*The clever drive*

CE

Controller bipolar open frame drive for 2 phase step motor :

- DC Power Supply: 12 ÷ 36Vdc
- DC Logic Supply: 24Vdc (mandatory)
- Phase current: up to 3 A_{RMS} (4,2 A_{PK})
- Chopper frequency: ultrasonic 40KHz
- Stepless Control Technology (65536 position per turn)
- Protections: over-current, over-temperature, short circuit phase-phase motor and phase-ground
- Direct feedback interface: incremental encoder (not isolated) 5Vdc TTL/CMOS or 24Vdc Push-Pull
- EtherCAT communication interfaces
- Service SCI interface for programming and real time debugging
- Enable Torque input not isolated (mandatory)
- 4 digital inputs (not isolated)
- 3 digital outputs (not isolated)
- 1 analog input
- Dimensions : 83 x 42 x 33mm (refer to picture)
- Pollution degree : 2
- Category C3 following standard EN 61800-3
- Working temperature 5°C ÷ 40°C; Storage temperature -25°C ÷ 55°C
- Humidity : 5% ÷ 85% not condensing

EtherCAT®

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

SB4D2030H2E1-30
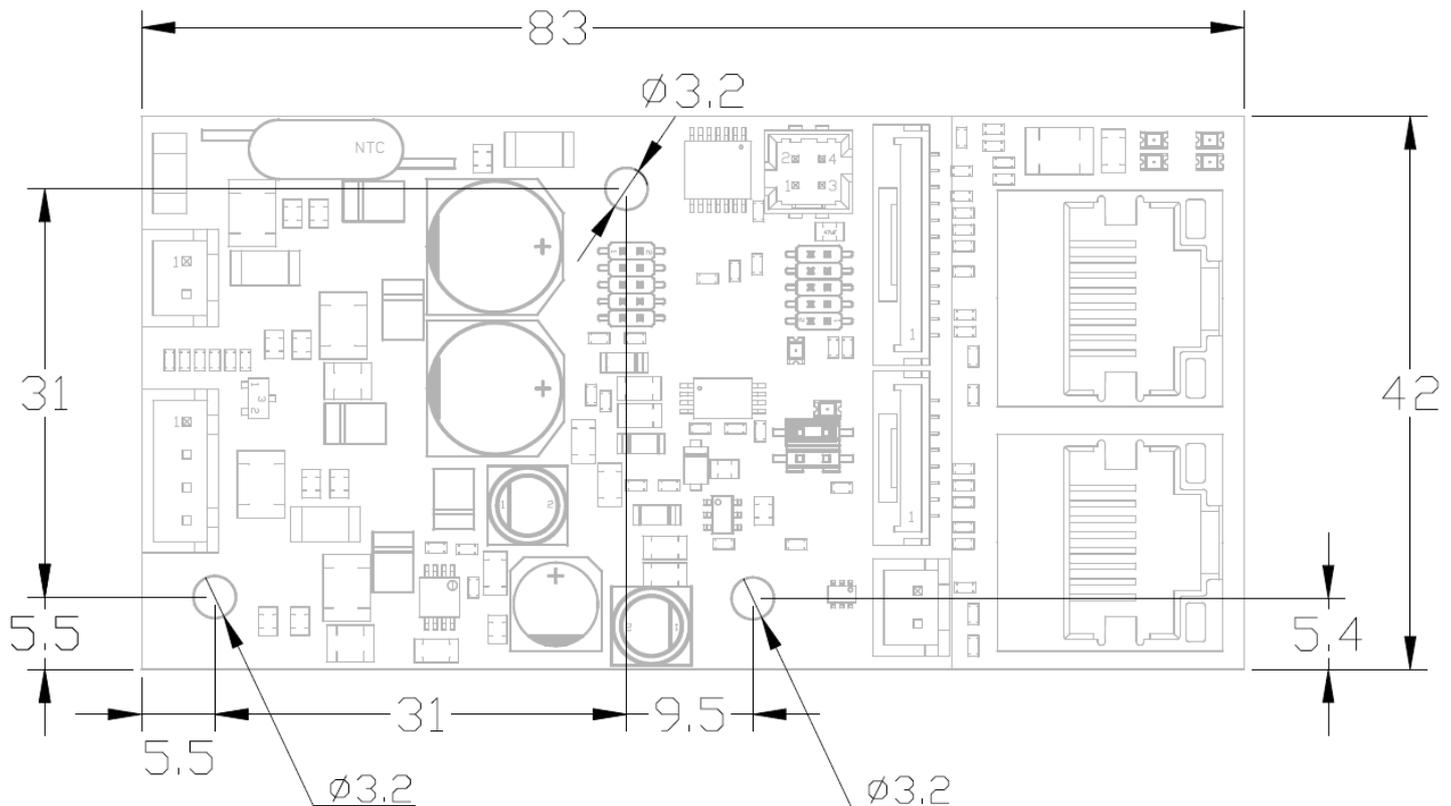


i For further support please contact support@everelettronica.it.

