

EPOS4 Micro 2-Axis Programmable Motherboard

Hardware Reference

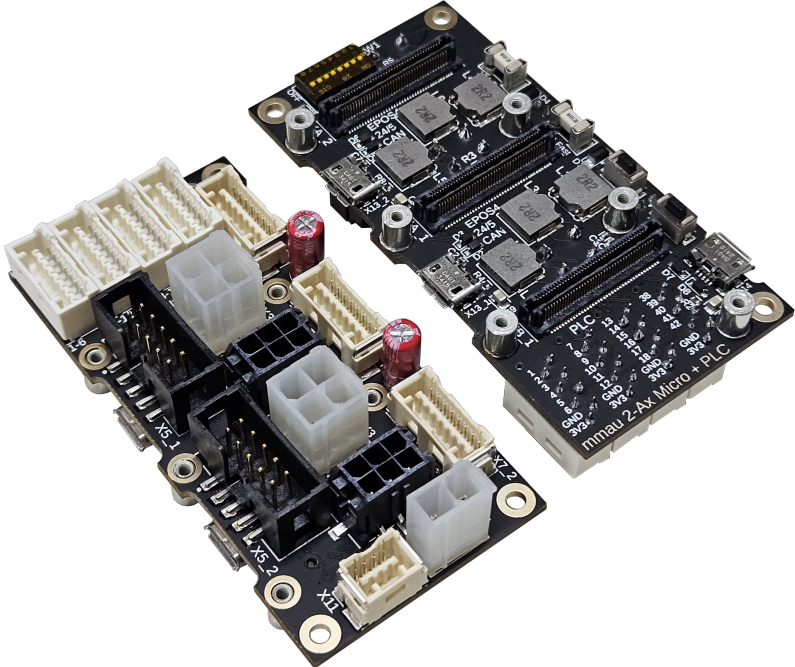


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READ THIS FIRST

These instructions are intended for qualified technical personnel. Prior commencing with any activities...

- *you must carefully read and understand this manual and*
- *you must follow the instructions given therein.*

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1 ABOUT

1.1 About this Document

1.1.1 Intended Purpose

Use the document to...
–stay safe,
–be fast,
–end up with set up and ready-to-go equipment.

The purpose of the present document is to familiarize you with the 2-axis Programmable Micro Motherboard. It will highlight the tasks for safe and adequate installation and/or commissioning. Follow the described instructions...

- to avoid dangerous situations,
- to keep installation and/or commissioning time at a minimum,
- to increase reliability and service life of the described equipment.

The present document is part of a documentation set. For a complete understanding of the technicalities of the required hardware components in use on the device, please refer to the documentation for the corresponding hardware component as shown below.

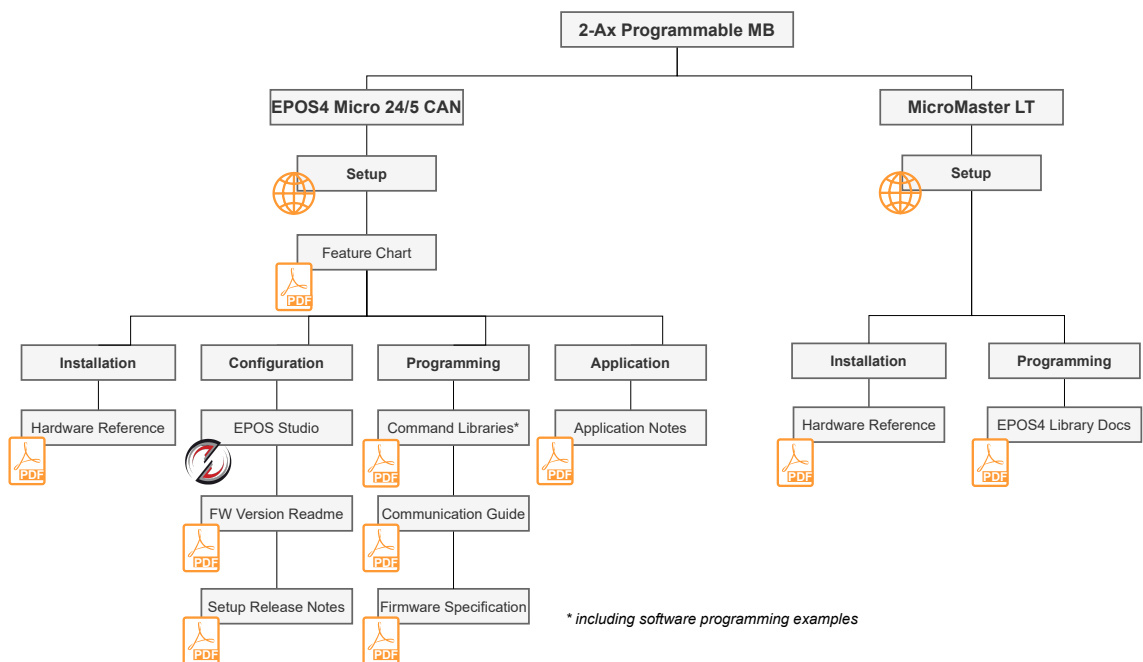


Figure 1-1 Documentation structure

1.1.2 Target Audience

The present document is intended for trained and skilled personnel. It conveys information on how to set up and install the 2-axis EPOS4 Micro Programmable Motherboard.

1.1.3 How to use

Throughout the document, the following notations and codes will be used.

Notation	Meaning
(n)	refers to an item (such as part numbers, list items, etc.)
→	denotes “see”, “see also”, “take note of” or “go to”

Table 1-1 Notation Used

1.1.4 Symbols & Signs

In the course of the present document, the following symbols and signs will be used.







Type	Symbol	Meaning	
Safety alert	 (typical)	DANGER	Indicates an imminent hazardous situation . If not avoided, it will result in death or serious injury .
		WARNING	Indicates a potential hazardous situation . If not avoided, it can result in death or serious injury .
		CAUTION	Indicates an probable hazardous situation or calls the attention to unsafe practices. If not avoided, it may result in injury .
Prohibited action		Indicates a dangerous action. Hence, you must not!	
Mandatory action		Indicates a mandatory action. Hence, you must!	
Information		Requirement / Note / Remark	Indicates an activity you must perform prior continuing, or gives information on a particular item you need to observe.
		Best practice	Indicates an advice or recommendation on the easiest and best way to further proceed.
		Material damage	Indicates information particular to possible damage of the equipment.

Table 1-2 Symbols and signs

1.1.5 Trademarks and Brand Names

For easier legibility, registered brand names are listed below and will not be further tagged with their respective trademark. It must be understood that the brands (the list below is not necessarily concluding) are protected by copyright and/or other intellectual property rights even if their legal trademarks are omitted in the later course of this document.

