyMotion Studio** PC applications may be used.

EasySetUp is a subset of EasyMotion Studio, including only the drive setup part. The output of EasySetUp is a set of setup data that can be downloaded into the drive EEPROM or saved on a PC file. At power-on, the drive is initialized with the setup data read from its EEPROM. With EasySetUp it is also possible to retrieve the complete setup information from a drive previously programmed. EasySetUp shall be used for drive setup in all cases where the motion commands are sent exclusively from a master. Hence neither the Micro 4803 TML programming capability nor the drive camming mode are used. **EasySetUp can be downloaded free of charge from Technosoft web page.**

EasyMotion Studio platform includes EasySetUp for the drive setup, and a **Motion Wizard** for the motion programming. The Motion Wizard provides a simple, graphical way of creating motion programs and automatically generates all the TML instructions. *With EasyMotion Studio you can execute complex motions, thanks to their built-in motion controller*s. EasyMotion Studio, may be used to program motion sequences in TML.

A demo version of EasyMotion Studio (with EasySetUp part fully functional) can be downloaded free of charge from Technosoft web page.

2.2 Product Features

- Fully digital multi-axis systems suitable for the control of **rotary or linear brushless and DC brush**
- Very compact design
- **Sinusoidal (FOC)** or **trapezoidal (Hall-based)** control of brushless motors
- **Technosoft Motion Language (TML)** instruction set for the definition and execution of motion sequences
- Standalone operation with stored motion sequences
- **Motor supply**: 7-48V; **Logic supply**: 6-48V; **PWM switching frequency**: up to 100kHz
- **Output current per axis:**
  - **Nominal**: $4A_{RMS}$ / 5.6A.
  - **Peak**: $10A_{RMS}$ / 14A amplitude peak.
- **Thermal Protection**: The internal temperature sensor disables the PWM outputs if the measured temperature exceeds 105°C
- **Various modes of operation**, including:
  - Position profiles with trapezoidal or S-curve speed shape
  - Position, Velocity, Time (PVT) 3rd order interpolation
  - Position, Time (PT) 1st order interpolation
  - Electronic gearing and camming
  - 40 Homing modes
  - **CAN version:** including: torque, speed or position control; position or speed profiles, Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV) and Cyclic Synchronous Torque (CST) for CANopen mode; external reference mode (analogue or encoder feedback) or sent via a communication bus
  - **EtherCAT version:** position or speed profiles, Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV) and Cyclic Synchronous Torque (CST)
- **Digital and analog I/Os per axis:**
  - 1 x analogue input software selectable: 12-bit 0-5V or ±10V: Reference, Feedback or general purpose

- 3 x digital inputs: 2 for limit switches + one Enable, NPN, pull-to-GND to activate, pull-up on-board to +5V. Pull to GND to activate
- 3 x configurabile I/Os, 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)

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

  2nd feedback devices supported:
  - **Incremental encoder** interface: differential.
  - **Pulse & direction** interface (differential) for external (master) digital reference
  - **Absolute:** 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 studio communication over EtherCAT
- **16K × 16 SRAM** memory for data acquisition per axis
- **24K × 16 E²ROM** to store TML motion programs, cam tables and other user data per axis
- Operating ambient temperature: 0-40°C (over 40°C with derating)
- **Voltage efficiency**: >99%
- Feature that **detects breakage** of **Hall wires** and/or of **incremental/absolute encoder wires**
- **Protections 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

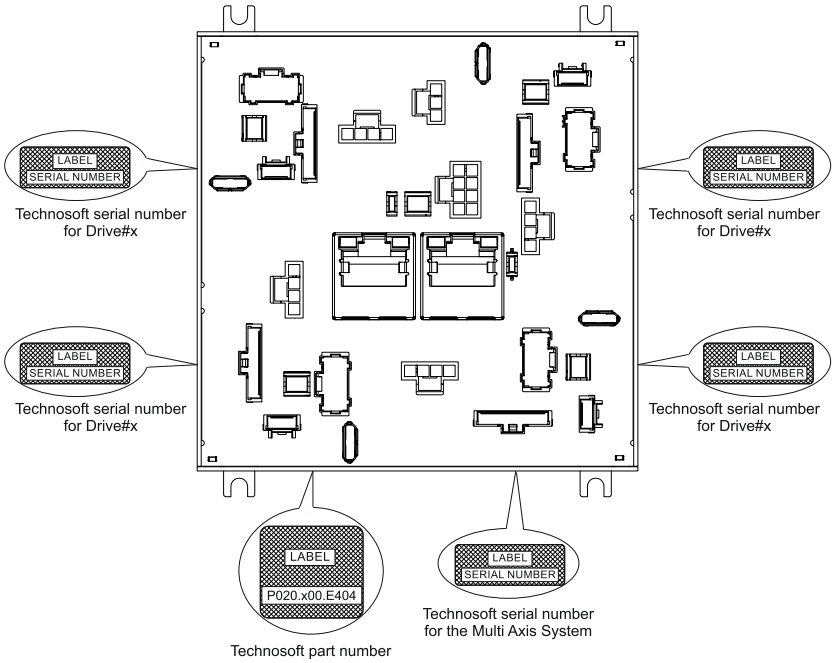


Figure 1 ***Micro 4803 Multi Axis System identification labels***

The **Micro 4803 systems** can have the following part numbers and names on the identification label:

- ***P020.200.E404*** – *Micro 4803 SY4* – 4 Axis Motion System, EtherCAT®
- ***P020.100.E404*** – *Micro 4803 SX4* – 4 Axis Motion System, CAN

2.4 Supported Motor Sensor Configurations

2.4.1 Single loop configurations

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

Motor sensors				Motor types		
Encoder[1]	Digital Halls	Linear Halls	Tacho	Brushless PMSM[2]	Brushless BLDC[3]	Brushed DC Voice coils
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[5]				✓		✓
Incremental encoder[4] / SSI / EnDAT2.2 / BiSS-C / Tamagawa / Panasonic / Nikon / Sanyo Denki[5]	✓			✓	✓	
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	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

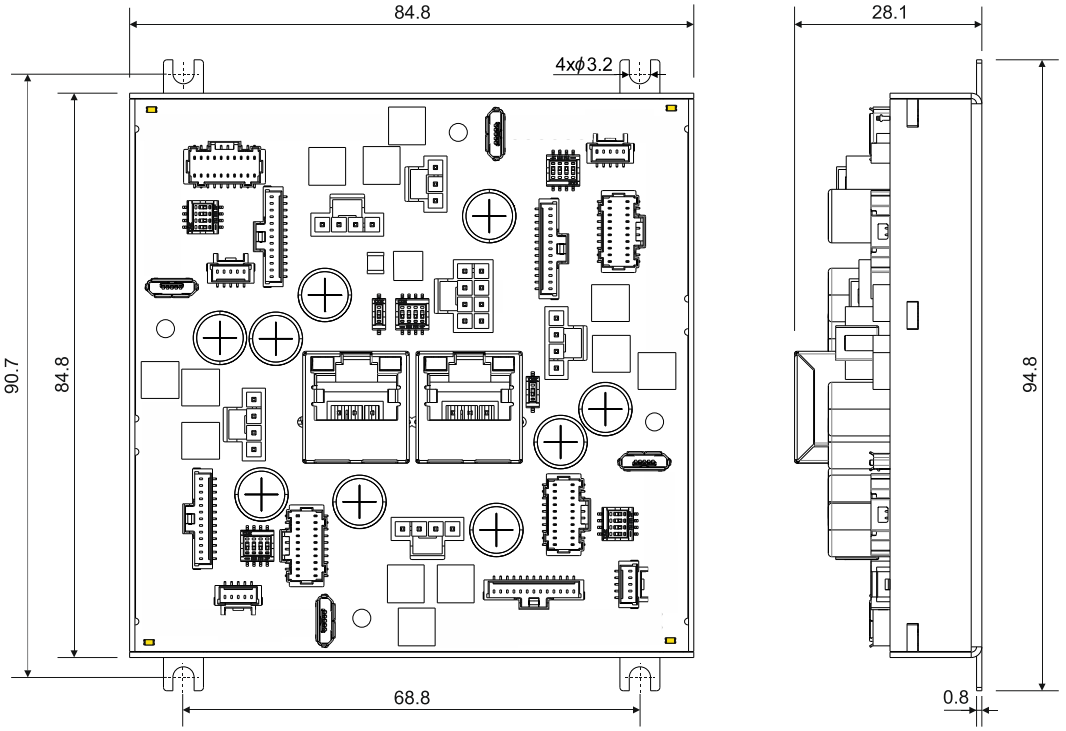
Each defined motor type can have any combination of the supported feedbacks either on motor or on load.

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 4803 SY Multi Axis System Dimensions



All dimensions are in mm. The drawings are not to scale.

Figure 2 **Micro 4803 SY Multi Axis System dimensions**

3.2 Micro 4803 SX Multi Axis System Dimensions

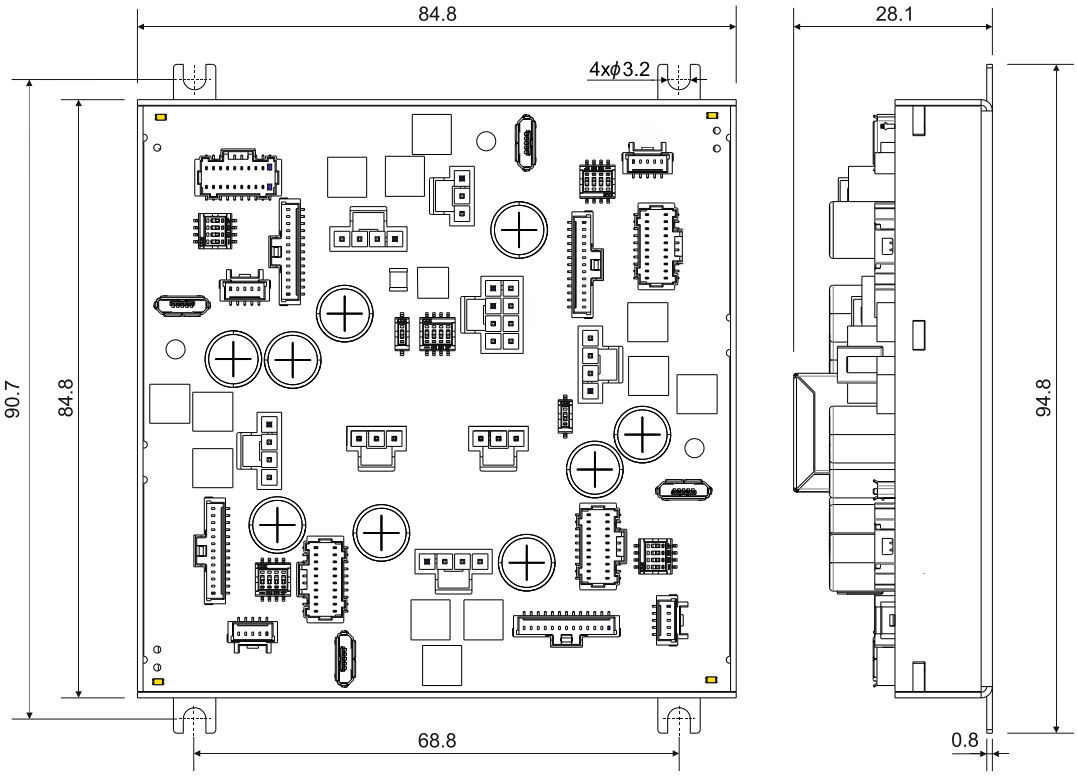
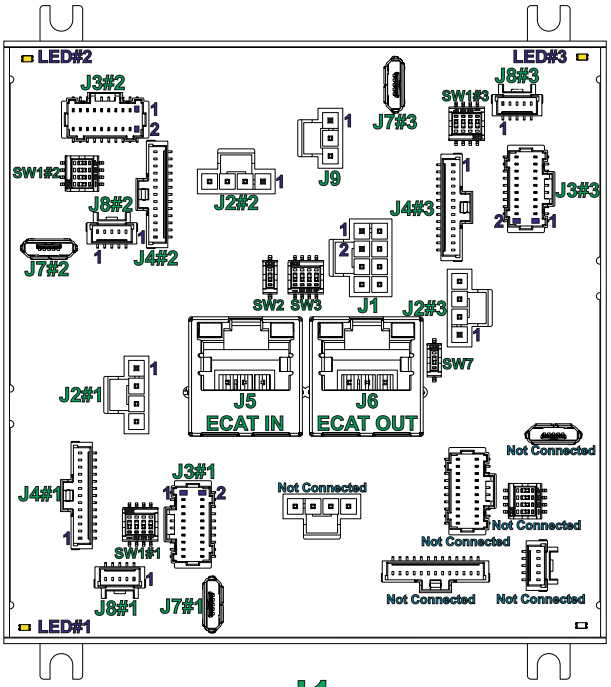


Figure 3 ***Micro 4803 SX Multi Axis System dimensions***

3.3 Connectors and Pinouts

3.3.1 Pinouts for Micro 4803 SY 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 3 drives +V_{mot} pins.
4	PE	-	Earth connection.
5,6,7	GND	-	Ground return.
8	PE	-	Earth connection

J2#x

Pin	Name	Type	Description
1	A	O	**Phase A** for 3-ph motors, Motor+ for DC brush motors.
2	B	O	**Phase B** for 3-ph motors, Motor- for DC brush motors.
3	C	O	**Phase C** for 3-ph motors.
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}.
5	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input.
6	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input.
7	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0.
8	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1.
9	I/O2	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4.
10	IN5/Enable	I	5-60V digital NPN input. Drive Enable input.
11	GND	-	Ground return.
12	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)
13	+5V	O	Supply for all feedback sensors.