System connectors

Connectors: position, function and pinout.

X1: Power Supply

X4: Service SCI Interface

X8A: EtherCAT OUT

LEDs

X5: Inputs & Outputs

X6: Feedback interface

X2: Motor connection

X7: Logic Supply

X8B: EtherCAT IN
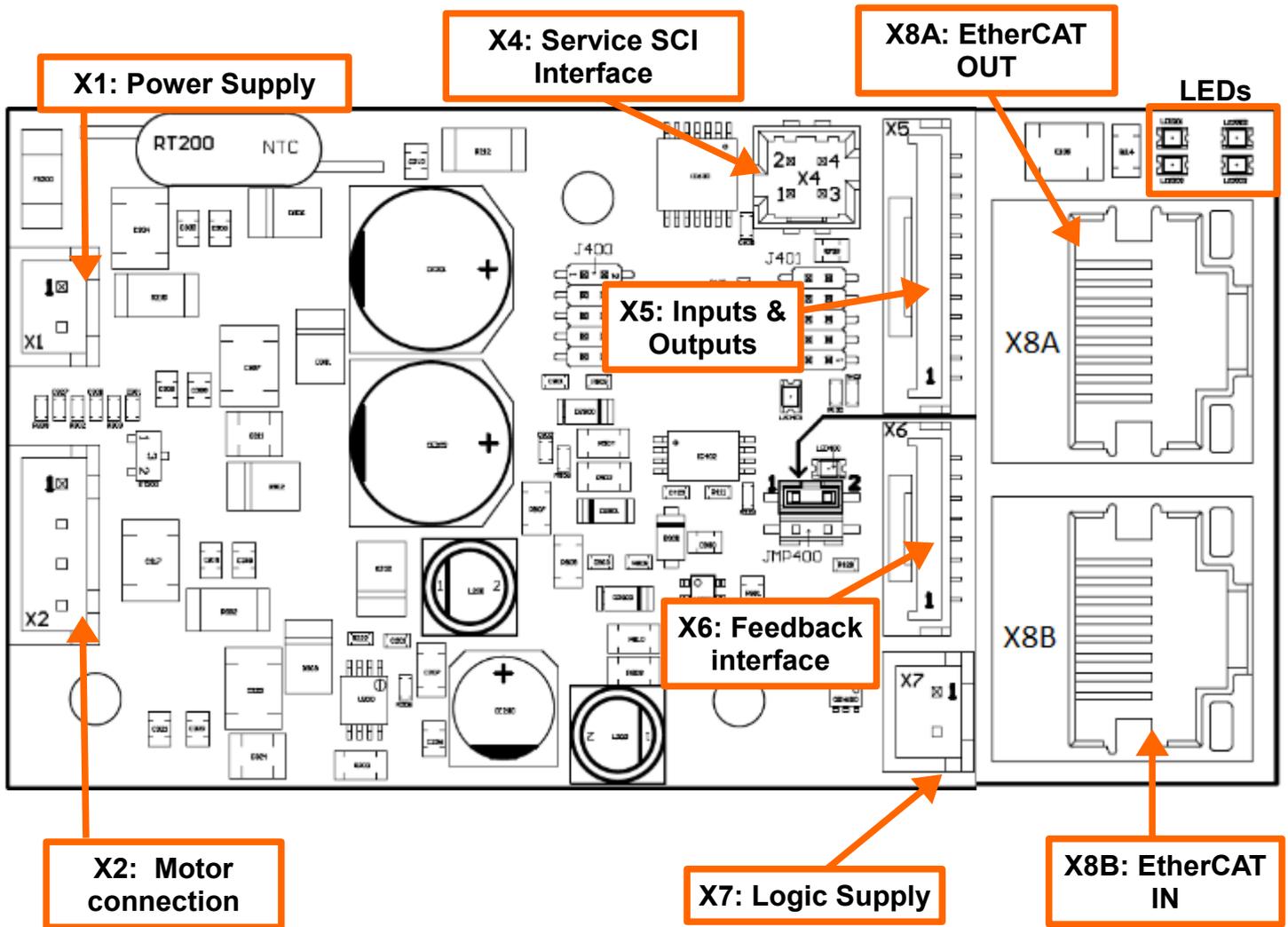
X1 : Power supply		
X1.1	VPOT	Positive power supply input
X1.2	PGND	Negative power supply input
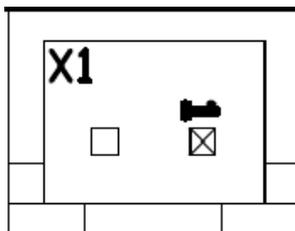
X2 : Motor Connection	
X2.1	Motor Phase A
X2.2	Motor Phase A/
X2.3	Motor Phase B
X2.4	Motor Phase B/
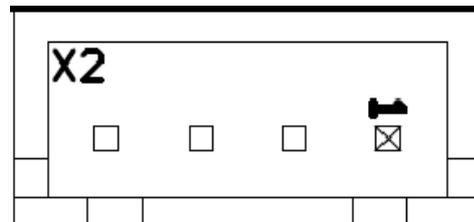
X5 : Inputs & Outputs