Notation	Meaning
CANopen® CiA®	© CiA CAN in Automation e.V, DE-Nuremberg
CLIK-Mate™ Micro-Fit™ Mini-Fit Jr.™ Mini-Fit Plus™ Mega-Fit®	© Molex, USA-Lisle, IL
Littelfuse®	© Littelfuse Inc., USA-Chicago, IL

Table 1-3 Brand names and trademark owners

1.2 About the Device

Capabilities of the device and included features.

The miniaturised **2-axis Programmable Motherboard** hosts two **EPOS4 Micro 24/5 CAN (638328)** full digital, smart positioning control units, and a **MicroMaster LT CANopen Master** programmable logic controller (PLC).

The EPOS4 Micro can control brushed DC/BLDC motors up to 120W (360W momentarily). The motherboard ensures comprehensive motor-related connectivity options, including both axes' motor power, hall sensor, and encoder connectors.

The motherboard has an integrated CAN bus configuration, where the EPOS4 Micro axes are controlled as slave nodes, mastered by the PLC. Additional axes/CAN nodes can be connected to the provided CAN connector onboard to realise more extensive architectures. In addition, each axis can be operated via any USB communication port of a workstation computer for setup and testing.

In terms of connectivity, the motherboard provides several general-purpose IOs for connection to peripheral sensors and devices, connected to the PLC and the EPOS4 Micro devices. The PLC also presents wireless connectivity options including Wi-Fi and Bluetooth.

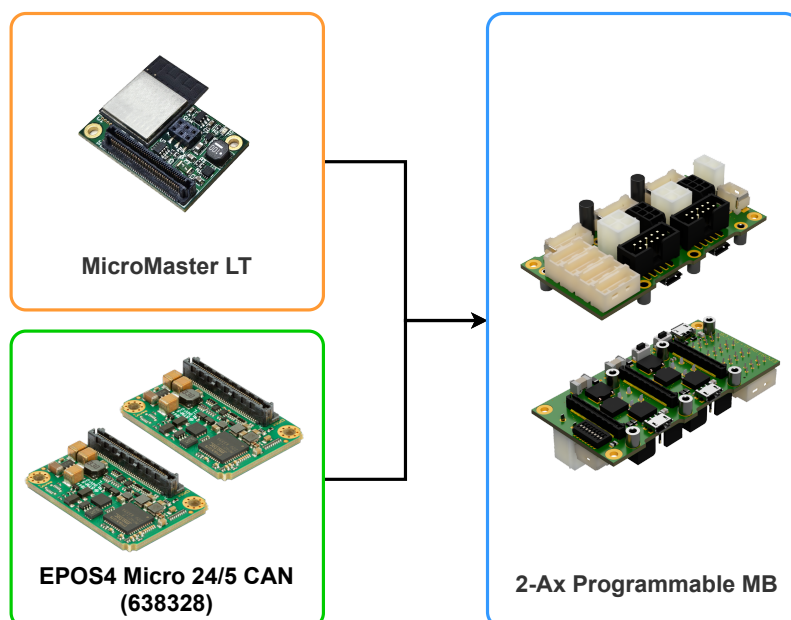


Figure 1-2 2-axis Programmable MB - Hardware Overview

For easier legibility, in the later course of this document naming of components will be as follows:

Short form	Meaning
Micro	EPOS4 Micro 24/5 CAN
PLC	MicroMaster LT

Table 1-4 Abbreviations

1.3 About the Safety Precautions

- Make sure that you have read and understood the note “READ THIS FIRST” on page A-2!
- Do not engage with any work unless you possess the stated skills (→ 1.1.2 “Target Audience” on page 4)!
- Refer to → Table 1-2 “Symbols and signs” on page 5 to understand the subsequently used indicators!
- You must observe any regulation applicable in the country and/or at the site of implementation with regard to health and safety/accident prevention and/or environmental protection!



DANGER

High voltage and/or electrical shock **Touching live wires causes death or serious injuries!**

- Consider any power cable as connected to live power, unless having proven the opposite!
- Make sure that neither end of cable is connected to live power!
- Make sure that power source cannot be engaged while work is in process!



Requirements

- Make sure that all associated devices and components are installed according to local regulations.
- Be aware that, by principle, an electronic apparatus can not be considered fail-safe. Therefore, you must make sure that any machine/apparatus has been fitted with independent monitoring and safety equipment. If the machine/apparatus should break down, if it is operated incorrectly, if the control unit breaks down or if the cables break or get disconnected, etc., the complete drive system must return – and be kept – in a safe operating mode.
- Be aware that you are not entitled to perform any repair on components supplied by maxon.



Electrostatic sensitive device (ESD)

- Wear working cloth and use equipment in compliance with ESD protective measures.
- Handle device with extra care.

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2 SPECIFICATIONS

2.1 Technical Data

2-axis Programmable Micro Motherboard		
Electrical Rating	Nominal power supply voltage +V _{cc}	10...24 VDC
	Absolute supply voltage +V _{min} / +V _{max}	8 VDC / 28 VDC
	Output voltage (max.)	0.9 x +V _{cc}
	Output current I _{cont} / I _{max} (<1s)	5 A / 10 A per axis
	Built-in motor chokes	3 x 4.7 µH; 5A per axis
	PLC input voltage limits	-0.3...3.6 VDC
Inputs & Outputs	PLC I/O	28 I/O, 3.3 V logic level. GPIO 1...18 can read analog input (12-bit resolution)
	EPOS4 Connections	Motor Power, Hall Sensors, Digital Incremental Encoder, Digital I/O. External EIA RS422 levels driver required for SSI Encoder.
Interfaces	EPOS4 USB 2.0 / USB 3.0	Full Speed
	PLC USB OTG	Software defined, 2.0 Full Speed capable
	PLC UART	Software defined, up to 5 Mbaud
	PLC Wi-Fi	802.11 b/g/n (802.11n up to 150 Mbps)
	PLC Bluetooth	Bluetooth v4.2 BR/EDR and Bluetooth Low Energy (BLE)
Physical	Weight	approx. 40 g
	Dimensions (L x W x H)	77.0 x 38.0 x 23.0 mm
	Mounting	3 mounting holes for M2.5 screws

Table 2-5 Technical Data

2.2 Limitations

Protection functionality	Switch-off threshold	Recovery threshold
Undervoltage	7.0 V	7.5 V
Overvoltage	32 V	29 V
Overcurrent	20 A per axis	—
Thermal overload	90 °C	85 °C