LEDs

LEDs
Each LED#x (yellow) shows if the corresponding drive logic supply is powered and if its internal +5V power supply is operational

SW7

SW7 - Reserved

- Where “x” can be 1, 2, 3 or 4

J3#x

Pin	Name	Type	Description
1	GND	-	Ground return.
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 positive (differential or single-ended) or Pulse+, or Data+ for SSI, or Slave+ for BiSS. Set SW1 pin 1 for differential.
8	GND	-	Ground return.
9	EncA1-/Dt1-	I	Encoder 1 A- / data negative (differential) or Pulse-, or Data- for SSI, or Slave- for BiSS. 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 positive (differential or single-ended). Set SW1 pin 2 for differential.
12	EncA2+/EncA2 Dt2+/Dt2	I	Incr. encoder2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; has 120Ω resistor between pins 12 and 14.
13	EncB1/ Clk1-	I	Encoder 1 B- / clock negative (differential). Set SW1 pin 2 for differential.
14	EncA2-/Dt2-	I	Incr. encoder2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; has 120Ω resistor between pins 12 and 14.
15	Z1+	I	Incr. encoder1 Z single-ended or Z+ diff. input. Set SW1 pin 3 for differential.
16	EncB2+/EncB2 Clk2+/Clk2	I/O	Incr. encoder2 B+ diff. input, or Dir+-, or Clock+ for SSI, or Master+ for BiSS; has 120Ω resistor between pins 16 and 18.
17	Z1-	I	Incr. encoder1 Z- diff. input. Set SW1 pin 3 for differential.
18	EncB2- Clk2-	I	Incr. encoder2 B- diff. input, or Dir--, or Clock- for SSI, or Master- for BiSS; has 120Ω resistor between pins 16 and 18.
19	GND	-	Ground return.
20	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.

J8#x

Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}. Internally connected to other +V_{log} pins.
2	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input. Internally connected to J4#x pin 5.
3	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input. Internally connected to J4#x pin 6.
4	GND	-	Ground return.
5	PE	-	Earth connection

J5, J6, J7#x

Port	Name	Type	Description
J5	ECAT IN	I	EtherCAT standard RJ45 Ethernet IN port.
J6	ECAT OUT	O	EtherCAT standard RJ45 Ethernet OUT port.
J7#x	USB	I/O	Standard Micro USB for PC data transfer

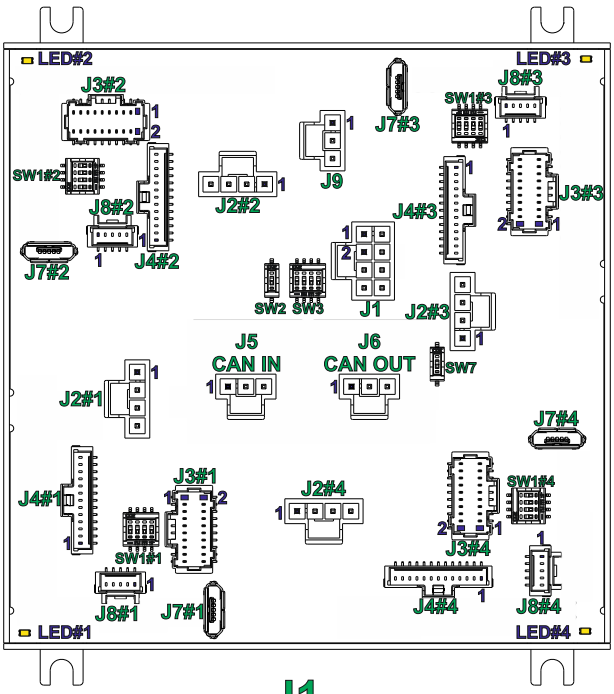
J9

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

SW1#x

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	Reserved.

3.3.2 Pinouts for Micro 4803 SX 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 3 drives +V_{mot} pins.
4	PE	-	Earth connection.
5,6,7	GND	-	Ground return.
8	PE	-	Earth connection

J2#x

Pin	Name	Type	Description
1	A	O	**Phase A** for 3-ph motors, Motor+ for DC brush motors.
2	B	O	**Phase B** for 3-ph motors, Motor- for DC brush motors.
3	C	O	**Phase C** for 3-ph motors.
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}.
5	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input.
6	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input.
7	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0.
8	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1.
9	I/O2	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4.
10	IN5/Enable	I	5-60V digital NPN input. Drive Enable input.
11	GND	-	Ground return.
12	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)
13	+5V	O	Supply for all feedback sensors.

LEDs

LEDs
Each LED#x (yellow) shows if the corresponding drive logic supply is powered and if its internal +5V power supply is operational

J7#x

Port	Name	Type	Description
J7#x	USB	I/O	Standard Micro USB for PC data transfer

- Where “x” can be 1, 2, 3 or 4

J3#x

Pin	Name	Type	Description
1	GND	-	Ground return.
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 positive (differential or single-ended) or Pulse+, or Data+ for SSI, or Slave+ for BiSS. Set SW1 pin 1 for differential.
8	GND	-	Ground return.
9	EncA1-/Dt1-	I	Encoder 1 A- / data negative (differential) or Pulse-, or Data- for SSI, or Slave- for BiSS. 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 positive (differential or single-ended). Set SW1 pin 2 for differential.
12	EncA2+/EncA2 Dt2+/Dt2	I	Incr. encoder2 A+ diff. input, or Pulse+, or Data+ for SSI, or Slave+ for BiSS; has 120Ω resistor between pins 12 and 14.
13	EncB1/ Clk1-	I	Encoder 1 B- / clock negative (differential). Set SW1 pin 2 for differential.
14	EncA2-/Dt2-	I	Incr. encoder2 A- diff. input, or Pulse-, or Data- for SSI, or Slave- for BiSS; has 120Ω resistor between pins 12 and 14.
15	Z1+	I	Incr. encoder1 Z single-ended or Z+ diff. input. Set SW1 pin 3 for differential.
16	EncB2+/EncB2 Clk2+/Clk2	I/O	Incr. encoder2 B+ diff. input, or Dir+-, or Clock+ for SSI, or Master+ for BiSS; has 120Ω resistor between pins 16 and 18.
17	Z1-	I	Incr. encoder1 Z- diff. input. Set SW1 pin 3 for differential.
18	EncB2- Clk2-	I	Incr. encoder2 B- diff. input, or Dir--, or Clock- for SSI, or Master- for BiSS; has 120Ω resistor between pins 16 and 18.
19	GND	-	Ground return.
20	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.

J8#x

Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}. Internally connected to other +V_{log} pins.
2	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input. Internally connected to J4#x pin 5.
3	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input. Internally connected to J4#x pin 6.
4	GND	-	Ground return.
5	PE	-	Earth connection

J5, J6

	Pin	Name	Type	Description
J5, J6	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)

J9

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

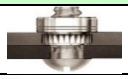
SW

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	Reserved.
SW2	
1	**OFF –** CANOpen mode
	ON – TMLCAN mode
SW7	
1	**ON** = Connect an 120Ω resistor between CAN Hi and CAN Lo signals.

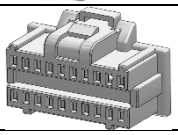
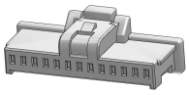
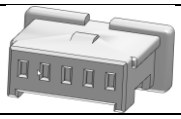
3.4 Mechanical Mounting

The *Micro 4803 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

3.5 Mating Connectors for Micro 4803 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	1x4 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 4 circuits	Molex	1053071204	
	**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	
	**J9**	1x3 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 3 circuits	Molex	1053071203	
	J7#x	USB cable, Cable USB A Male - Micro B Male, 1m, shielded, black, 9.6mm plastic width	Tensility International Corp	1002333	
	**J8#x**	Pico-Clasp Receptacle Crimp Housing, 1.00mm Pitch, Single Row, Friction Lock, 5 Circuits, White	Molex	5013300500	
	**J1, J9, 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, J8#x	Pre-Crimped wires for Pico-Clasp — Cable Assembly, Pico-Clasp Crimp Terminal Socket to Pico-Clasp Crimp Terminal Socket, 300mm	Molex	0797581019	
	**J1, J9, J2#x**	Pins for Nano-Fit — Nano-Fit Crimp Terminal, Female, 0.76µm Gold (Au) Plating, Lubricated, 24-26 AWG	Molex	1053001400	
	J3, J4, J8#x	Pins for Pico-Clasp — 1.00mm Pitch, Pico-Clasp Female Crimp Terminal, Gold Plating 0.10µm, 28-32 AWG, Reel	Molex	5011937000	
	**J1, J9, J2#x**	Crimp tool Pico-Clasp — Crimp Tool, Ratchet, Molex Pico-Clasp 501193 & 501334 Series 32-28AWG Contacts	Molex	638191500	
	J3#x, J4#x, J8#x	Crimp tool Nano Fit — Crimp Tool, Ratchet, Molex Nano-Fit 105300 Series 26-24AWG Socket Contacts, 207129 Series	Molex	638276000	

- Where “x” can be 1, 2 or 3 for Micro 4803 SY3 or 1, 2, 3 or 4 for Micro 4803 SY4