|		5 digital inputs, 3 digital outputs and 1 analog input	
X5.1	V_POT	PWR_OUT	+5Vdc supply output for potentiometer
X5.2	DIG_IN0	DIG_IN	Digital input IN0
X5.3	DIG_IN1	DIG_IN	Digital input IN1
X5.4	EN_TORQUE	DIG_IN	Digital input EN_TORQUE
X5.5	DIG_IN3	DIG_IN	Digital input IN3
X5.6	DIG_IN2	DIG_IN	Digital input IN2
X5.7	IN_AN0	AN_IN	Analog input 0
X5.8	**Reserved** ⚠	----	**Reserved pin (see EN_TORQUE input connection paragraph)**
X5.9	DIG_OUT0	DIG_OUT	PNP digital output OUT0
X5.10	DIG_OUT1	DIG_OUT	PNP digital output OUT1
X5.11	DIG_OUT2	DIG_OUT	PNP digital output OUT2
X5.12	GND	PWR_OUT	Reference ground for potentiometer
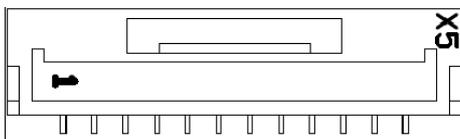
X6 : Feedback interface

		Incremental encoder interface (not isolated)	
X6.1	+5E	PWR Output	Positive +5Vdc power supply output
X6.2	ENC_PHA	DIG_IN	Encoder Phase A input
X6.3	ENC_PHB	DIG_IN	Encoder Phase B input
X6.4	ENC_ZERO	DIG_IN	Encoder Zero Signal input
X6.5	Reserved	---	Reserved pin (do not connect)
X6.6	Reserved	---	Reserved pin (do not connect)
X6.7	Reserved	---	Reserved pin (do not connect)
X6.8	GND	PWR Output	Negative side of supply
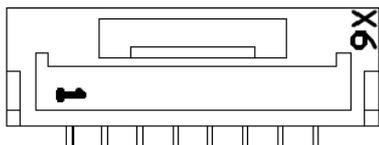
X7 : Logic supply

X1.1	VLOG	Positive logic supply input
X1.2	GND	Negative logic supply input
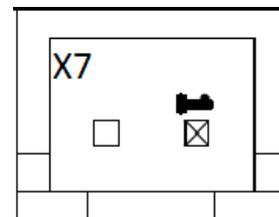
X4 : Service SCI Interface

X3.1	TX/RX	Transmit / Receive Line
X3.2	$\overline{DE}$/RE	Drive Enable Negated / Receive Enable
X3.3	+5V	+5Vdc power out
X3.4	GND	GND power out
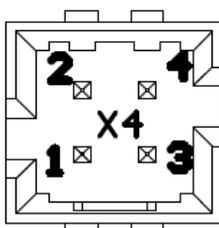
X8A e X8B : EtherCAT Interface

Dual RJ45 connectors (IN-OUT)
100BASE-TX (100Mb/sec) ports
Accept standard Ethernet cable (CAT5 or higher)

Working Status (LED)
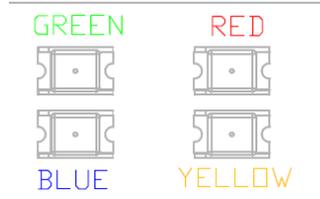
Visualization status		Description
✖	Green OFF	Bus status **'Init'**
●	Green ON	Bus status '**Operational**'
◉	Green Blinking (1s)	Bus status '**Pre-Operational**'
◉	Green Single Flash	Bus status '**Safe-Operational**'
●	Blue ON	Error : connect with Service SCI kit and check with software.
● ●	Blue ON Yellow ON	Drive in boot mode. A new firmware should be downloaded to drive.
● ◉	Blue ON Yellow Blinking (200ms)	Firmware update in progress. Do not power off the drive until the update process is completed.
● ◉	Blue ON Red Blinking (200ms)	Initialization phase. Should last few seconds. While in this condition the drive is not fully operational.
●	Yellow ON Red OFF Blue OFF	Missing setting of Inominal
◉	Yellow Blinking (200ms) Red OFF Blue OFF	Warning : connect with Service SCI kit and check with software.
●	Red ON	Protection: Motor is in open phase condition
◉	Red Blinking (200ms)	Current protection
● ◉	Red ON (1sec) + Yellow 1 Blink	Overvoltage protection
● ◉ ◉	Red ON (1sec) + Yellow 2 Blink	Undervoltage protection
● ◉ ◉ ◉	Red ON (1sec) + Yellow 3 Blink	Thermal protection
● ◉ ◉ ◉ ◉	Red ON (1sec) Yellow 4 Blink	Motor Feedback Error
● ◉ ◉ ◉ ◉ ◉	Red ON (1sec) + Yellow 6 Blink	Motor Current Regulation is out of range
● ◉ ◉ ◉ ◉ ◉ ◉ ◉	Red ON (1sec) + Yellow 7 Blink	eePLC User Protection (generated by setting bit #0 of eePLC_User_Settings)

Note : Drive could be considered in a correct status if leds Red, Yellow and Blue are all OFF.
In general :
- **Led Blue indicates a software internal fault or a non-operative condition**
- **Led Red indicates an alarm or a drive protection**
- *Led Yellow indicates a warning*

