

Installation instructions



Refer to installation use and maintenance manual for more information.



3 Axis stepper drive technical data:

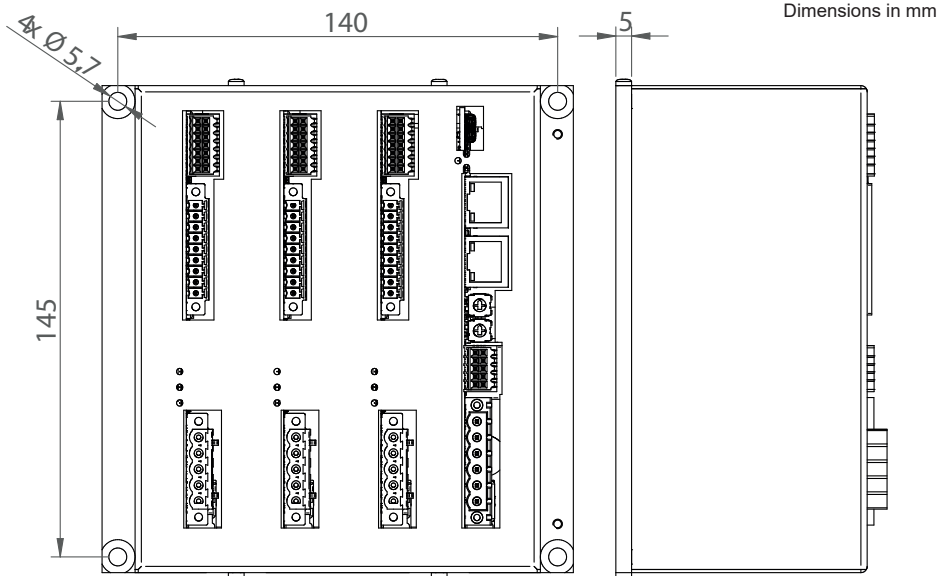
- DC power supply: 24 ± 80 Vdc
- DC logic supply: 24 Vdc (mandatory and isolated)
- Phase current: up to 11 Apeak for each motor
- Chopper frequency: ultrasonic 40KHz
- Stepless Control Technology (65536 position per turn)
- Protections against over current, over/under voltage, overheating, short circuit between motor phase-to-phase and phase-to-ground
- Industrial-Ethernet interface (see ordering code)
- Incremental Encoder (isolated): 5V Differential (RS422) or Single-Ended (TTL/CMOS) (see ordering code)
- Absolute Encoder (isolated): 5V Endat2.2 or BiSS-C or SSI interface (see ordering code)
- USB Service interface for programming and real time debugging (isolated)
- Safe Torque Off (STO) inputs (opto-coupled)
- 12 digital inputs (opto-coupled)
- 6 digital outputs (opto-coupled)
- 3 analog inputs (isolated)
- Dimensions: 155 x 150 x 80 mm (without connectors)
- Protection degree: IP20
- Pollution degree 2
- Overvoltage Category II (not directly connected to supply mains)
- Short Circuit Current: 5 KA
- Protection Class: Class I Equipment
- Category C3 following standard EN 61800-3
- Working temperature: $5^{\circ}\text{C} \pm 40^{\circ}\text{C}$
- Storage temperature: $-25^{\circ}\text{C} \pm 55^{\circ}\text{C}$
- Humidity: 5% $\pm$ 85% not condensing