3.6 Connection diagrams

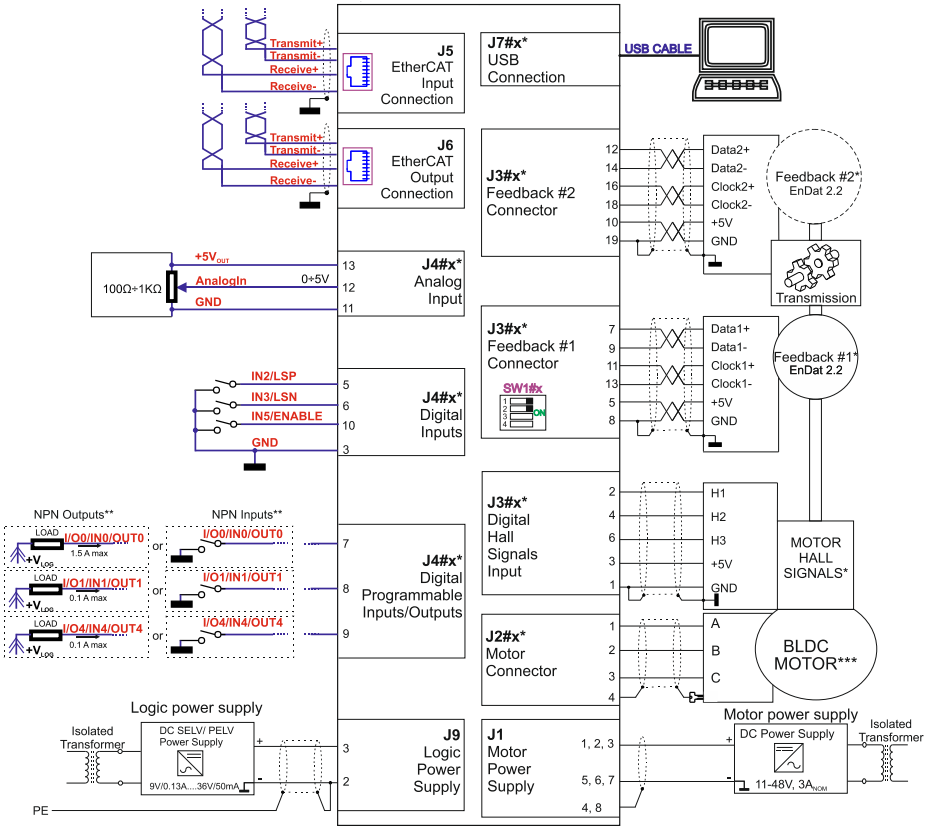


Figure 4 Micro 4803 SY Multi Axis System Connection diagram

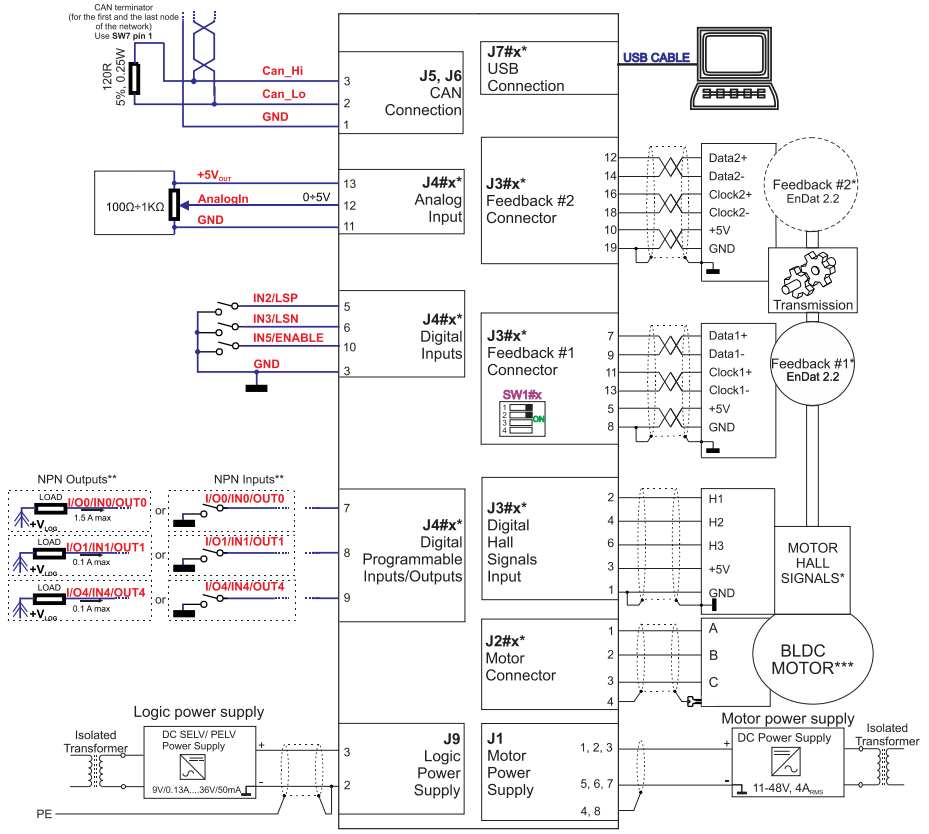


Figure 5 Micro 4803 SX Multi Axis System Connection diagram

* Where “x” can be 1, 2, 3 or 4

** 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

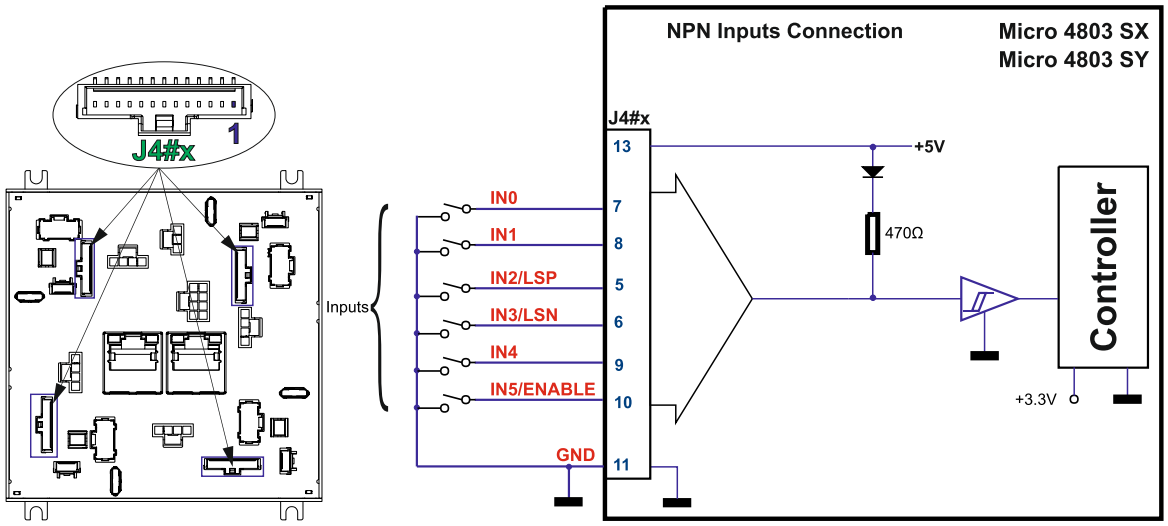


Figure 6 **Digital NPN Inputs connection**

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

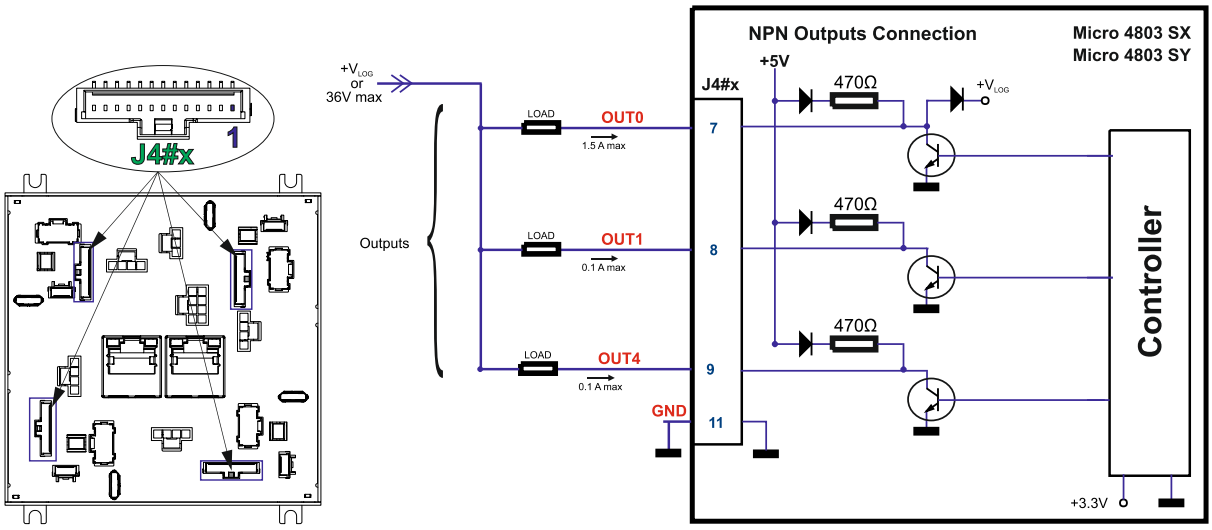


Figure 7 **Digital NPN Outputs connection**

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

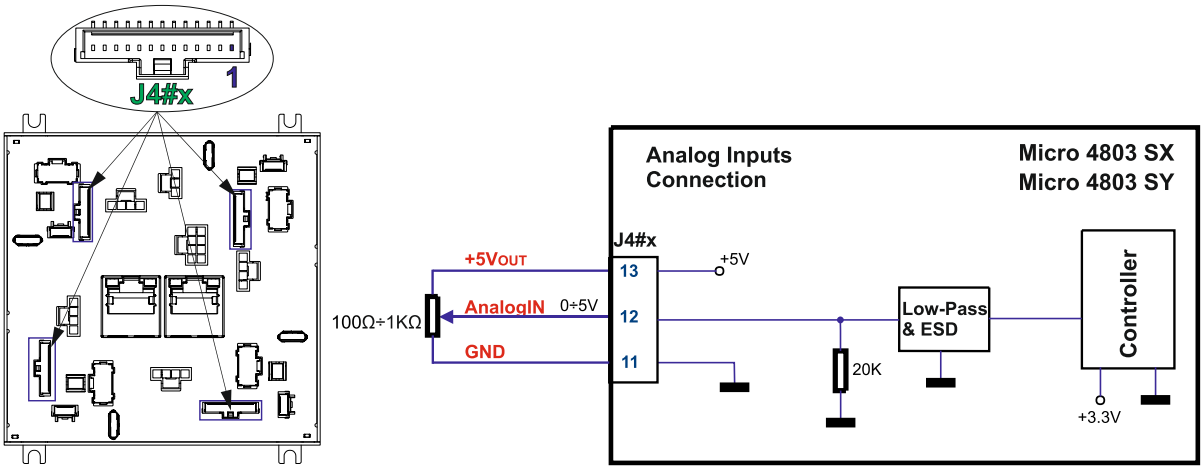


Figure 8 ***0-5V*** **Analog inputs connection**

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.*

3.8.1.1 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

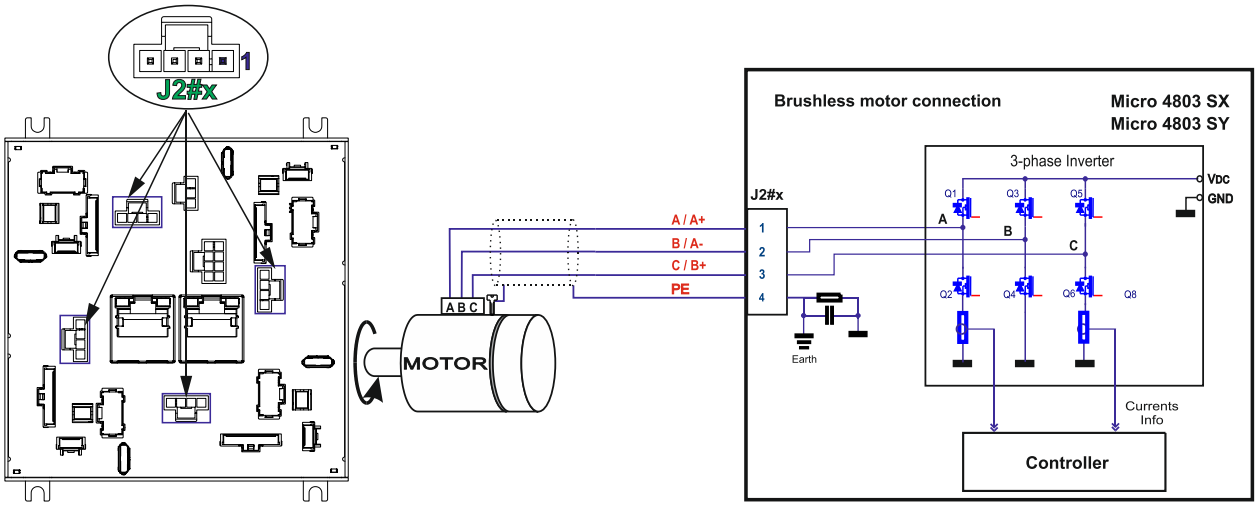


Figure 9 **Brushless motor connection**

3.9.2 DC Motor connection

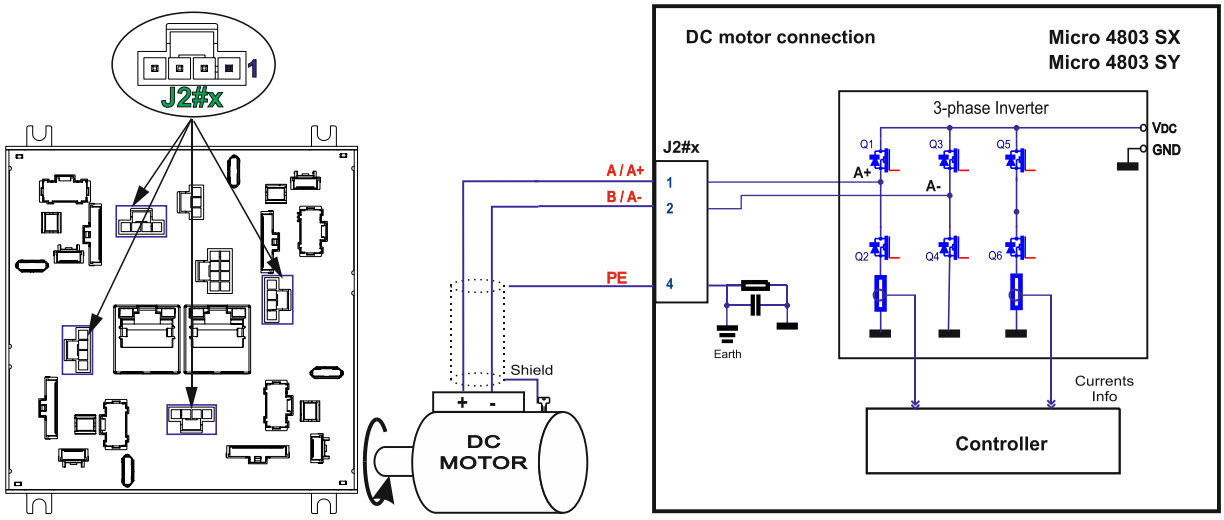


Figure 10 **DC Motor connection**

3.9.2.1 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 4803 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 4 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

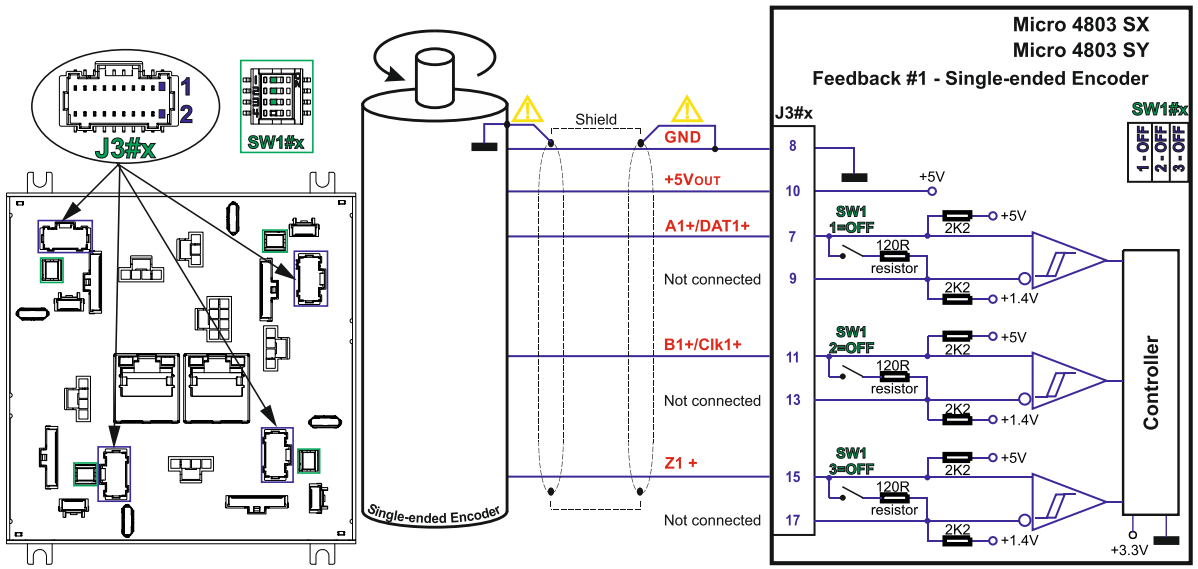


Figure 11 **Feedback #1 - Single-ended Incremental Encoder Connection**

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