Service SCI connection

⚠ This connection is __only__ possible with hardware and software provided by Ever.
Kit code : SW4_SERV00-SL or SW4_SERV00-EE

Feedback connection (not isolated)

- 5Vdc TTL/CMOS incremental encoder
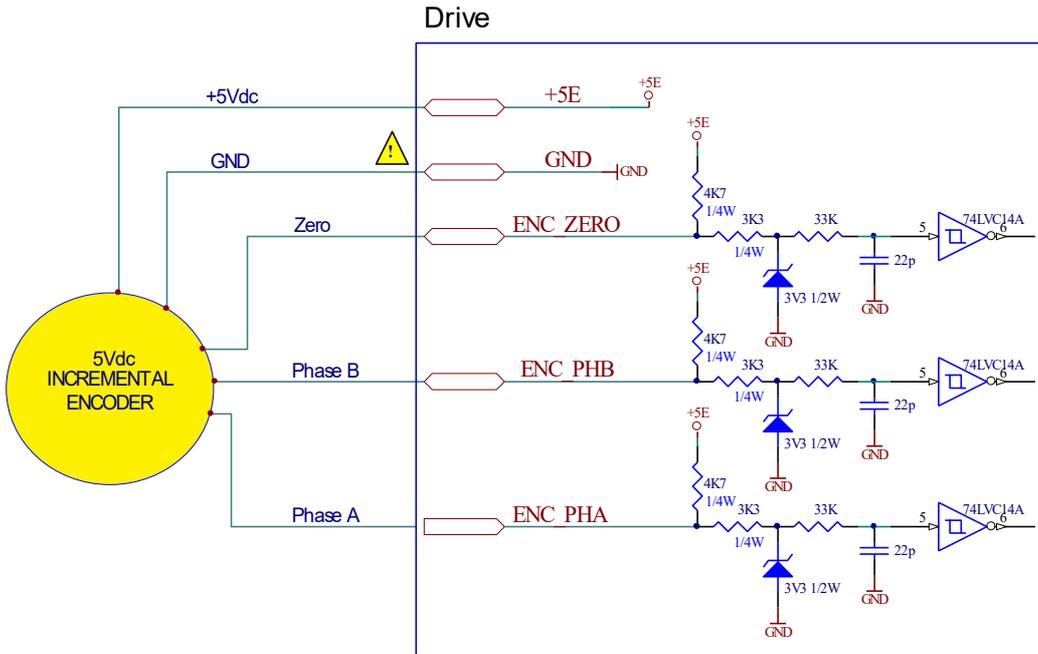
## - 24Vdc Push-pull incremental encoder
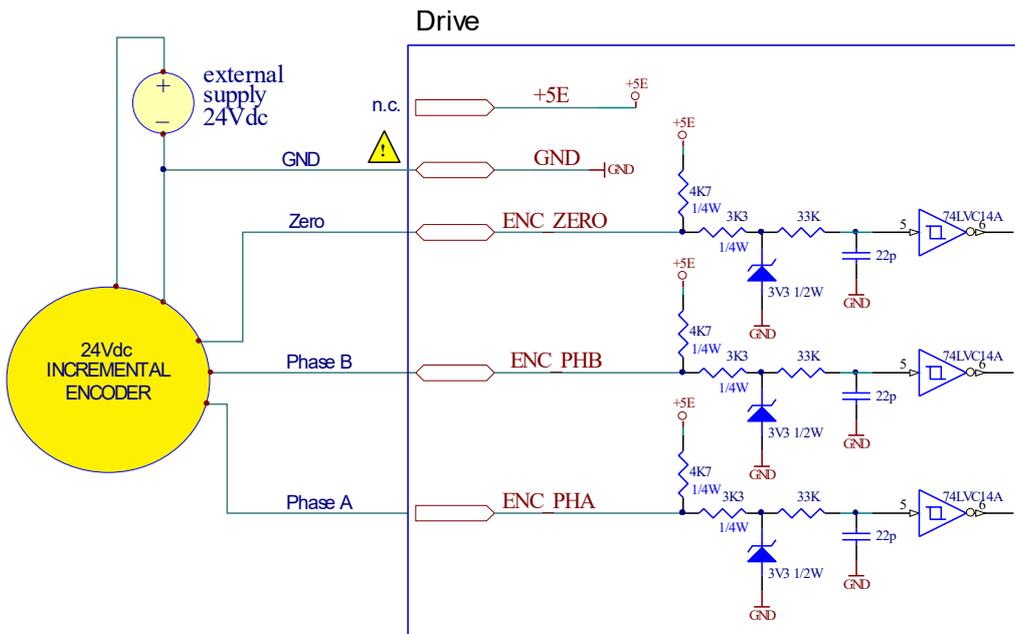
⚠️ *GND is internally in common with power ground, this is potentially dangerous. Take all necessary measures to avoid possible contacts in the final installation.*