Table 2-6 Limitations

2.3 Dimensional drawing

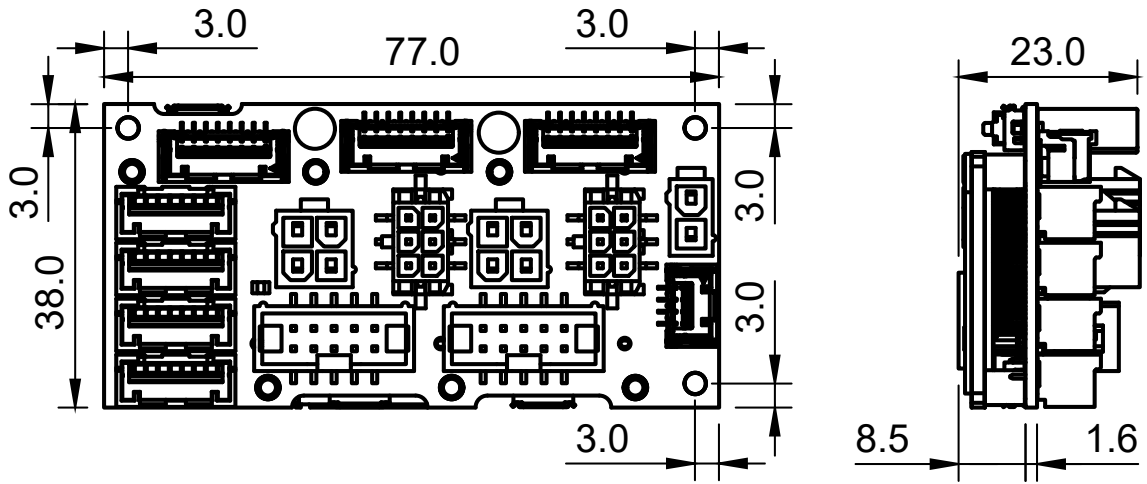


Figure 2-3 2-axis EPOS4 Micro Programmable Motherboard - Dimensional drawing [mm]

3 SETUP

3.1 Generally applicable Rules



Maximal permitted supply voltage

- Make sure that supply power is between 10...24 VDC.
- Supply voltages above 28 VDC, or wrong polarity will destroy the unit.
- Note that the necessary output current is depending on the load torque. Yet, the output current limits per axis are as follows:
 - continuous max. 5 A
 - short-time (acceleration) max. 15 A



Hot plugging the USB interface may cause hardware damage

If the USB interface is being hot-plugged (connecting while the power supply is on), the possibly high potential differences of the two power supplies of controller and PC/Notebook can lead to damaged hardware.

- Avoid potential differences between the power supply of controller and PC/Notebook or, if possible, balance them.
- Insert the USB connector first, then switch on the power supply of the controller

3.2 Pin Assignment

3.2.1 Cabling

Not all connections will be required for every application.

3.2.1.1 Plug & Play

Take advantage of maxon's prefab cable assemblies. They come as ready-to-use parts and will help to reduce commissioning time to a minimum.

Connector	Prefab Cable Assembly	
	Designation	Part Number
X1	Power Cable	275829 → page 14
X3	Motor Cable	275851 → page 15
X4	Hall Sensor Cable	275878 → page 16
X5	Encoder Cable	275934 → page 17
X7, PLC I/O	Signal Cable 8core	520853 → page 18
X11	CAN-COM Cable	520857 → page 19
	CAN-CAN Cable	520858 → page 19
X13, X14	USB Type A - micro B Cable	403968 → page 20

Table 3-7 Prefab maxon cables

3.2.1.2 Make Your Own

If you decide not to employ maxon motor's prefab cable assemblies, the required connectors are as follows:

Cable Connector Parts		
Connector	Specification	Quantity
Connectors		
X1	Molex Mini-Fit Jr., 2 poles (39013028)	1
X3	Molex Mini-Fit Jr., 4 poles (39-01-2040)	2
X4	Molex Micro-Fit 3.0, 6 poles (430-25-0600)	2
X7, PLC I/O	Molex CLIK-Mate, 1.5 mm, 8 poles (502578-0800)	7
X11	Molex CLIK-Mate, 1.5mm, 4 poles (502578-0400)	1
Crimp Terminals		
X1, X3	Molex Mini-Fit Plus female crimp terminal (45750-1111)	6
X4	Molex Micro-Fit 3.0 female crimp terminal (43030-0010)	6
X7, PLC I/O, X11	Molex CLIK-Mate crimp terminal 1.5 mm (502579-0100)	60

Table 3-8 Connector List



X1 Wire Gauge

*Wires with a conductor cross section of at least 0.75mm² **must** be used for the X1 Power Cable in order to safely provide 10A of supply current.*

3.2.1.3 Tools

Tool	Manufacturer	Part Number
Hand crimper for CLIK-Mate crimp terminals 1.5 mm	Molex	63819-4600
Hand crimper for Mini-Fit crimp terminals	Molex	63819-0900
Hand crimper for Micro-Fit 3.0 crimp terminals	Molex	63819-0000