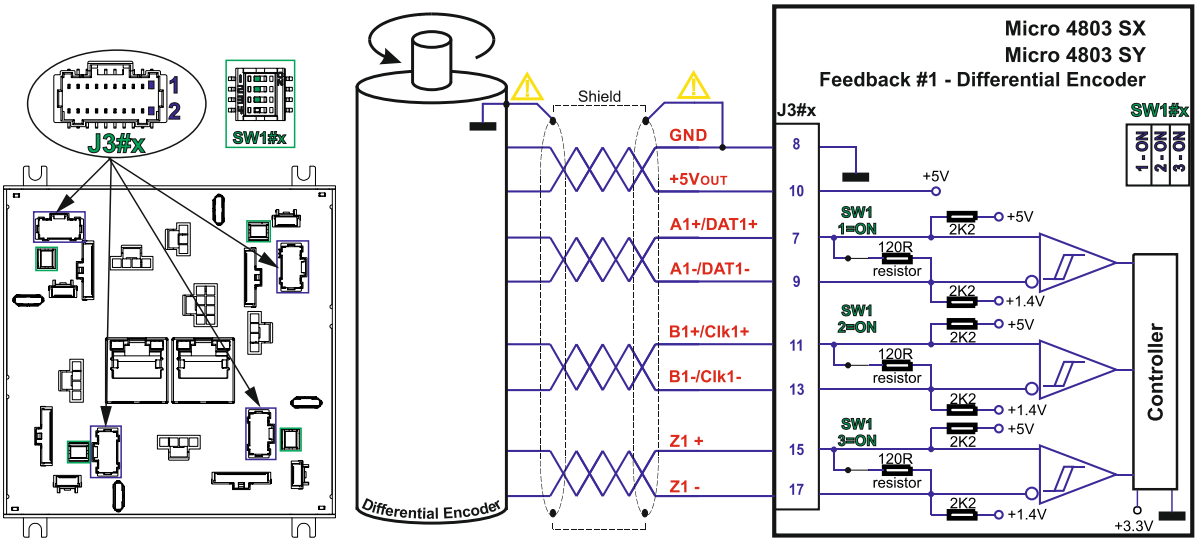


Figure 12 **Feedback #1 - Differential Incremental Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis System Feedback #1 differential connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x pins 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 - Differential Incremental Encoder Connection

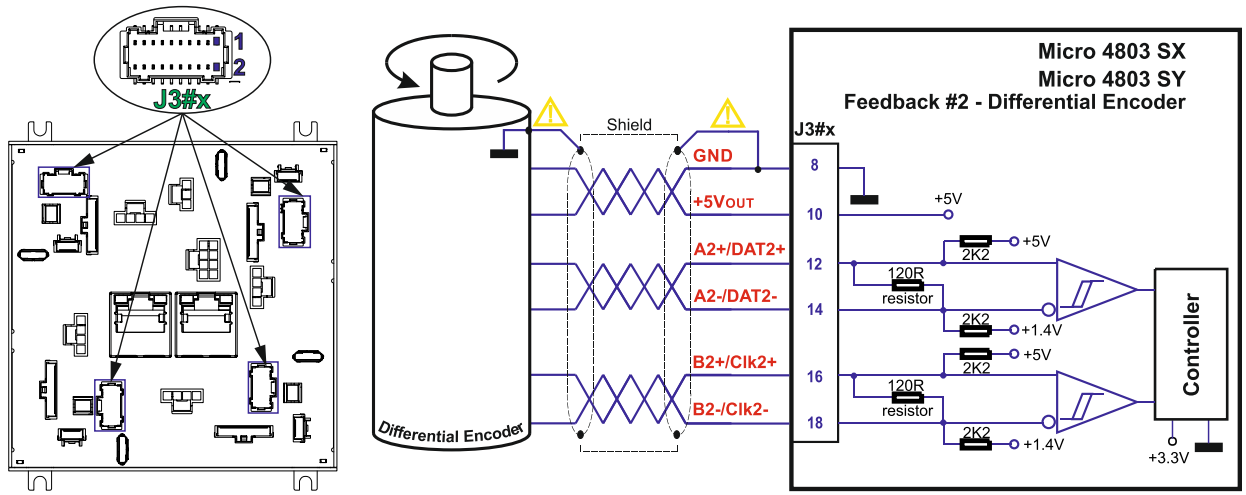


Figure 13 **Feedback #2 - Differential Incremental Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis System Feedback#2 input has internal termination resistors, equivalent to 120Ω (0.25W), present in the drive.*
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.***

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

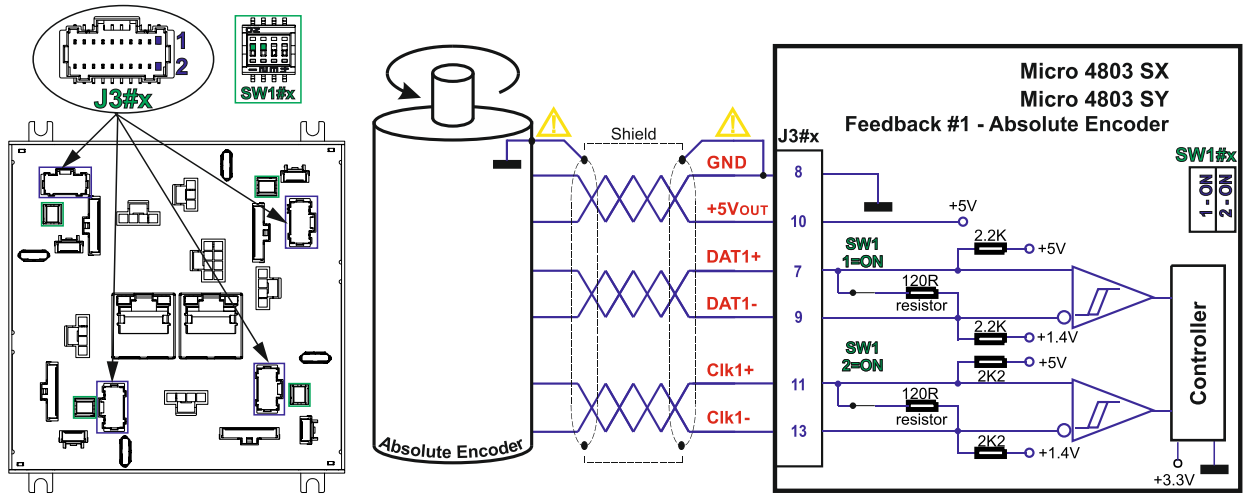


Figure 14 **Feedback #1 – Absolute Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis system Feedback#1 absolute connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x pins 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.***

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

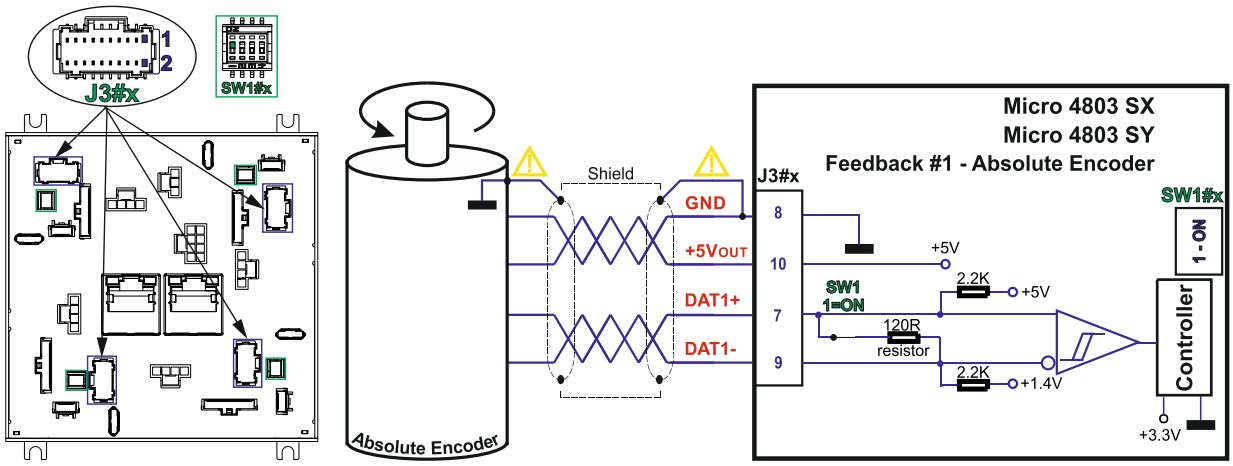


Figure 15 **Feedback #1 – Absolute Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis system Feedback#1 absolute connection, 120Ω (0.25W) termination resistors are internally added by putting the SW1#x pin 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.***