Digital inputs connection

**i** *5-24Vdc single-ended PNP (TTL/CMOS compatible) digital inputs (not isolated)*

5- 24V INPUT

External Control Logic | Drive

PNP Connection

DIG_INn

74LVC14A

DIG_INn   DIG_INn   3K3   33K

4K7   3V3   22p
1/4W   1/2W

GND   GND   GND
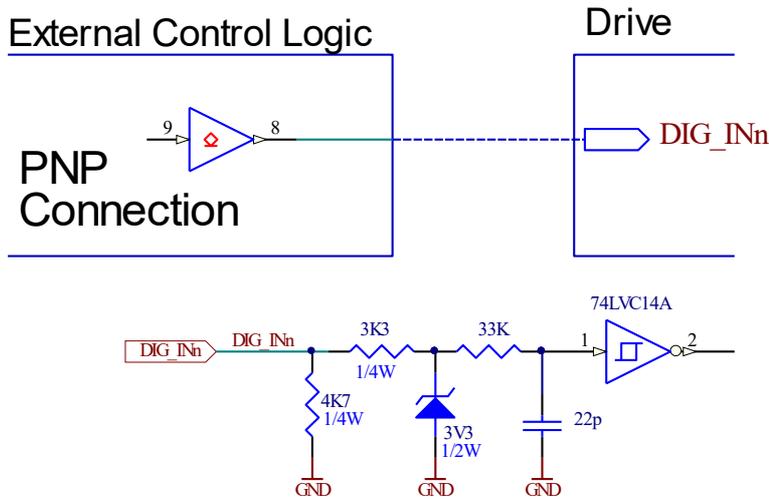
EN_TORQUE input connection

i *5-24Vdc single-ended PNP (TTL/CMOS compatible) digital input (not isolated)*

High-Side Drive   VMOT

EN_TORQUE   Motor Outputs
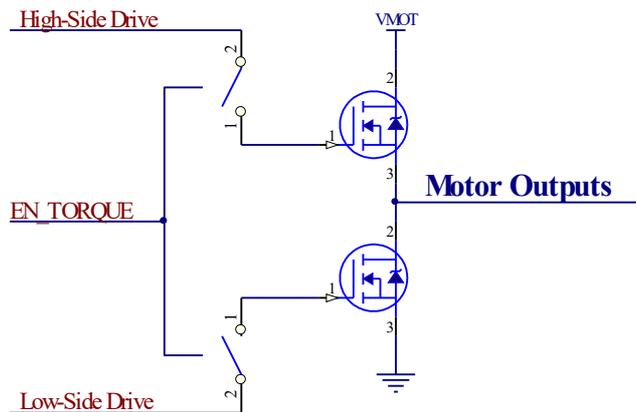
Low-Side Drive

This is the enable signal for H-bridges that cannot be overidden by the control firmware :

- *Input floating or connected to GND* = H-bridges are open (Safe state) and the High&Low Side drive outputs cannot be activated to drive the motor (motor not powered and without torque).
- *Input connected to High voltage (5-24Vdc)* = the microcontroller is able to control the outputs of the High&Low side drive and also to drive the motor.

i If EN_TORQUE input is not used, it must be connected externally to pin X5.8 in order to enable the drive to control the motor.