Table 3-9 Recommended tools

3.2.2 Connections

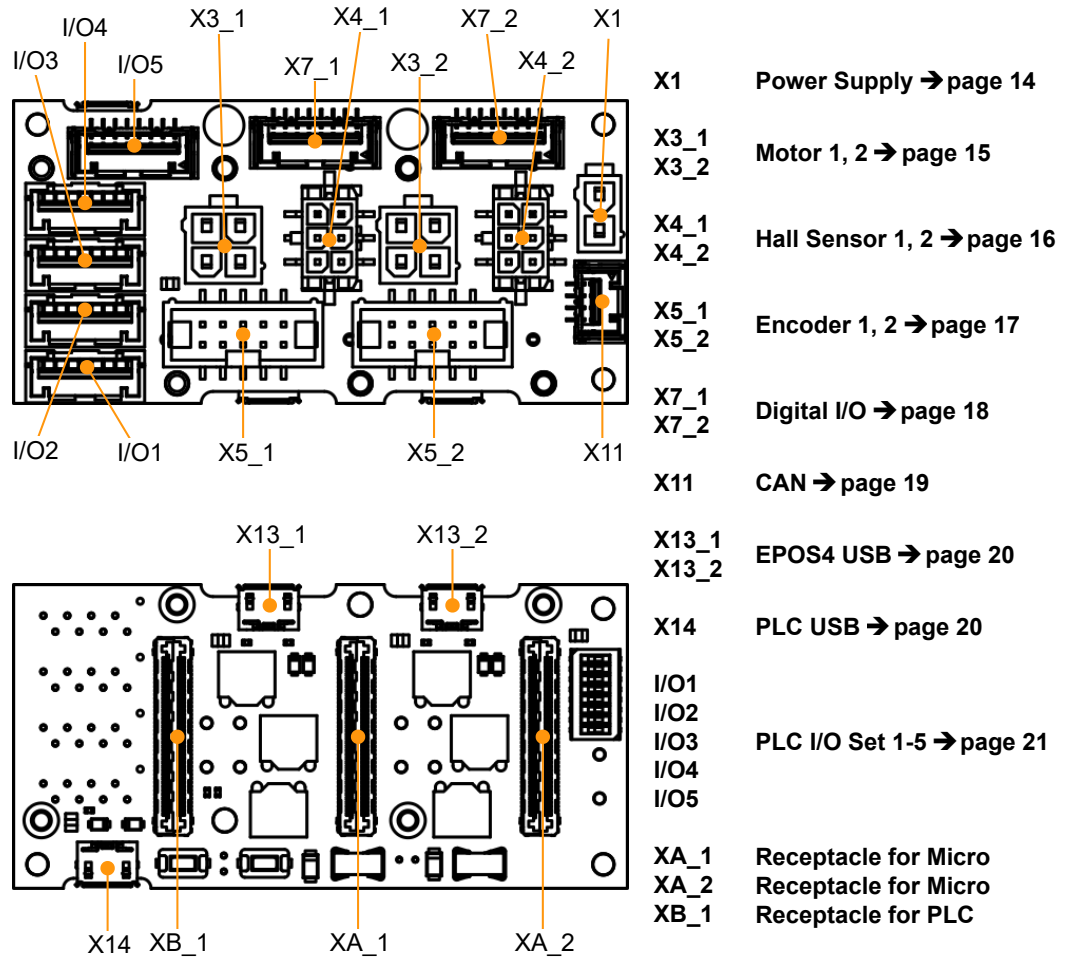


Figure 3-4 Connector locations

3.2.2.1 Power Supply (X1)



Best Practice

Keep the motor mechanically disconnected during the setup and adjustment phase.

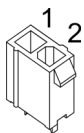


Figure 3-5 Power supply connector (X1)

Con- nector Pin	Signal	Description
1	GND	Ground
2	+V _{cc}	Power supply voltage (+10...+24 VDC)

Table 3-10 Power supply connector X1 – Pin assignment

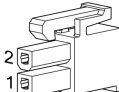
Power Cable (275829)		
A		B
Cross-section	2 x 0.75 mm ² , grey	
Length	3 m	
Head A	Plug	Molex Mini-Fit Jr., 2 poles (39-01-2020)
	Contacts	Molex Mini-Fit Jr. female crimp terminals (444-76-xxxx)
Head B	Cable end sleeves 0.75 mm ²	

Table 3-11 Power Cable

3.2.2.2 Motor (X3_1, X3_2)

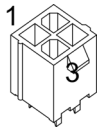


Figure 3-6 Motor connectors X3_1, X3_2

Con- nector Pin	Prefab Cable Colour	Signal	Description
1	white	Motor (+M)	DC motor: Motor +
2	brown	Motor (-M)	DC motor: Motor -
3	green	-	Not connected
4	black	Motor shield	Cable shield

Table 3-12 Motor connector X3_1, X3_2 – Pin assignment for maxon DC motor

Con- nector Pin	Prefab Cable Colour	Signal	Description
1	white	Motor winding 1	EC motor: Winding 1
2	brown	Motor winding 2	EC motor: Winding 2
3	green	Motor winding 3	EC motor: Winding 3
4	black	Motor shield	Cable shield

Table 3-13 Motor connector X3_1, X3_2 – Pin assignment for maxon EC motor

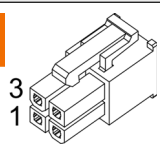
Motor Cable (275851)		
A		B
Cross-section	3 x 0.75 mm ² , shielded, grey	
Length	3m	
Head A	Plug	Molex Mini-Fit Jr., 4 poles (39-01-2040)
	Contacts	Molex Mini-Fit Plus crimp terminals (45750)
Head B	Wire end sleeves 0.75 mm ²	

Table 3-14 Motor Cable

3.2.2.3 Hall Sensor (X4_1, X4_2)

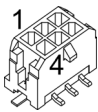


Figure 3-7 Hall sensor connector X4_1, X4_2

Connector Pin	Prefab Cable Colour	Signal	Description
1	green	Hall sensor 1	Hall sensor 1 input
2	brown	Hall sensor 2	Hall sensor 2 input
3	white	Hall sensor 3	Hall sensor 3 input
4	yellow	GND	Ground
5	grey	V_{Sensor}	Sensor supply voltage (+5 VDC; $I_L \leq 120$ mA per axis)
6	black	Hall shield	Cable shield

Table 3-15 Hall sensor connector X4_1, X4_2 – Pin assignment

Hall Sensor Cable (275878)		
Cross-section	5 x 0.14 mm ² , shielded, grey	
Length	3 m	
Head A	Plug	Molex Micro-Fit 3.0, 6 poles (430-25-0600)
	Contacts	Molex Micro-Fit 3.0 female crimp terminals (430-30-xxxx)
Head B	Wire end sleeves 0.14 mm ²	

Table 3-16 Hall Sensor Cable

3.2.2.4 Encoder (X5_1, X5_2)

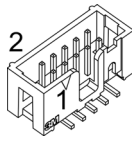


Figure 3-8 Encoder connector X5_1, X5_2

Connector Pin	Prefab Cable Colour	Signal	Description
1	brown	—	Not connected
2	white	V_{Sensor}	Sensor supply voltage (+5 VDC; $I_L \leq 120$ mA per axis)
3	red	GND	Ground
4	white	—	Not connected
5	orange	Channel A\	Channel A complement
6	white	Channel A	Channel A
7	yellow	Channel B\	Channel B complement
8	white	Channel B	Channel B
9	green	Channel I\	Channel I complement
10	white	Channel I	Channel I

Table 3-17 Encoder connector X5_1, X5_2 – Pin assignment

Accessories		
Suitable strain relief	Retainer	For sockets with strain relief: 1 retainer clip, height 13.5 mm, 3M (3505-8110) For sockets without strain relief: 1 retainer clip, height 7.9 mm, 3M (3505-8010)
	Latch	For sockets with strain relief: 2 pieces, 3M (3505-33B)

Table 3-18 Encoder connector X5 – Accessories

Encoder Cable (275934)	
Cross-section	10 x AWG28, round-jacket, flat cable, pitch 1.27 mm
Length	3 m
Head A	DIN 41651 female, pitch 2.54 mm, 10 poles, with strain relief
Head B	DIN 41651 plug, pitch 2.54 mm, 10 poles, with strain relief