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

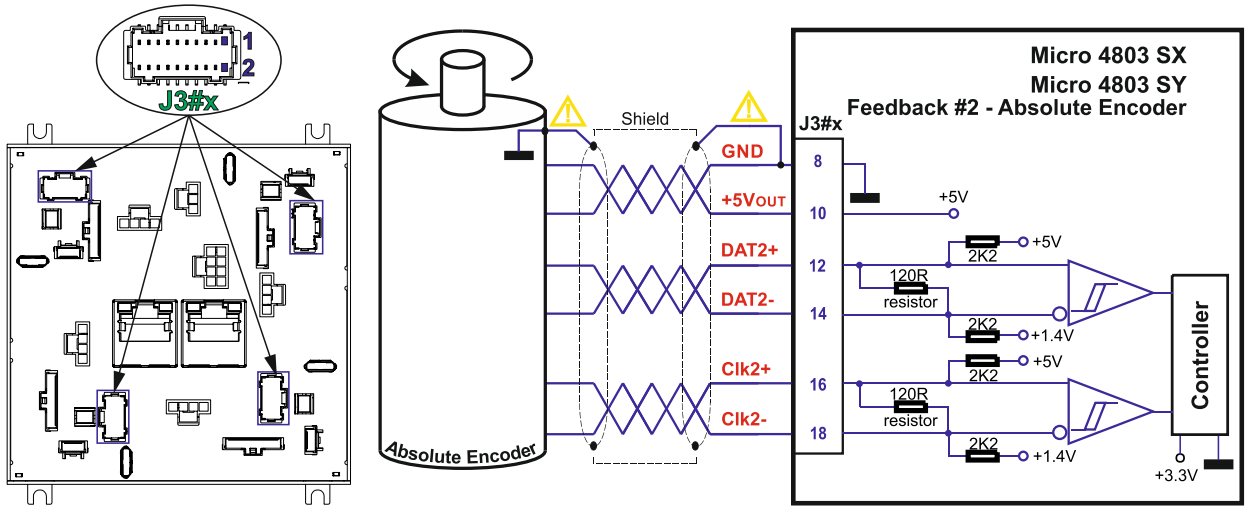


Figure 16 **Feedback #2 – Absolute Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis System Feedback #2 input has internal termination resistors, equivalent to 120Ω (0.25W), present in the drive.*
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: Panasonic, Tamagawa, Nikon, Sanyo Denki

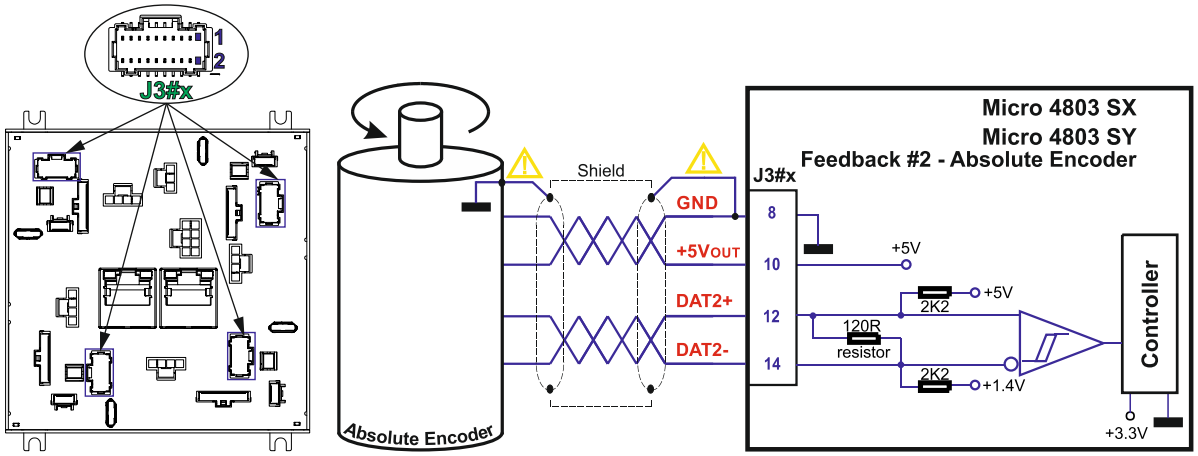


Figure 17 **Feedback #2 – Absolute Encoder Connection**

Remarks:

1. *For Micro 4803 Multi Axis System Feedback #2 input has internal termination resistors, equivalent to 120Ω (0.25W), present in the drive.*
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 Linear (Analog) Hall Connection

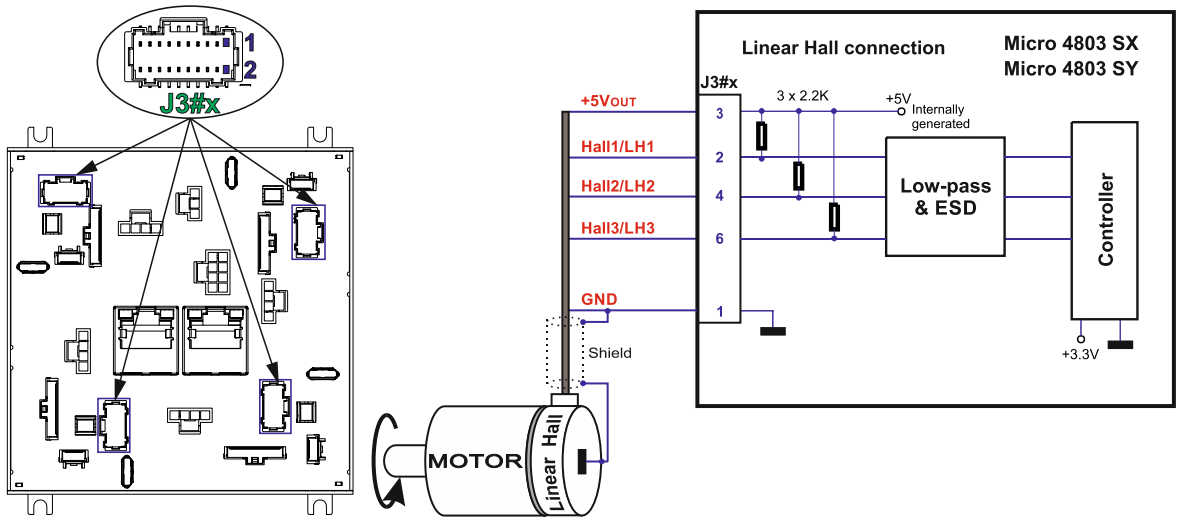


Figure 18 **Linear Hall connection**

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

3.10.9 Digital Hall Connection for Motor + Hall + Incremental Encoder

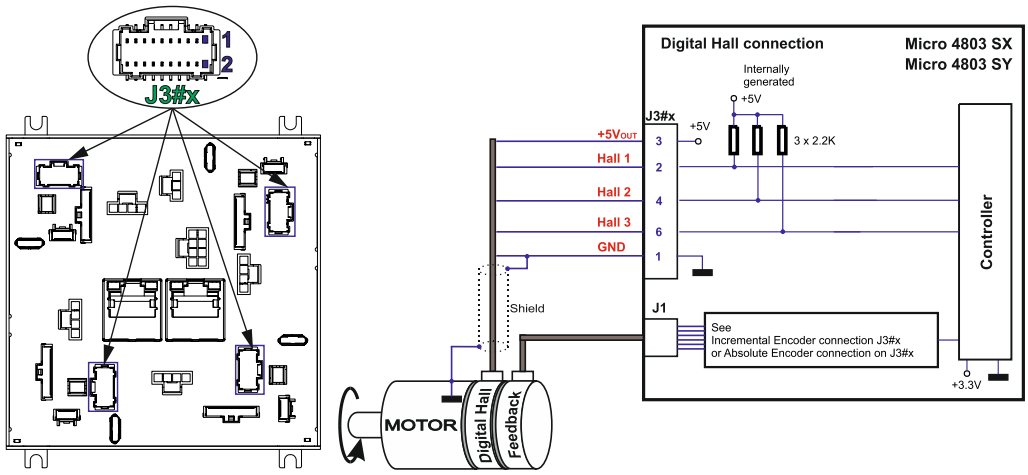


Figure 19 **Digital Hall connection**

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 4803 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.***

3.10.10 Digital Hall Connection for direct motor control without an encoder

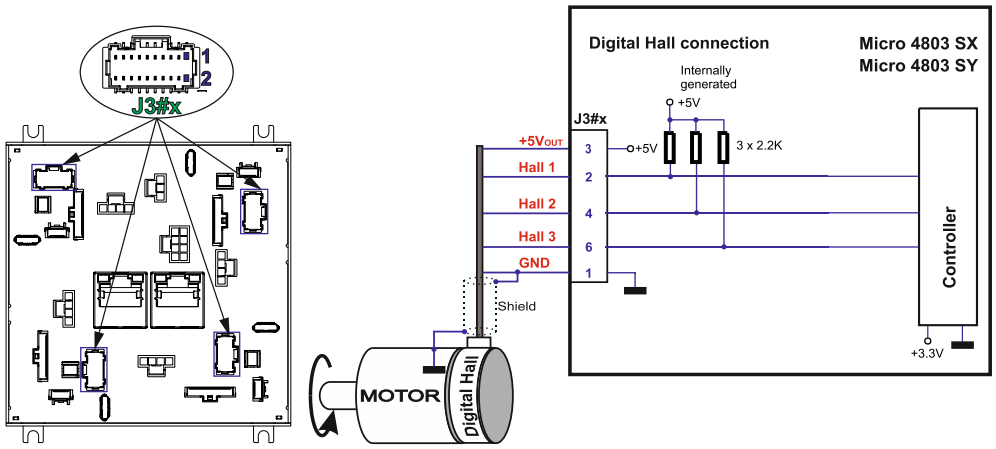


Figure 20 **Digital Hall connection**

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 4803 are equipped with a feature that detects breakage of Hall wires and/or of incremental/absolute encoder wires.*[1]
3. *The length of the cables must be up to 30m, reducing the exposure to voltage surges in industrial environment.*

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

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

3.10.10.1 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.
a) If the +5V supply output is used by another device (like for example an encoder) and the connection cable is longer than 5 meters, add a decoupling capacitor near the supplied device, between the +5V and GND lines. The capacitor value can be 1...10 µF, rated at 6.3V.