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VECTOR - STEPPER - DRIVES

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Mechanical data

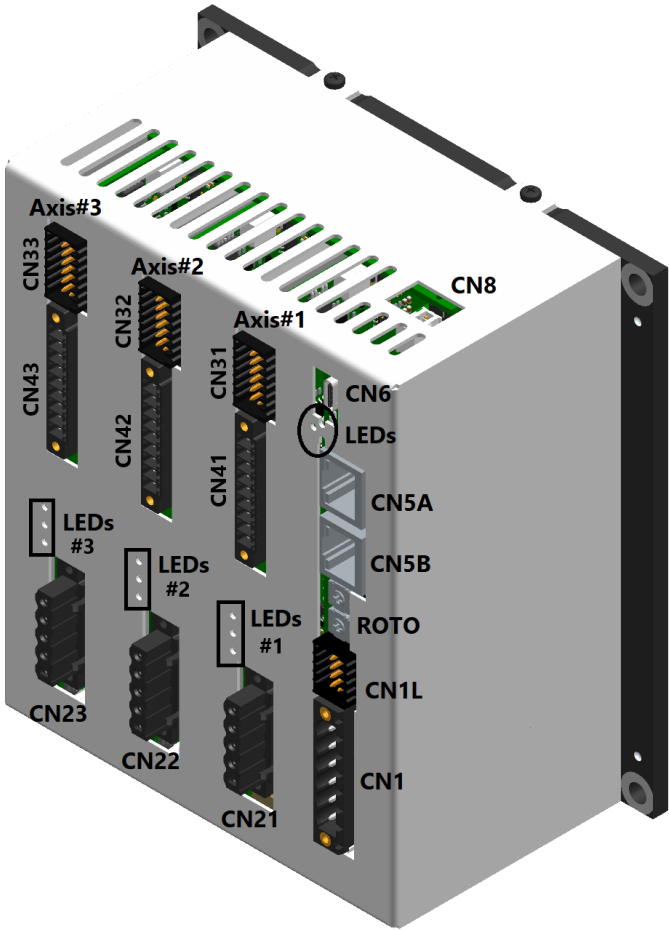


Ordering codes

System code	Fieldbus	Feedback
SW5D3070R473-30	Powerlink	Incremental encoder
SW5D3070R473-35		Absolute encoder
SW5D3070E473-30	Modbus TCP/IP	Incremental encoder
SW5D3070E473-35		Absolute encoder
SW5D3070H473-30	EtherCAT	Incremental encoder
SW5D3070H473-35		Absolute encoder
SW5D3070T473-30	Profinet	Incremental encoder
SW5D3070T473-35		Absolute encoder
SW5D3070I473-30	Ethernet/IP	Incremental encoder
SW5D3070I473-35		Absolute encoder

System connections

Connectors:

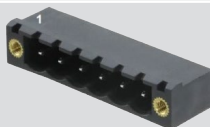


System connection

CN1: Power supply

6 positions, male, with pitch 5.08mm

CN1.1	VIN	PWR_IN	Positive DC power supply input
CN1.2	VIN	PWR_IN	Positive DC power supply input
CN1.3	GND	PWR_IN	Negative DC power supply input
CN1.4	GND	PWR_IN	Negative DC power supply input
CN1.5	N.C.		Not connected
CN1.6	PE		Protective Earth input



Drives are intended for installation in Overvoltage Category II not connected directly to supply mains.



Discharge time of the internal capacitors on the DC power supply.

Wait at least No.30 seconds after disconnecting DC power supply

Time required for the capacitors to a safe discharge to a level below 60 Vdc.

CN21, CN22, CN23: Motors (one connector for each motor)

9 positions, male with pitch 3.5mm

CN2x.1	Phase A	PWR_OUT	Motor output phase A
CN2x.2	Phase A/	PWR_OUT	Motor output phase A/
CN2x.3	Phase B	PWR_OUT	Motor output phase B
CN2x.4	Phase B/	PWR_OUT	Motor output phase B/
CN2x.5	PE_M		Motor protective Earth input



CN41, CN42, CN43: Encoders (one connector for each motor)

9 positions, male with pitch 3.5 mm

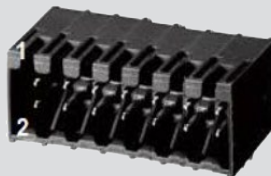
Type	Incremental encoder	Absolute encoder
CN4x.1	ENCA+	CLK+
CN4x.2	ENCA-	CLK-
CN4x.3	ENCB+	DATA+
CN4x.4	ENCB-	DATA-
CN4x.5	ENCZ+	n.c.
CN4x.6	ENCZ-	n.c.
CN4x.7		+5V
CN4x.8		0V
CN4x.9		Cable shield connection