Table 3-19 Encoder Cable

3.2.2.5 Digital I/O (X7_1, X7_2)

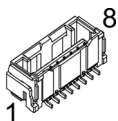


Figure 3-9 Digital I/O connector X7_1, X7_2

X7 Head A Pin	Prefab Cable Colour	Signal	Description
1	white	DigIN1	Digital input 1
2	brown	DigIN2	Digital input 2
3	green	DigIN3	Digital input 3
4	yellow	HsDigIN4	High-Speed Digital input 4 (Data)
5	grey	HsDigOUT1	High-Speed Digital output 1 (Clock)
6	pink	DigOUT2	Digital output 2
7	blue	GND	Ground
8	red	V _{Sensor}	Sensor supply voltage (+5 VDC; I _L ≤120 mA per axis)

Table 3-20 Digital I/O connector X7_1, X7_2 – Pin assignment

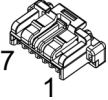
Signal Cable 8core (520853)		
A		B
Cross-section	8 x 0.14 mm ² , grey	
Length	3 m	
Head A	Plug	Molex CLIK-Mate, single row, 8 poles (502578-0800)
	Contacts	Molex CLIK-Mate crimp terminals (502579)
Head B	Wire end sleeves 0.14 mm ²	

Table 3-21 Signal Cable 8core

3.2.2.6 CAN (X11)

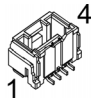


Figure 3-10 CAN Connector X11

X11 Head A Pin	Prefab Cable Colour	520857 Head B Pin	520858 Head B Pin	Signal	Description
1	white	7	1	CAN high	CAN high bus line
2	brown	2	2	CAN low	CAN low bus line
3	green	3	3	GND	Ground
4	Shield	5	4	Shield	Cable shield

Table 3-22 CAN connector X11 – Pin assignment


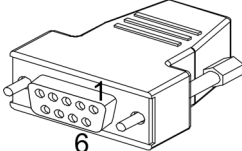
CAN-COM Cable (520857)		
A 	 B	
Cross-section	2 x 2 x 0.14 mm ² , twisted pair, shielded	
Length	3m	
Head A	Plug	Molex CLIK-Mate, single row, 4 poles (502578-0400)
	Contacts	Molex CLIK-Mate crimp terminals (502579)
Head B	Female D-Sub connector DIN 41652, 9 poles, with mounting screws	

Table 3-23 CAN-COM Cable


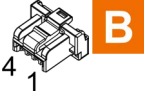
CAN-CAN Cable (520858)		
A 	 B	
Cross-section	2 x 2 x 0.14 mm ² , twisted pair, shielded	
Length	3m	
Head A	Plug	Molex CLIK-Mate, single row, 4 poles (502578-0400)
	Contacts	Molex CLIK-Mate crimp terminals (502579)
Head B	Plug	Molex CLIK-Mate, single row, 4 poles (502578-0400)
	Contacts	Molex CLIK-Mate crimp terminals (502579)

Table 3-24 CAN-CAN Cable

3.2.2.7 USB (X13_1, X13_2, X14)



Hot plugging the USB interface may cause hardware damage

If the USB interface is being hot-plugged (connecting while the power supply is on), the possibly high potential differences of the two power supplies of controller and PC/Notebook can lead to damaged hardware.

- Avoid potential differences between the power supply of controller and PC/Notebook or, if possible, balance them.
- Insert the USB connector first, then switch on the power supply of the controller

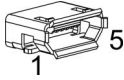


Figure 3-11 USB connector X13_1, X13_2, X14

Con- nector Pin	Signal	Description
1	V _{BUS}	USB bus supply voltage input +5VDC
2	USB_D-	USB Data- (twisted pair with Data+)
3	USB_D+	USB Data+ (twisted pair with Data-)
4	ID	Not connected
5	GND	USB Ground

Table 3-25 USB connector X13_1, X13_2, X14 – Pin assignment

USB Type A - micro B Cable (403968)	
Cross-section	According to USB 2.0 / USB 3.0 specification
Length	1.5 m
Head A	USB Type “micro B”, male
Head B	USB Type “A”, male

Table 3-26 USB Type A - micro B Cable

3.2.2.8 PLC I/O (I/O1, I/O2, I/O3, I/O4, I/O5)

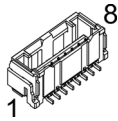


Figure 3-12 PLC I/O connector I/O1, I/O2, I/O3, I/O4, I/O5

I/O Head A Pin	Prefab Cable Colour	I/O1 Signal	I/O2 Signal	I/O3 Signal	I/O4 Signal	I/O5 Signal
1	white	GPIO 1	GPIO 7	GPIO 13	GPIO 38	GPIO 33
2	brown	GPIO 2	GPIO 8	GPIO 14	GPIO 39	GPIO 34
3	green	GPIO 3	GPIO 9	GPIO 15	GPIO 40	GPIO 35
4	yellow	GPIO 4	GPIO 10	GPIO 16	GPIO 41	GPIO 47
5	grey	GPIO 5	GPIO 11	GPIO 17	GPIO 42	GPIO 48
6	pink	GPIO 6	GPIO 12	GPIO 18	N/C	N/C
7	blue	Ground	Ground	Ground	Ground	Ground
8	red	+3.3 VDC	+3.3 VDC	+3.3 VDC	+3.3 VDC	+3.3 VDC

Table 3-27 PLC I/O connector I/O1, I/O2, I/O3, I/O4, I/O5 – Pin assignment

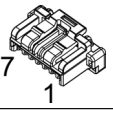
Signal Cable 8core (520853)		
A		B
Cross-section	8 x 0.14 mm ² , grey	
Length	3 m	
Head A	Plug	Molex CLIK-Mate, single row, 8 poles (502578-0800)
	Contacts	Molex CLIK-Mate crimp terminals (502579)
Head B	Wire end sleeves 0.14 mm ²	

Table 3-28 Signal Cable 8core

3.2.3 Fuses

Each axis is fitted with a user-replaceable fuse to protect the device in the case of reversed input voltage polarity or an overcurrent fault.

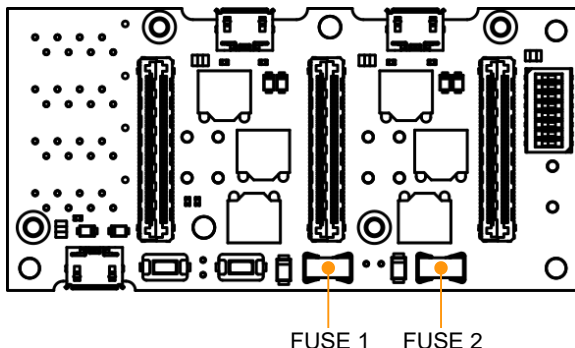


Figure 3-13 2-Axis Programmable Micro Motherboard - Fuses

Blown fuses should be replaced **only** with a Littelfuse 10A Fast-Blow fuse, such as the Littelfuse 0453010.MR.