3.11 Power Supply Connection

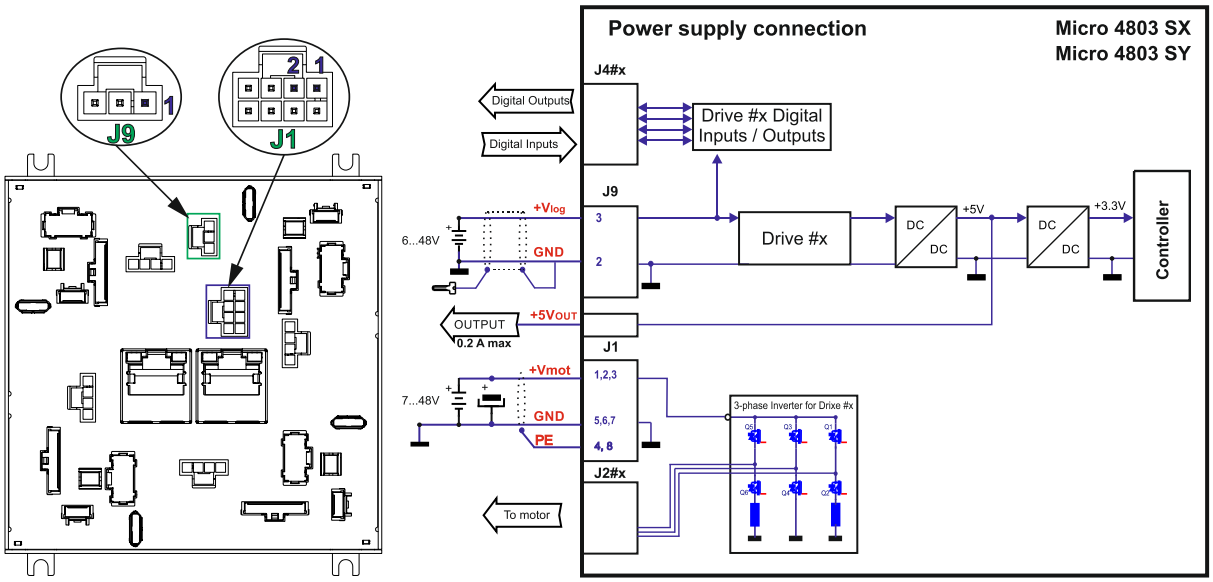


Figure 21 **Supply connection**

Remarks:

1. The Micro 4803 always requires two supply voltages: $+V_{LOG}$ and $+V_{MOT}$.
2. *The $+V_{log}$ inputs can be supplied from the same power source as long as its output voltage is 6 to 48V DC from a SELV/ PELV power supply.*
3. *J9 connector is internally connected to all axis $+V_{log}$ inputs and GND.*
4. *An external electrolytic capacitor may be added between $+V_{mot}$ and GND, to help reduce over-voltage during load braking/ reversals. See paragraph 0 for details.*

3.11.1.1 Recommendations for Supply Wiring

a) Use short, thick wires between the Micro 4803 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 4803 SY.
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:

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]

ω_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 ω_M will become linear speed measured in [m/s] and the friction torque T_F will become friction force measured in [N].

3.12 USB connection

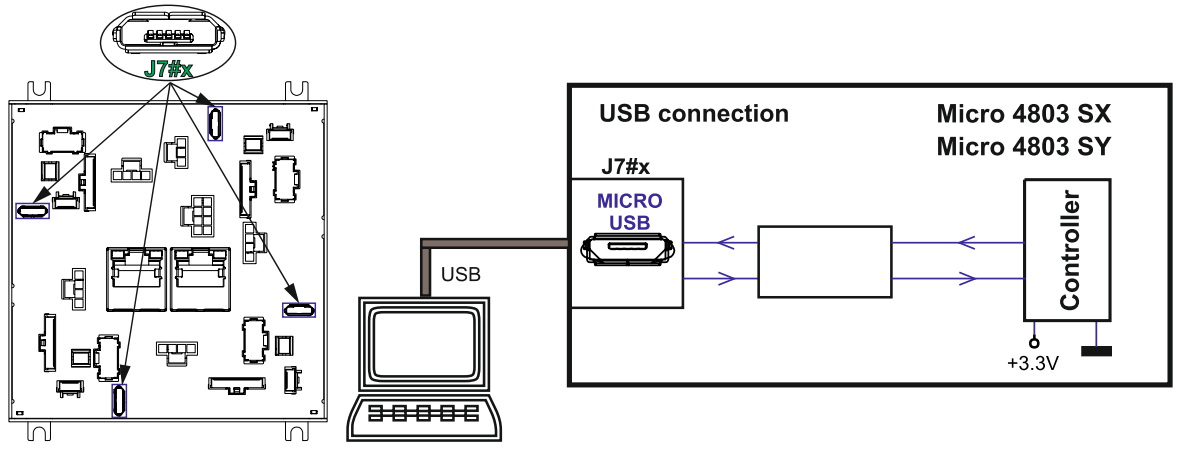


Figure 22 **USB connection**

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.
In Easy Motion studio, choose the following communication settings:

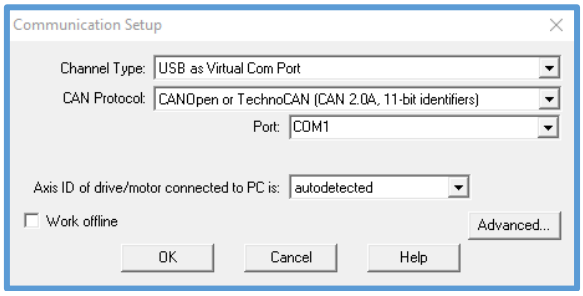


Figure 23 **USB connection**

Instead of COM1, choose the new COM value detected after the driver is installed.

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

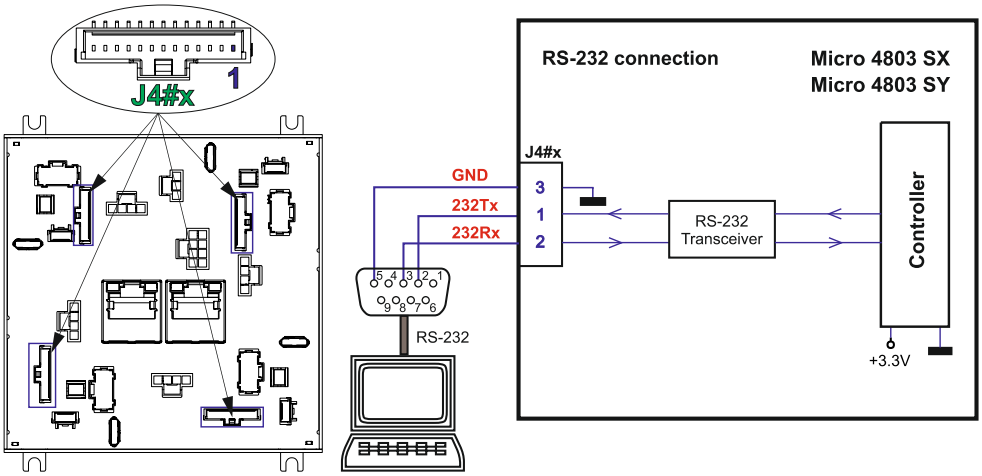


Figure 24. ***Serial RS-232 connection***

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

b) If you build the serial cable, you can use a 3-wire shielded cable with shield connected to BOTH ends. Do not use the shield as GND. The ground wire must be included inside the shield, like the 232Rx and 232Tx signals.
c) Always power-off all the Micro 4803 supplies before inserting/removing the RS-232 serial connector
d) Do not rely on an earthed PC to provide the Micro 4803 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

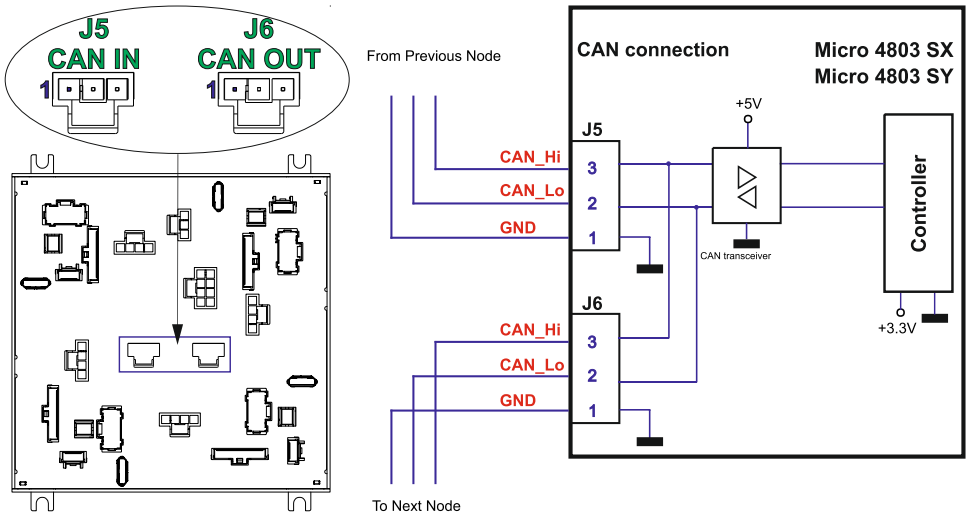


Figure 25. ***Serial RS-232 connection***

Remarks:

1. *The CAN network requires a 120-Ohm terminator between CAN-Hi and CAN-Lo signals available via SW7.*
2. *CAN signals are not isolated from other Micro 4803 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.

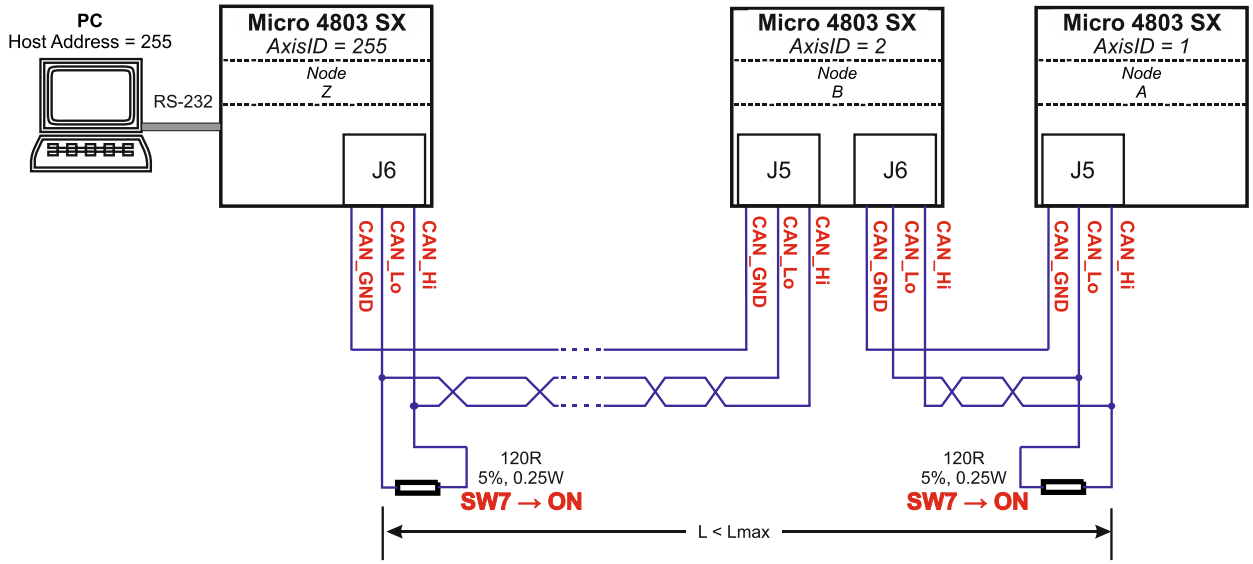


Figure 26. ***Multiple-Axis CAN network***

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 acceptable to use STP (shielded twisted pair) or FTP (foil twisted pair) cables, rated CAT5E or higher (CAT6, etc.). The added shielding is beneficial in reducing the RF (radio-frequency) emissions, improving the EMC emissions of the application.
- The maximum length of each network segment must be less than 100 meters.
- The network topology is daisy-chain. All connections are done using point-to-point cables. The global topology can be one of the two:
    - Linear, when the OUT port of the last drive in the chain remains not connected. Master is connected to IN port of the first drive; OUT of the first drive is connected to IN of the following drive; OUT of the last drive remains unconnected. See ***Figure*** *27* 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*** *28* 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.