Drive

External
Connection   EN_TORQUE

X5.4

X5.8
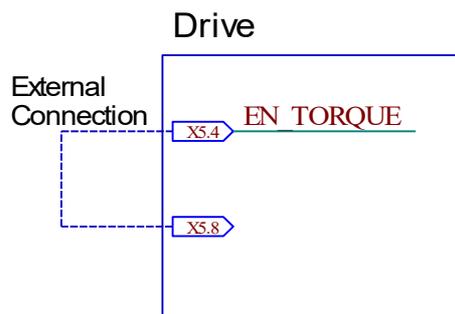
Digital outputs connection

Digital outputs Open-Drain digital ouputs (not isolated).

They can sink up to 100mA from external loads operating from power supplies to +24Vdc.
The internal diode in the output is for driving inputs that are opto-isolated and connected to +24Vdc.
The diode prevents conduction from +24Vdc through the 4,7 kΩ resistor to +5Vdc in the drive. This could turn the input on, giving a false indication of the drive output state.
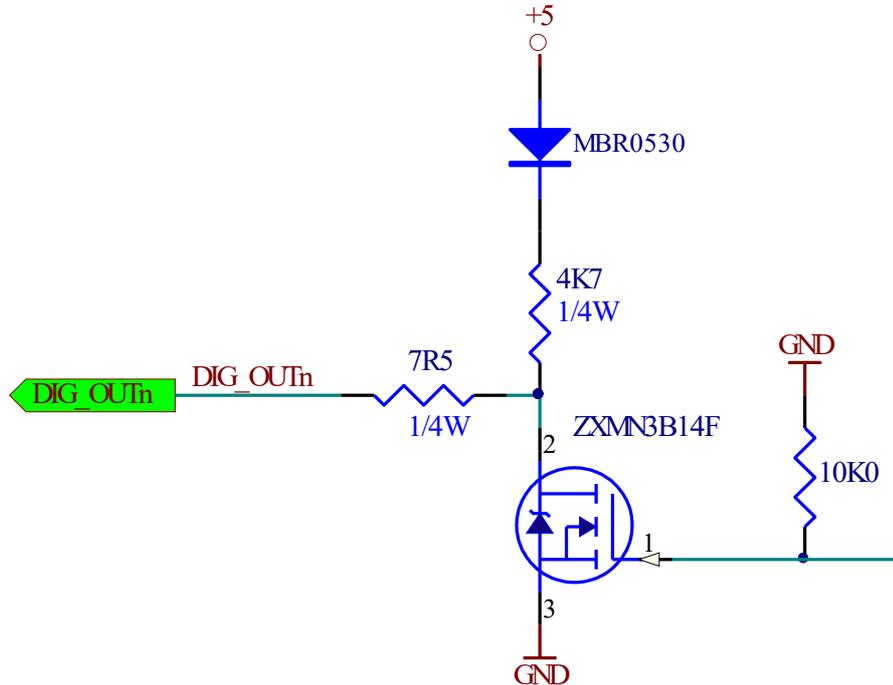
Analog input connection
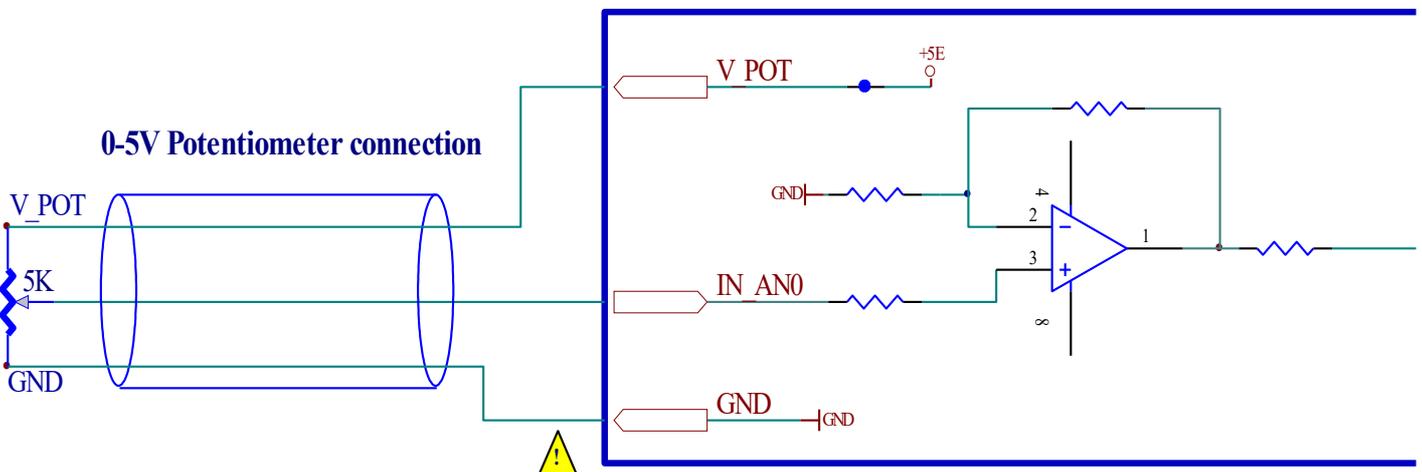
⚠️ *GND is internally in common with power ground, this is potentially dangerous. Take all necessary measures to avoid possible contacts in the final installation.*