After a fuse has blown

Do not replace a fuse without first investigating why the fuse may have blown. Short circuits, reversed input voltage polarity, damaged motors, or higher than specified loads must be remedied before the replacement of a fuse.



Replacing fuses

*Fuses **must** be replaced with the specified 10A fast-blow fuse. Not doing so will reduce operating capabilities, and polarity and overcurrent protection may be lost! This may result in damage to the EPOS4 Micro 24/5 CAN plugged into the corresponding slot.*

3.2.4 Switches

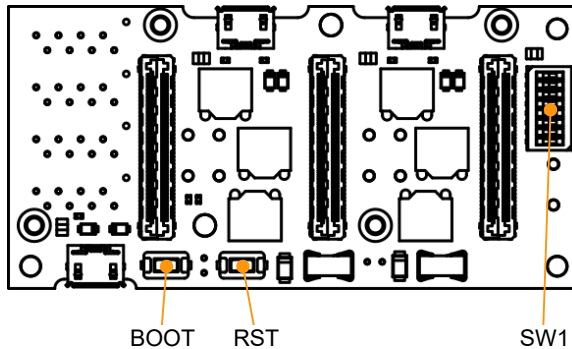


Figure 3-14 Identification of switches and buttons

3.2.4.1 CAN ID (Node-ID) Configuration

The «Micro» identification (subsequently called “ID”) for both axes is set by means of DIP switches 1...6 of SW1.



Setting the IDs by DIP switch SW1

- By setting the DIP switch (1...6) address 0 (“OFF”), the ID may be set by software (object 0x2000 «Node-ID», range 1...127).
- The ID results in the summed values of DIP switch addresses 1 (“ON”).
- The ID switches (1...6) are shared between both «Micro».
- The ID for «Micro» in XA_1 is set with switches 2...6
- The ID for «Micro» in XA_2 is set with switches 1...6
- When using the DIP switches to set the Node-ID, switch 1 **must** be set to 1 (“ON”) to ensure the configured IDs are different.
- DIP switches 7...8 do not have any impact on the ID.


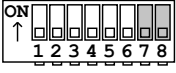

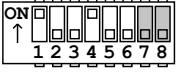
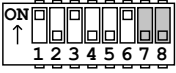
Factory Setting	Switch	Binary Code	Valence
	1	2^0 (0 for XA_1)	1 (0 for XA_1)
	2	2^1	2
	3	2^2	4
	4	2^3	8
	5	2^4	16
	6	2^5	32

Table 3-29 DIP switch SW1 – Binary code values

The set ID can be observed by adding the valence of all activated switches. Use the following table as a (non-concluding) guide:

Configuration	Switch						ID XA_1	ID XA_2
	1	2	3	4	5	6		
	0	0	0	0	0	0	-	-
	1	1	0	0	0	0	2	3
	1	0	0	1	0	0	8	9
	1	0	1	0	0	1	36	37

0 = Switch "OFF". 1 = Switch "ON".

Table 3-30 DIP switch SW1 – Examples

3.2.4.2 CAN Automatic Bit Rate Detection


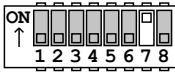
Switch	OFF	ON
7	 <p>Automatic bit rate detection deactivated (factory setting)</p>	 <p>Automatic bit rate detection activated</p>

Table 3-31 DIP switch SW1 – CAN automatic bit rate detection

3.2.4.3 CAN Bus Termination

Use the termination if and only if the CAN connector (X11) is disconnected.

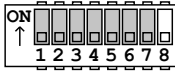
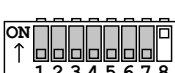
Switch	OFF	ON
8	 <p>Without bus termination (factory setting)</p>	 <p>Bus termination with 120 Ω</p>

Table 3-32 DIP switch SW1 – CAN bus termination

3.2.4.4 Programming Buttons

Two switch buttons are situated on the board, designated for use when programming the PLC using the X14 PLC USB interface: The "RST" and "BOOT" buttons.

A so-called "bootloader" mode should be activated when flashing a replacement program onto the PLC. To activate "bootloader" mode, hold the "BOOT" button down, momentarily press the "RST" button, and then release the "BOOT" button.

The ability to reprogram the PLC can be permanently disabled by setting the "EFUSE_DIS_DOWNLOAD_MODE" eFuse.

4 WIRING

In this section you will find the wiring information for the setup you are using. You can either use the consolidated wiring diagram (→ Figure 4-16) featuring the full scope of interconnectivity and pin assignment. Or you may wish to use the connection overviews for either DC motor or EC (BLDC) motor that will assist you in determining the wiring for your particular motor type and the appropriate feedback signals.

The device can host up to two «Micro» modules and is therefore ready to drive one or two axes. Thereby, the power supply, logic supply, and CAN interface for all axes are each merged in one consolidated connector. The axis-specific wiring is separately connected for up to two individual axes.

The connectors on the PCBs are marked as to the following → Table 4-33. Take note that in the subsequent diagrams the designation of the axis 1 and 2 is omitted (respective connectors marked in blue color).

2-Axis Programmable Motherboard		In wiring diagrams *
Axis 1	Axis 2	
X3_1	X3_2	X3
X4_1	X4_2	X4
X5_1	X5_2	X5
X7_1	X7_2	X7
X13_1	X13_2	X13

Table 4-33 Designation of connectors and PCB marking

There are five I/O connectors on the motherboard, all connected to the PLC. The connectors are consolidated in the wiring diagram by the designation indicated in blue color.

2-Axis Programmable Motherboard	In wiring diagrams *
I/O1, I/O2, I/O3, I/O4, I/O5	I/O

Table 4-34 PCB marking for PLC I/O connectors

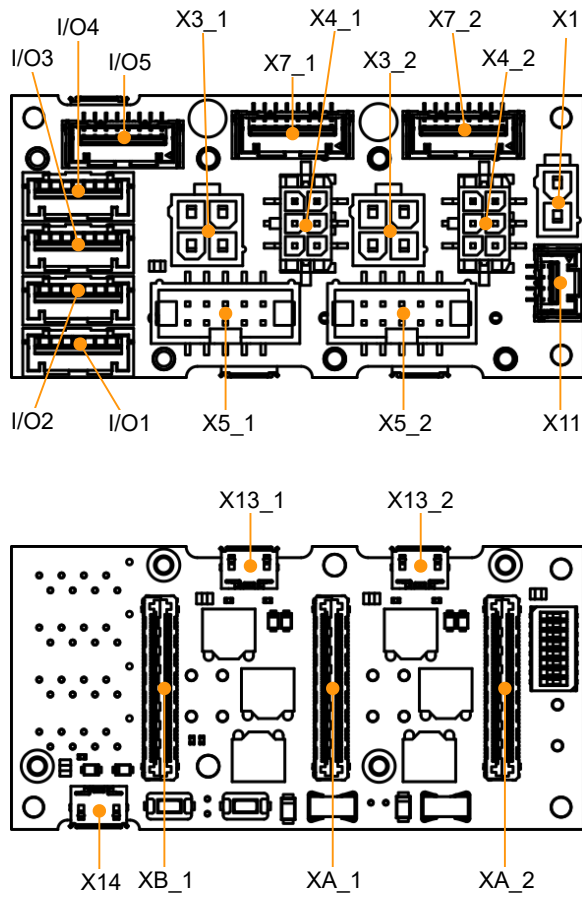


Figure 4-15 Interfaces – Designations and location

4.1 Possible Combinations to connect a Motor

The following tables show feasible ways on how to connect the motor with its respective feedback signals or possible combinations thereof. To find the wiring that best suits your setup, proceed as follows:

- 1) Decide on the type of motor you are using; either DC or EC (BLDC) motor.
- 2) Connect the power supply by following the link to the stated figure.
- 3) Check-out the listing for the combination that best suits your setup. Pick the wiring method # and go to the respective table; for DC motor Table Table 4-35, for EC (BLDC) motor Table Table 4-36.
- 4) If an SSI Encoder is used, an external EIA RS422 levels driver is required.
- 5) Pick the row with the corresponding wiring method # and follow the link (or links) to the stated figure(s) to find the relevant wiring information.

4.1.1 DC Motor

Power supply Figure 4-17

Motor & feedback signals

Without sensor Method # DC1
 Digital incremental encoder Method # DC2
 SSI absolute encoder Method # DC5
 Digital incremental encoder & SSI absolute encoder Method # DC8

Method #	Digital Incremental Encoder 1 (Sensor 1) X5	SSI Absolute Encoder 1 (Sensor 2) X7	→
DC1			Figure 4-17
DC2	✓		Figure 4-17, Figure 4-21
DC5		✓	Figure 4-17, Figure 4-22
DC8	✓	✓	Figure 4-17, Figure 4-21, Figure 4-22

Table 4-35 Possible combinations of feedback signals for DC motor

4.1.2 EC (BLDC) Motor

Power supply Figure 4-17

Motor & feedback signals

Hall sensors Method # EC1

Hall sensors & Digital incremental encoder Method # EC2

Hall sensors & SSI absolute encoder Method # EC5

Hall sensors & Digital encoder & SSI absolute encoder Method # EC8

Digital incremental encoder & SSI absolute encoder Method # EC9

SSI absolute encoder Method # EC10

Method #	Hall Sensor (Sensor 3) X4	Digital Incremental Encoder 1 (Sensor 1) X5	SSI Absolute Encoder 1 (Sensor 2) X7	→
EC1	✓			Figure 4-17, Figure 4-20
EC2	✓	✓		Figure 4-17, Figure 4-20, Figure 4-21
EC5	✓		✓	Figure 4-17, Figure 4-20, Figure 4-22
EC8	✓	✓	✓	Figure 4-17, Figure 4-20, Figure 4-21, Figure 4-22
EC9		✓	✓	Figure 4-17, Figure 4-21, Figure 4-22
EC10			✓	Figure 4-17, Figure 4-22