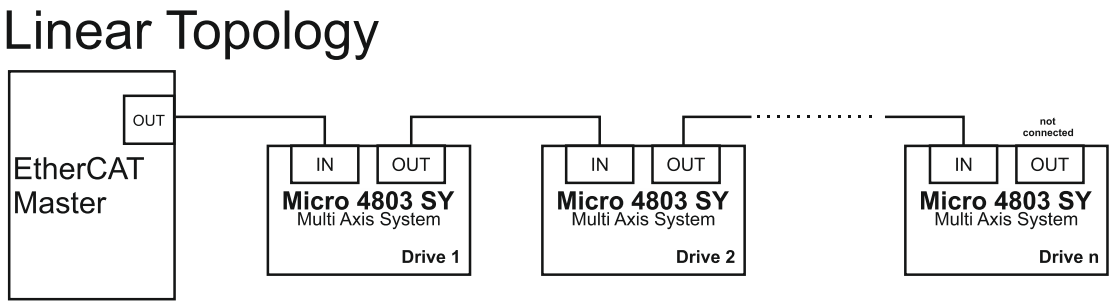


Figure 27 **EtherCAT network linear topology**

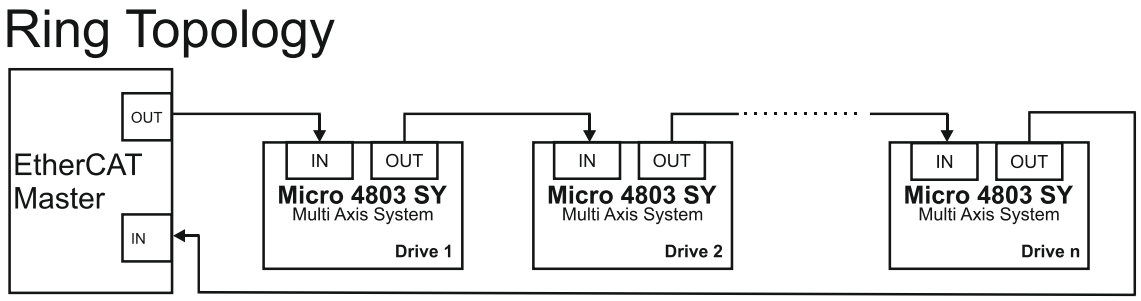


Figure 28 **EtherCAT network ring topology**

- 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 4803 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 **29**). 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 some very rare cases, the setup table might be corrupted, causing the drive to reset continuously. This state can be noticed by seeing both the Ready and Error LED blinking for short periods of time continuously.

To recover from this state, the setup table must be invalidated by connecting all digital Hall inputs to GND.

On the next power on, the drive will load the default settings and set bit 2 from Motion Error Register – “Invalid Setup Data ”. After a new valid setup table is loaded onto the drive, disconnect the hall sensors from GND and execute a new power off/ power on cycle.

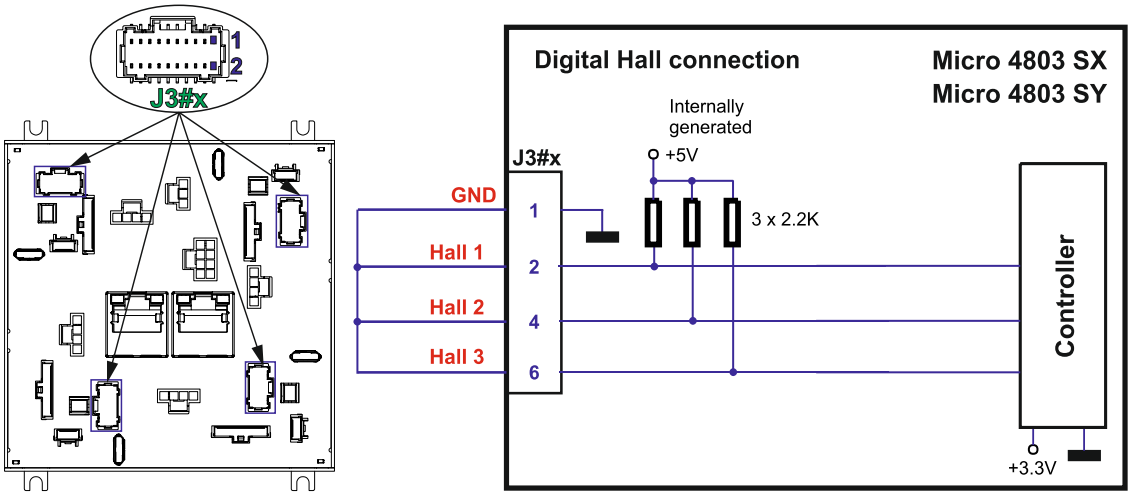


Figure 29 **Temporary connection during power-on to invalidate the Setup table for Micro 4803**

3.17 Axis ID Selection

3.17.1 AxisID selection for Micro 4803 SX

The drive AxisID value is set after power on by:

- **Software**, setting via EasySetUp or EasyMotion Studio a specific AxisID value in the range 1-255.
- **Hardware**, by setting "H/W" option in Drive Setup dialogue from EasySetUp or EasyMotionStudio and setting **SW3** according to Table **3.1** – AxisID selection for Micro 4803 SX system.

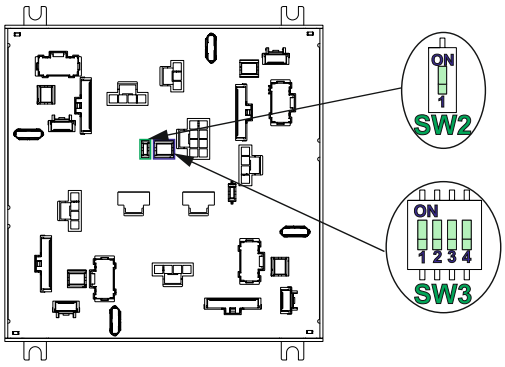


Figure 30 ***Axis ID switches for Micro 4803 SX***

Table 3.1 – AxisID selection for Micro 4803 SX system

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

The communication protocol can be set by the **SW2** 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 4803 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.*

3.17.2 AxisID selection for Micro 4803 SY

The Micro 4803 SY Multi Axis System support all EtherCAT standard addressing modes. In case of device addressing mode based on node address, the Micro 4803 SY Multi Axis System drives sets the EtherCAT register called "*configured station alias* address" with its AxisID value.

The drive AxisID value is set after power on by:

- **Software**, setting via EasySetUp or EasyMotion Studio a specific AxisID value in the range 1-255.

- **Hardware**, by setting “H/W” option in Drive Setup dialogue from EasySetUp or EasyMotionStudio and setting **SW2 & SW3** according to **Table 3.2 - AxisID selection for Micro 4803 SY system**.

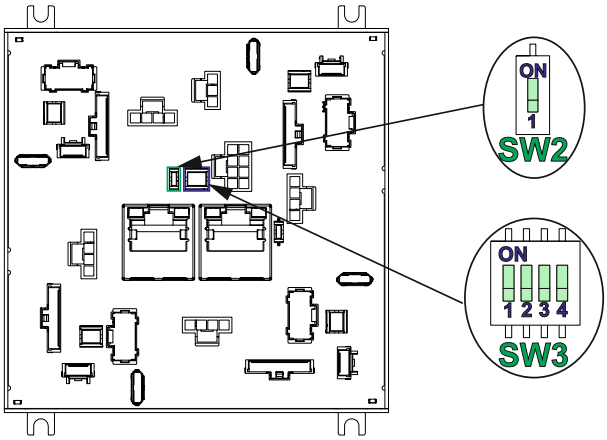


Figure 31 ***Axis ID switches for Micro 4803 SY***

Table 3.2 - AxisID selection for Micro 4803 SY system

SW2 & SW3 - AxisID Selection								
SW2	**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

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 4803 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.*

3.18 Electrical Specifications

- All parameters measured under the following conditions (unless otherwise specified):
- V_{LOG} = 24 VDC; V_{MOT} = 48VDC; F_{PWM} = 20 kHZ
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude) = 5.6A
- Data is provided for each axis of the system

3.18.1 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

3.18.2 Storage Conditions

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

3.18.3 Mechanical Mounting

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

3.18.4 Environmental Characteristics

			Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size	Micro 4803 SY	84.8 x 68.8 x 28.1			mm
			~3.3 x 2.7 x 1.1			inch
		Micro 4803 SX	84.8 x 68.8 x 23.1			mm
			~3.3 x 2.7 x 0.9			inch
Weight			-			g
Cleaning agents	Dry cleaning is recommended		Only Water- or Alcohol- based			
Protection degree	According to IEC60529		IP20			-

3.18.5 Logic Supply Input (+V_{LOG})

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

3.18.6 Motor Supply Input (+V_{MOT})

		Min	Typ.	Max.	Units
Supply voltage	Nominal values	7		48	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	6		60	V_{DC}
	Absolute maximum values, continuous	-0.5		63	V_{DC}

[1] Operating temperature at higher temperatures is possible with reduced current and power ratings
[2] Micro 4803 can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.
[3] In case of forced cooling (conduction or ventilation) the spacing requirements may drop substantially down to zero as long as the ambient temperature is kept below the maximum operating limit

Supply current	Idle		25		mA
	Operating	-15	±3	+15	A
	Absolute maximum value, short-circuit condition (Duration ≤ 10ms) †			16.5	A
Voltage Measurement - Total error				1.5	%
Utilization category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})	DC-3			

3.18.7 Motor Outputs (A/A+, B/A-, C)

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

3.18.8 Supply Output (+5V)

		Min.	Typ.	Max.	Units
Output voltage	Current sourced = 400mA	5.05	5.2	5.25	V
Output current[1]		650			mA
	24V motor		800		
Short-circuit to GND protection		Yes / Drive resets at event			
Over-voltage protection		NOT protected			
ESD protection	Human body model	±1			KV

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

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

[1] For more details see the “Current de-rating with +5V output current” graph

3.18.10 Digital Outputs (OUT0, OUT1, OUT4)

				Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT0, OUT1, OUT4)				NPN 24V		
Default state	Not supplied (+V_{LOG} floating)				High-Z (floating)		
	Immediately after power-up				Logic “HIGH”		
Output voltage	Logic “LOW”; output current = 1.5A for OUT0/ 0.05A for the other digital outputs					0.4	V
	Logic “HIGH”; output current = 0, no load			4	4.5	5	
	Logic “HIGH”, external load to +V_{LOG}				V_{LOG}		
	Absolute maximum, continuous (free-wheeling diodes to +V_{LOG} to GND)			-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1s) †			-1		V_{LOG}+1	
Output current	Logic “LOW”, sink current, short duration, duty cycle <=1%	5s max	OUT1, OUT4			0.1	A
			OUT0			2	
		0.5s max	OUT1, OUT4			0.15	A
			OUT0			2.5	
	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				0.05	0.1	mA
Minimum pulse width				0.5			µs
ESD protection	Human body model			±15			kV

3.18.11 Encoder Inputs (A+, A-, B+, B-, Z+, Z-,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)			
Single-ended threshold	A1+, B1+, Z1+, A2+, B2+	1.2	1.3	1.5	V
Single-ended input current	Input pulled to GND against on-board 2.2 KΩ pull-up to 5V		2.2	2.5	mA
Differential mode compliance	For full RS422 compliance, see [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	A+, A2+, B+, B2+, Z+, Z2+		2.2		kΩ
	A-, A2-, B-, B2-, Z-, Z2-		4.4		
Input frequency	Differential mode	0		15	MHz
Minimum pulse width	Differential mode	33			ns
ESD protection	Human body model	±30			kV

3.18.12 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	4.7	5	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				70		µs
ESD protection	Human body model			±15		kV

RS-232		Min.	Typ.	Max.	Units
Compliance		TIA/EIA-232-C			
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV
ESD protection	Human body model	±1			KV

[1] Full RS-422 compatibility, as well as noise rejection improvement the setting of SW1 pins 1, 2, 3 for each signal pair (A1+/A1-, B1+/ B1-, Z1+/Z1-) is needed

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

		Min.	Typ.	Max.	Units
Differential mode (CLOCK, DATA)	For full RS422 compliance, see[1]	TIA/EIA-422-A			
CLOCK (DATA) Output voltage	Differential; 50Ω differential load	1.5	3.3		V
	Common-mode, referenced to GND	1	1.7	3	
CLOCK frequency	Software selectable	1000, 2000, 3000, 4000			kHz
CLOCK (DATA) 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	Single-turn			56	Bits
	Multi-turn and single-turn			56	
	If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution				