Mating connector kit

X1, X7	JST cod. XHP-2	con crimp SXH-001T-P0.6
X2	JST cod. XHP-4	con crimp SXH-001T-P0.6
X5	JST cod. GHR-12V-S	con crimp SSHL-002T-P0.2
X6	JST cod. GHR-08V-S	con crimp SSHL-002T-P0.2
X8A/B	Ethernet standard cables (CAT5 or higher)	

Section of the cables

Supply and motor $0.3mm^2$ (AWG22)

EtherCAT interfaces Ethernet standard cables (CAT5 or higher)

Inputs/Outputs Min $0.05mm^2$ (AWG30) Max $0.12mm^2$ (AWG26)

Feedback interf. Min $0.05mm^2$ (AWG30) Max $0.12mm^2$ (AWG26)

Verify the installation

- Check all connection : power supply, logic supply and inputs/outputs.
- Make sure all settings right for the application.
- Make sure the power and logic supplies are suitable for the drive.
- If possible, remove the load from the motor shaft to avoid that wrong movements cause damage.
- Enable the current to the motor and verify the applied torque.
- Enable a movement of some steps and verify if the rotation direction is the desired one.
- Disconnect the power supply, connect the load on the motor and check the full functionality.

Check the detected fail function

When one of the following situations occur, the drive doesn't function correctly and it is reported an error.

DEFECT	CAUSE	ACTION
The external fuse to the drive burns	May be due to a wrong connection of the power supply.	Adjust the connection and recover the fuse. Use a fuse suitable for the application.
Over temperature protection.	May be due to a duty cycle	Increase the air flux and if it is possible chose a motor with higher torque at same current value.
Over current protection.	May be due to a short circuit on the motor power stage.	Shut down the power supply and check if the motor is damaged
Noisy motor movement with vibrations.	May be caused due to a state of resonance.	Increase the resolution of the step angle and/or change the motor velocity to avoid resonance area
The motor produce torque but doesn't rotate	May be caused due to a wrong connection of the I/O's.	Check the connection of the I/O's