Table 4-36 Possible combinations of feedback signals for EC (BLDC) motor

4.2 Main Wiring Diagram

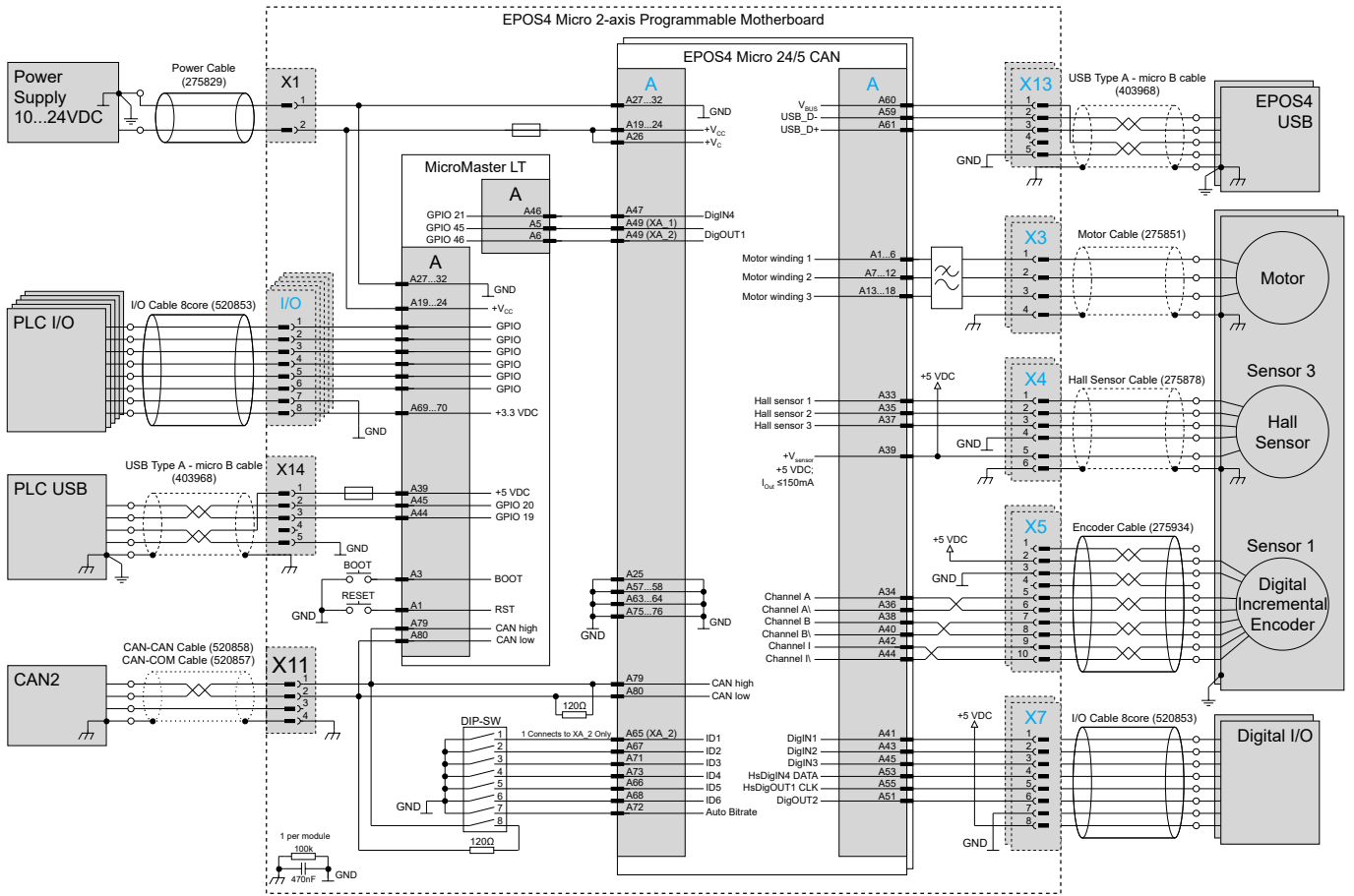


Figure 4-16 2-Axis Micro Programmable Motherboard - Main wiring diagram

4.3 Excerpts

4.3.1 Power Supply

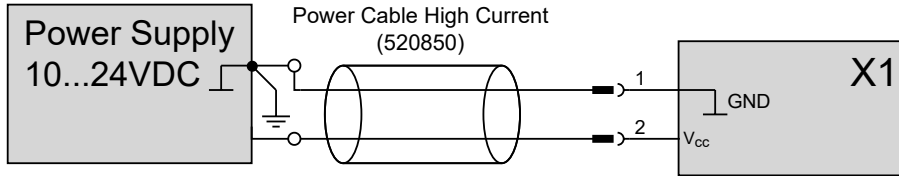


Figure 4-17 Power Supply

4.3.2 DC Motor

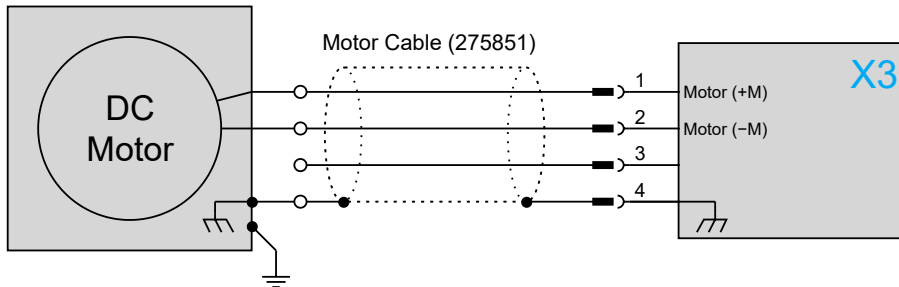


Figure 4-18 DC motor

4.3.3 EC (BLDC) Motor

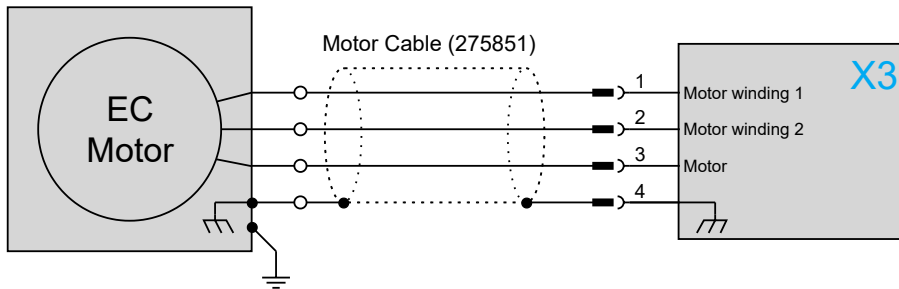


Figure 4-19 EC (BLDC) motor

4.3.4 Hall Sensors (Sensor 3)

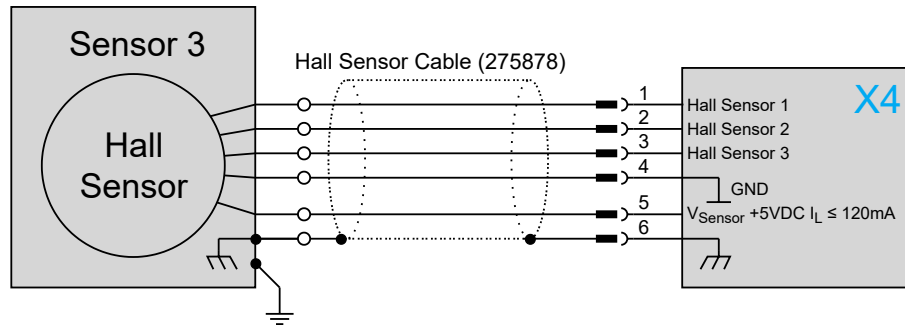


Figure 4-20 Hall sensors (Sensor 3)

4.3.5 Digital Incremental Encoder 1 (Sensor 1)

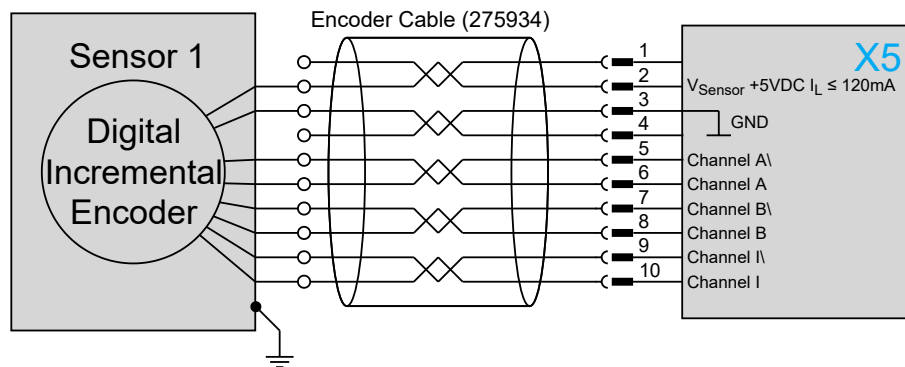


Figure 4-21 Digital incremental encoder 1 (Sensor 1)

4.3.6 SSI Encoder 1 (Sensor 2)

An external EIA RS422 levels driver is required for the use of an SSI encoder.

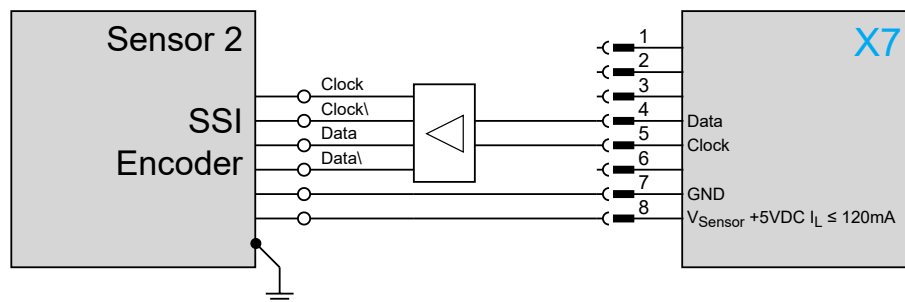


Figure 4-22 SSI encoder 1 (Sensor 2)

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