3.18.14 Analog Inputs (REF, FDBK)

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

3.18.15 EtherCAT® (Micro 4803 SY system)

		Min.	Typ.	Max.	Units
Compliance		IEEE802.3, IEC61158			
Transmission line specification	According to TIA/EIA-568-5-A	Cat. 5e.UTP			
J5,J6 pinout	EtherCAT® supports MDI/MDI-X auto-crossover	TIA/EIA-568-A or TIA/EIA-568-B			
Software protocols compatibility		CoE, CiA402, IEC61800-7-301			
Node addressing	By software	1 ÷ 255			-
	By Hardware	According to **Table 3.2 - AxisID selection for Micro 4803 SY system**			-
MAC addressing		none			-
ESD protection	Human body model	±15			kV

3.18.16 CAN-Bus

		Min.	Typ.	Max.	Units
Compliance	ISO11898, CiA-301v4.2, CiA 305 v2.2.13, 402v3.0				
Bit rate	Software selectable	125		1000	Kbps
Bus length	1Mbps			25	m
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo	none on-board			
Node addressing	Hardware	According to **Table 3.1 – AxisID selection for Micro 4803 SX system**			

[1] Full RS-422 compatibility, as well as noise rejection improvement the setting of SW1 pins 1, 2, 3 for each signal pair (A1+/A1-, B1+/ B1-, Z1+/Z1-) is needed

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

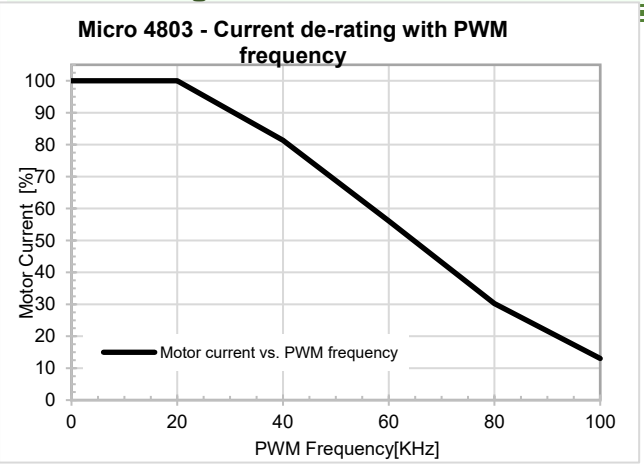
	Software	1-255			
Voltage, CAN-Hi or CAN-Lo to GND		-58		+58	V
Voltage, CAN-Hi to CAN-Lo		-45		+45	
ESD protection	Human body model	±15			kV

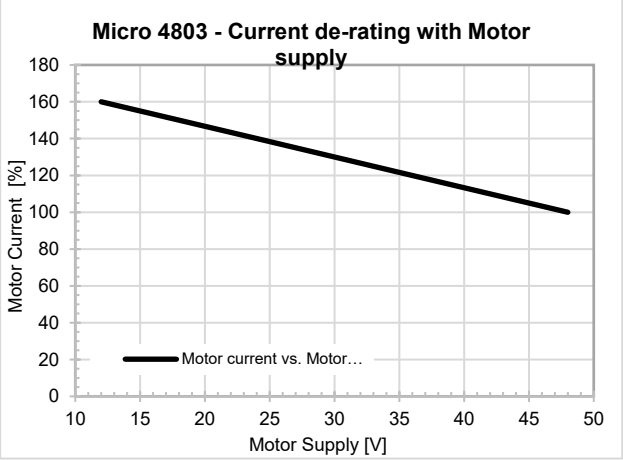
3.18.17 Conformity

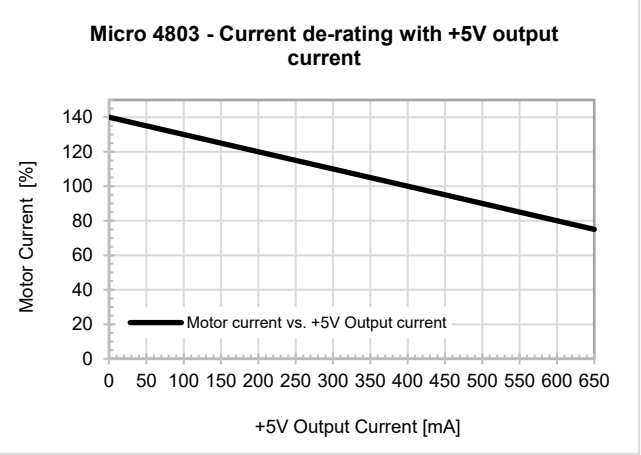
EU Declaration	2014/30/EU (EMC), 2014/35/EU (LVD), 2011/65/EU (RoHS),1907/2006/EC (REACH), 93/68/EEC (CE Marking Directive), EC 428/2009 (non dual-use item, output frequency limited to 590Hz)

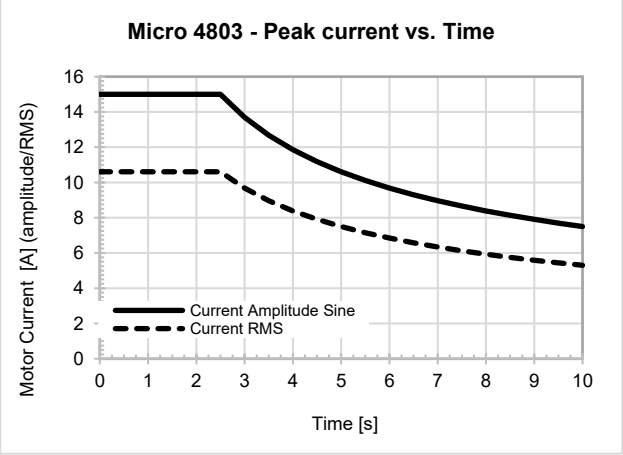
† Stresses beyond values listed under “absolute maximum ratings” may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

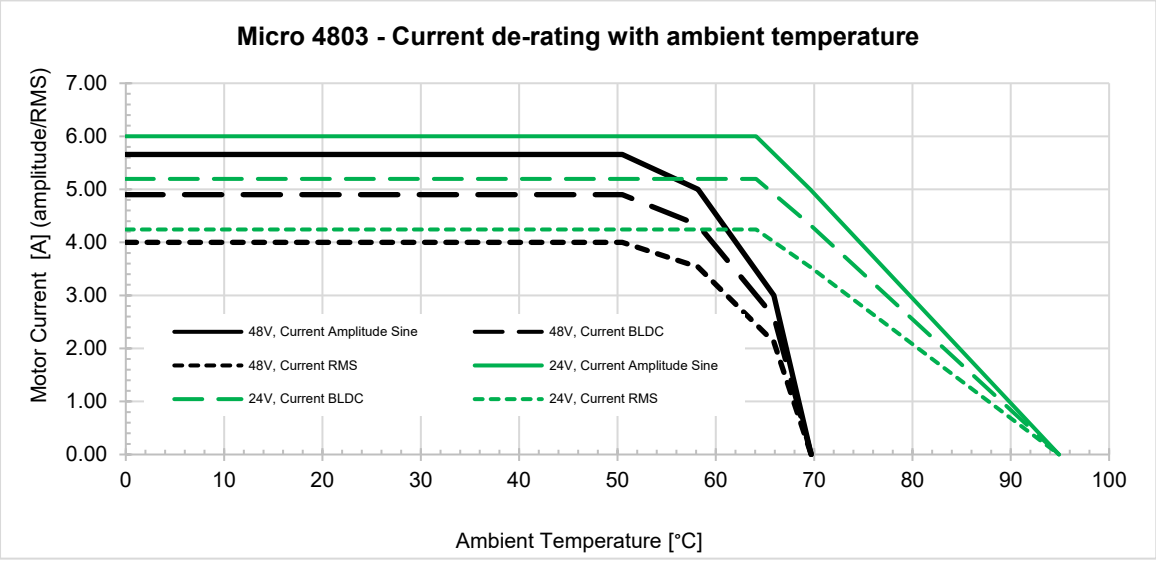
4 De-rating curves

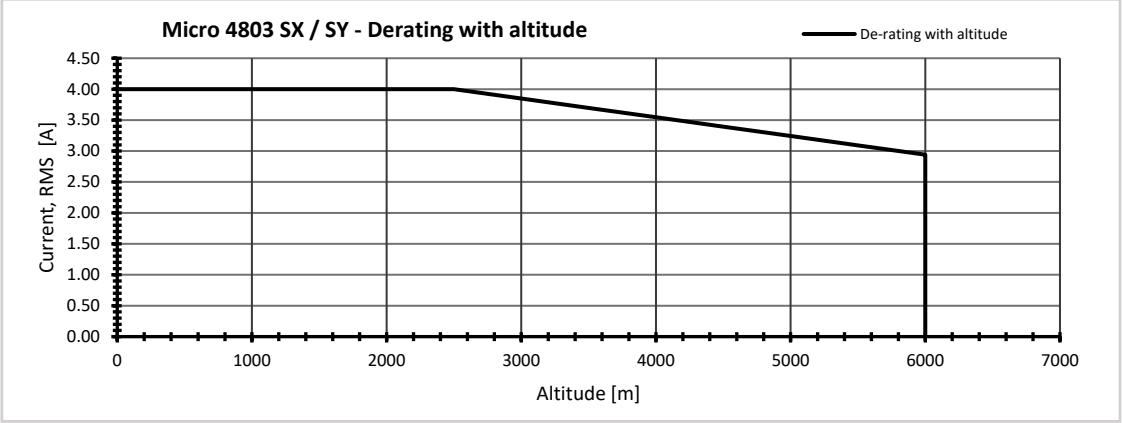












5 Memory Map

Micro 4803 has 2 types of memory available for user applications: 16K×16 SRAM and up to 24K×16 serial E²ROM.

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

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

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

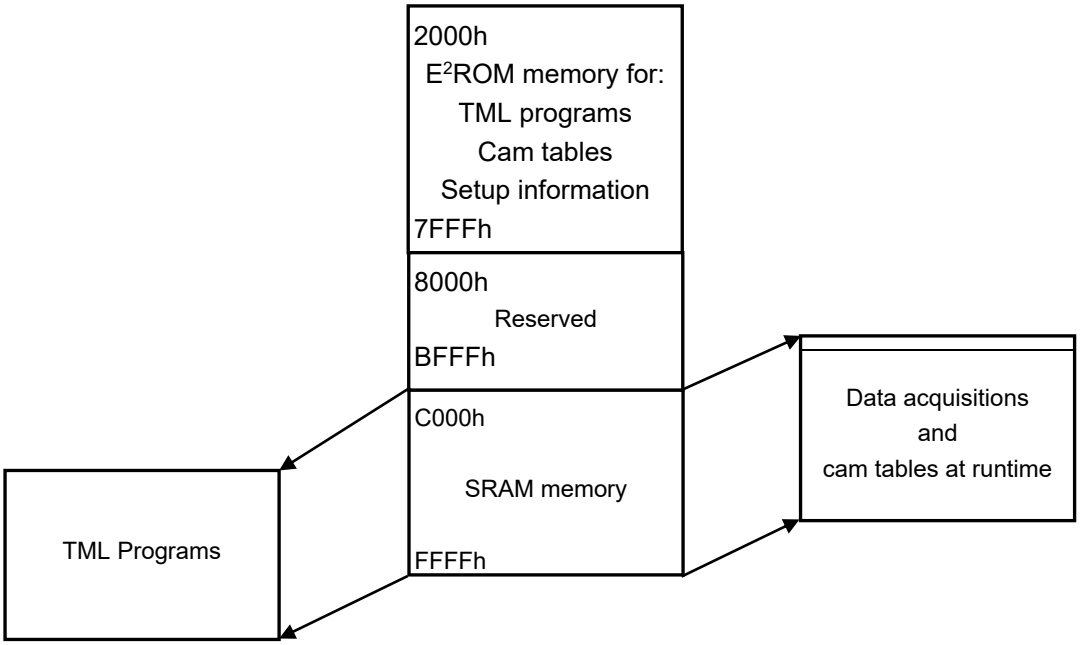


Figure 32 *Micro 4803 Memory Map*