CN31, CN32, CN33: Inputs and Outputs (one connector for each motor)

14 positions, male double row with pitch 2.54mm

CN3x.1	OUT1	Digital output 1
CN3x.2	VSS	Negative reference for OUT1
CN3x.3	OUT0	Digital output 0
CN3x.4	VSS	Negative reference for OUT0
CN3x.5	IN3+	Positive side digital input 3
CN3x.6	IN3-	Negative side digital input 3
CN3x.7	IN2+	Positive side digital input 2
CN3x.8	IN2-	Negative side digital input 2
CN3x.9	IN1+	Positive side digital input 1
CN3x.10	IN1-	Negative side digital input 1
CN3x.11	IN0+	Positive side digital input 0
CN3x.12	IN0-	Negative side digital input 0
CN3x.13	IN_AN0	Analog input 0
CN3x.14	AVSS	Negative reference for IN_AN0



CN1L: 24 Vdc Logic Supply & STO

10 positions, male double row with pitch 2.54mm

CN1L.1	24VDC_IN	24Vdc logic supply input
CN1L.2	VSS_IN	VSS logic supply input
CN1L.3	24VDC_OUT	24Vdc output
CN1L.4	VSS_OUT	VSS output
CN1L.5	24VDC_OUT	24Vdc output
CN1L.6	VSS_OUT	VSS output
CN1L.7	STO1+	STO1 positive input side
CN1L.8	STO1-	STO1 negative input side
CN1L.9	STO+2	STO2 positive input side
CN1L.10	STO-2	STO2 negative input side



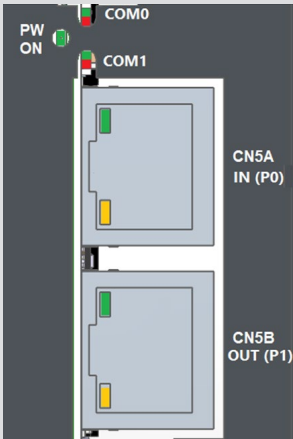
Logic Supply and STO inputs are 24 Vdc MANDATORY and ISOLATED.

System connections

CN5A / CN5B: Industrial Ethernet Interface

Dual RJ45 connectors (P0-P1)

100BASE-TX (100Mb/sec) ports - Accept standard Ethernet cable (CAT5 or higher)



Industrial Ethernet LEDs

Led name	Powerlink	EtherCAT	ModbusTCP	Profinet	Ethernet/IP
COM0	BS - Green	RUN - Green	SF - Red	SF - Red	MS - Green/Red
COM1	BE - Red	ERR - Red	BF - Red	BF - Red	Ns - Green/Red
P0 (on CN5A)	L/A P0 - Green	L/A IN - Green	LINK - Green ACT - Yellow	LINK - Green RX/TX - Yellow	LINK - Green ACT - Yellow
P1 (on CN5B)	L/A P1 - Green	L/A OUT - Green	LINK - Green ACT - Yellow	LINK - Green RX/TX - Yellow	LINK - Green ACT - Yellow

 Refer to the software manual for more details.

CN6: USB Service Interface

USB 2.0 Type C connector

This connection is possible only with software provided by Ever Motion Solutions.

Kit code: [USBC_SERV00EE-1M](#)



CN8: Canbus interface (isolated)

3 positions male with pitch 2.54mm

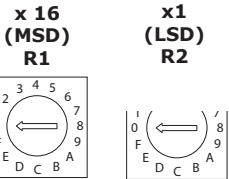
1	CAN_H
2	CAN_L
3	CAN_GND



Roto-Switches settings

 Drives are equipped with two Roto-Switches within it's possible to set the Node ID.
Refer to the Software Manual for more details.

Node ID Selection (Hexadecimal Value)										
R1 x 16 (MSD)	0	0	0	0		2	2		F	F
R2 x 1 (LSD)	0	1	2	3		C	D		E	F
Node ID #	SW settings (default)	1	2	3		44	45		254	255



R1 (MSD): Most Significant Digit that must by multiplied per 16.
R2 (LSD): Least Significant Digit that must by multiplied per 1.
Example: 5C
R1 = 5 ----> 5x16 = 80
R2 = C ----> 12x1 = 12
Node ID = 92

Working Status LEDs (three LEDs for each motor)

		Description	GREEN  PW ON YELLOW  STATUS LEDs GREEN / RED 
	Green ON	Correct functioning	
	Green Blinking	Enable OFF, current zero	
	Yellow ON - Red OFF	Missing setting of Inominal	
	Yellow Blinking (500ms) - Red OFF	Warning: connect with USB and check with software	
	Red ON	Protection: Motor is in open phase condition	
	Red Blinking (200ms)	Current protection	
	Red ON (1sec) + Yellow 1 Blink	Under/Over voltage protection	
	Red ON (1sec) + Yellow 3 Blink	Thermal protection	
	Red ON (1sec) + Yellow 4 Blink	Motor Feedback Error	
	Red ON (1sec) + Yellow 5 Blink	Missing Safe Torque Off	
	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 and Yellow are all OFF.

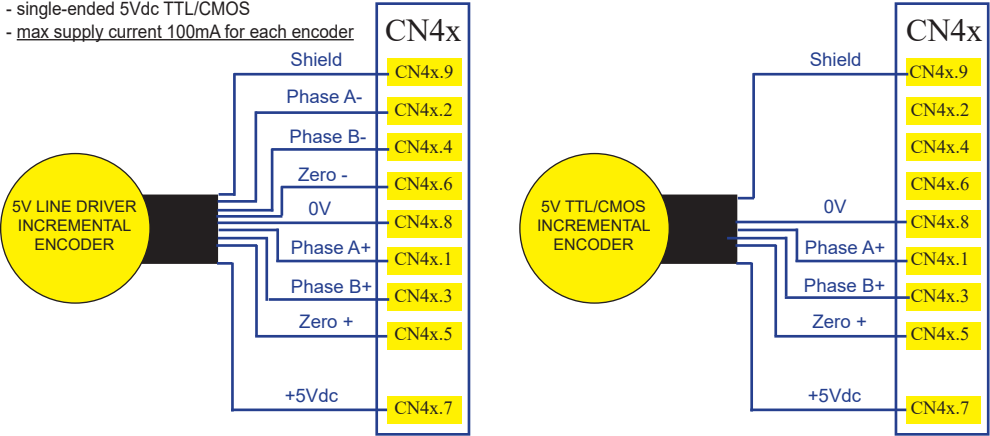
In general:

- Led Red indicates an alarm or a drive protection
- Led Yellow indicates a warning

Incremental and Absolute Encoder input connection (isolated)

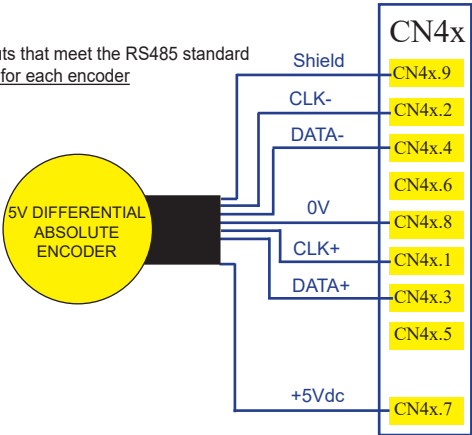
Incremental encoder inputs:

- differential 5Vdc that meet the RS422 standard
- single-ended 5Vdc TTL/CMOS
- max supply current 100mA for each encoder



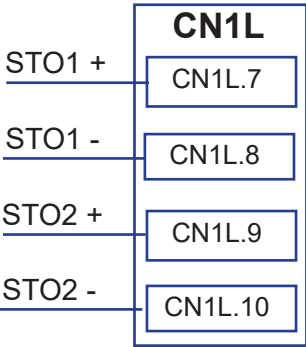
Absolute encoder input:

- differential 5Vdc digital inputs that meet the RS485 standard
- max supply current 100mA for each encoder



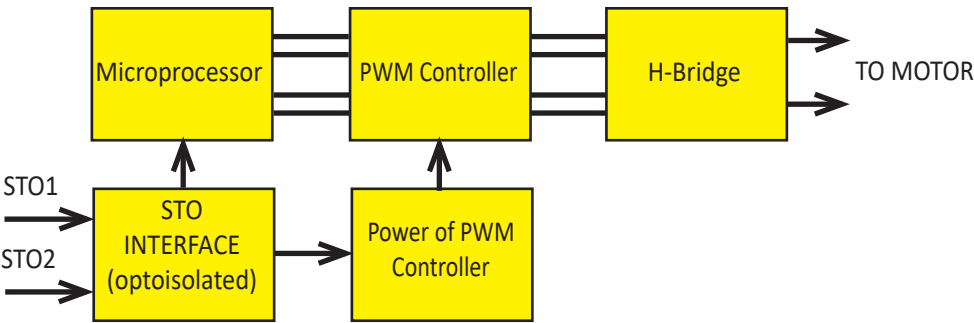
Safe Torque Off inputs (STO)

2 terminals, 24V compatible (optoisolated)



STO1	STO2	Drive Status	Motor Status
+24Vdc	+24Vdc	Enable	SW controlled
+24Vdc	Not connected	Disable	Stop for inertia
Not connected	+24Vdc	Disable	Stop for inertia
Not connected	Not connected	Disable	Stop for inertia

Principle of operation:



The drive has a safety feature that is designed to provide the Safe Torque Off (STO) function. Two input signals are provided which, when not connected, prevent the upper and lower devices in the PWM outputs from being operated by the digital control core. This provides a positive OFF capability that cannot be overridden by the control firmware, or associated hardware components. When both STO signals are activated (current is flowing in the input diodes of the optocouplers), the control core will be able to control the on/off state of the PWM outputs.

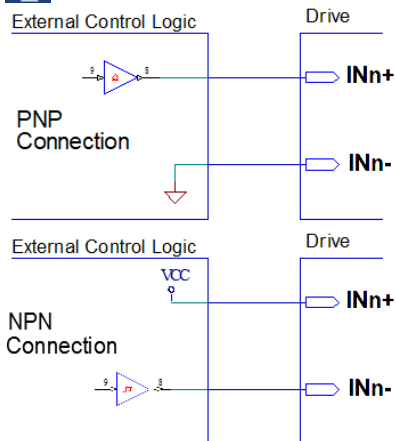
i If not using the STO feature, the interface must be connected to an external +24Vdc supply in order enabled the drive.

i If a drive in operation mode is disabled by STO signal, it immediately finish to produce torque but the motor continues to run by inertia until it can stop.

Digital inputs connection (opto-coupled)



24V PNP/NPN type, $F_{max} = 1\text{kHz}$



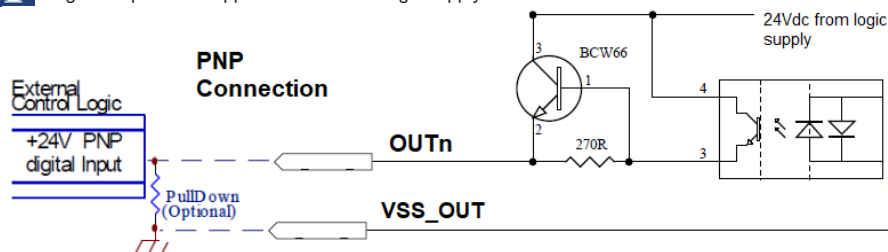
Characteristics	MIN.	MAX.	Unit
Supply voltage	19	24	Vdc
Inputs frequency	--	1	kHz
Threshold switching voltage	10	--	Vdc
Current at 24 Vdc	--	10	mA

Digital outputs connection (opto-coupled)

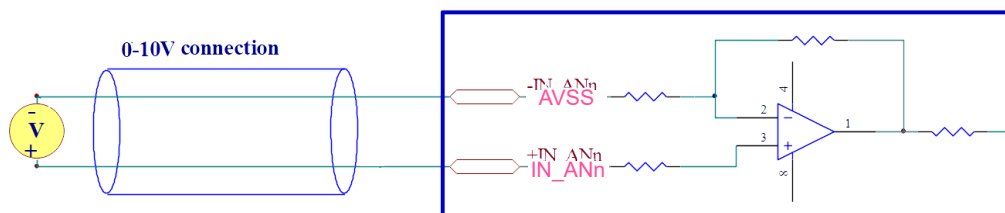


24Vdc PNP, $I_{OUTmax} = 100mA$, $F_{max} = 1kHz$

Digital outputs are supplied from 24 Vdc logic supply



Analog inputs connection (isolated)



Mating connectors

Connector	Description
CN1	Dinkle 2ESSM-06P or Phoenix 1655238
CN1L	Dinkle 0156-1B10-BK
CN21 / CN22 / CN23	Dinkle 2ESHM-05P-BK or Phoenix IC 2, 5/ 5-STF-5,08 BK
CN31 / CN32 / CN33	Dinkle 0156-1B14-BK
CN41 / CN42 / CN43	Dinkle 0221-2809-BK or Phoenix FMC 1,5/ 9-STF-3,5 BK
CN5A / B	Ethernet standard cables (CAT5 or higher)
CN6	USB 2.0 Type-C

Cables section

Function	Cable	
	Minimum	Maximum
Power supply and PE	0.20 mm ² (AWG24)	2.50 mm ² (AWG12)
Motors outputs	0.20 mm ² (AWG24)	2.50 mm ² (AWG12)
Logic supply & STO	0.14 mm ² (AWG26)	0.50 mm ² (AWG20)
Feedback	0.20 mm ² (AWG24)	1.50 mm ² (AWG16)
Digital Inputs / Outputs	0.14 mm ² (AWG26)	0.50 mm ² (AWG20)
Fiedlbus interfaces	Ethernet standard cables (CAT5 or higher)	

Verify the installation

- Check all connection: power supply and inputs/outputs
- Make sure all settings right for the application.
- Make sure the power supply is 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.

Analysis of malfunctions



When any of the following situations occur, the drive is placed in a fault condition.

DEFECT	CAUSE	ACTION
Intervention of the thermal protection.	Can be caused by a heavy working cycle or a high current in the motor.	Improve the drive cooling by natural or fan air flow. Consider to use a motor with a higher torque vs current rating.
Intervention of the current protection.	Short circuit on the motor powering stage(s) of the drive.	Check motor windings and cables to remove the short circuits replacing faulty cables or motor if necessary.
Intervention of the over/under voltage protection.	Supply voltage out of range	Check the value for the supply voltage
Open phase motor protection.	Motor windings to drive not proper connection.	Check motor cables and connections to the drive.



When any of the following situations occur, the drive doesn't work and isn't placed in an error condition.

DEFECT	CAUSE	ACTION
Noisy motor movement with vibrations.	Can be caused by a lack of power supply to a phase of the motor or a poor regulation of the winding currents.	Check the cables and connections of the motor and/or change the motor speed to avoid a resonance region.
The external fuse on the power supply of the drive is burned.	Can be caused by a wrong connection of the power supply.	Connect the power supply correctly and replace the fuse.
At high speed, the motor torque is not enough.	Can be due to a "self-limitation" of motor current and torque.	Increase the motor current (always within the limits), increase the supply voltage, change motor connection from series to parallel.

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