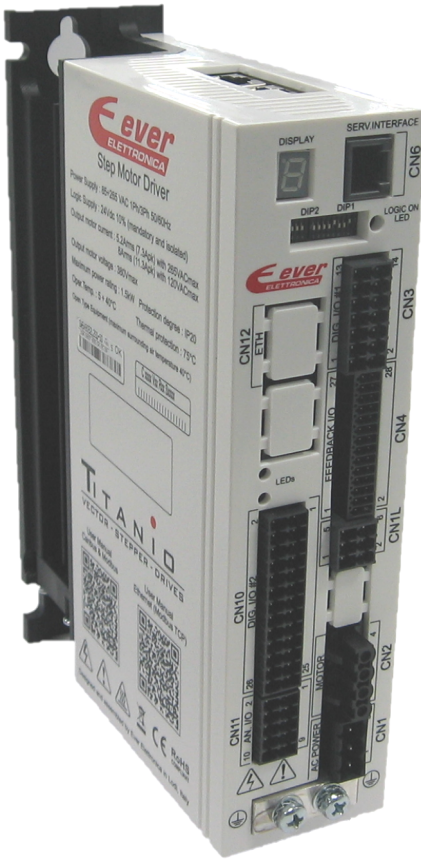
MAN.HESW5A9052

SW5A9052x2x1
SW5A5080x2x1
Manual for Installation Use and Maintenance



TITANIO
VECTOR - STEPPER - DRIVES

c UL us
E363861

STO
Safe Torque Off
SIL3
PLe

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EVER Elettronica S.r.l.
Via del Commercio 2/4, Loc. San Grato Z.I.
26900 – LODI – ITALY
Phone: ++39(0)371412318 Fax: ++39(0)371412367
e-mail : infoever@everelettronica.it
URL : www.everelettronica.it

Release	Name	FA	Action	Date
0.0	Sonzogni	HD	First draft	08/10/2020

Printed in LODI – ITALY 08/10/2020

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1 INTRODUCTION

1.1 Guarantee

Ever Elettronica guarantee that their motors and drives supplied to the client (end user, machine builder or distributor), are free of defects caused by materials, shipment operations and packaging and to meet the guarantee in accordance with the client's specifications who has accepted the written terms defined by Ever.

The product guarantee is valid for the duration of 3 year from the date of construction, which is indicated by the code on the label present on the system.
During the guarantee period of the product, Ever is in no case responsible for damages to the product caused by improper storage or installation, negligent maintenance or unauthorized modifications or repairs to the product.

The responsibility of EVER is limited to the reparation (or replacement at their insight) of any manufactured product, or part of it, which is defect due to defect materials or a manufacturing defect, in accordance with the guarantee conditions of EVER.

The content of this manual is updated until the date of printing. With the continuous development and introduction of product improvements, EVER have the right to change the technical specifications of their products and to alter the content of this manual without the obligation to announce it.

EVER dissuades the use of its products in applications that support vital functions where in the damaging or failure of its products can directly threaten the life or safety of persons, other living beings and things. The user that applies the EVER products to applications that support vital functions is responsible for all risks during the use and the indemnify of EVER from all caused damage.

1.2 In this manual

The symbols used in this manual have the following meaning:

 ***Danger Warning Caution***	*Used for circumstances in which the life or health of the user are exposed to **danger** or where in **serious damage** to the materials may occur.*
 ***Attention!***	***Special instructions** for a safe use and an effective installation.*
 ***Information***	*Used to stress **important additional information.***
 ***EMC***	*An essential element to stay within the limits specified by the **EMC** directives is, in addition to the use of filters, the installation in accordance with the EMC requirements.*

1.3 General drive description

The information in this manual refers to all versions of the drives (refer to chapter 4 VERSIONS AVAILABLE for all possible versions).
Where there is the general indication, the informations should be considered applicable to all version.

The drives have been designed to drive with stepless technology 2 phase stepper motors, keeping the phase current sinusoidal regardless from the selected step angle resolution, in order to realize fluid movements and precise positioning.

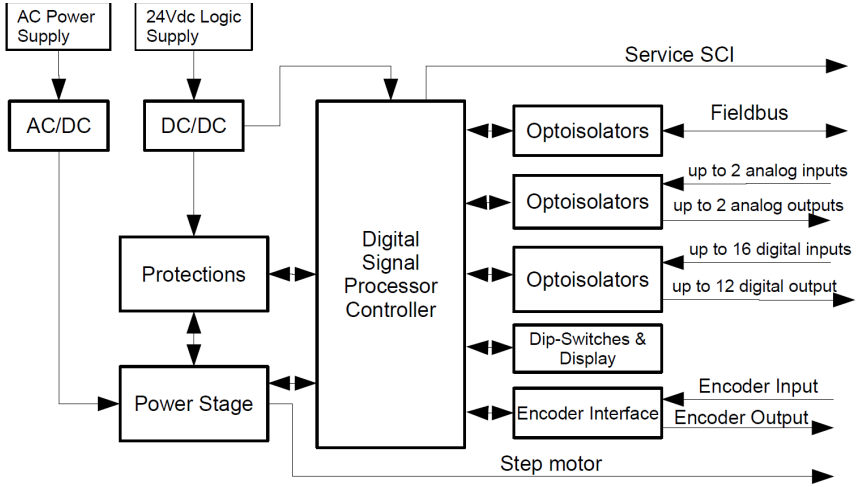
The drives can control the motors with winding current

- **Version SW5A9052** : up to 7,3Apk (5,2Arms)
- **Version SW5A5080** : up to 11,3Apk (8Arms)

The drive is suitable for:

- Stepless : smooth movements and precision positioning;
- Sinusoidal winding currents to optimize the motor performances;
- Protection set and monitoring of the system status.
- Protections to protect the electronics against eventual damages such as:
  - over- and under- voltage;
  - overheating;
  - over current;
  - open motor phase;
- Possibility to generate operational ramps for the motor;

The diagram shows the functional blocks composing the drives.

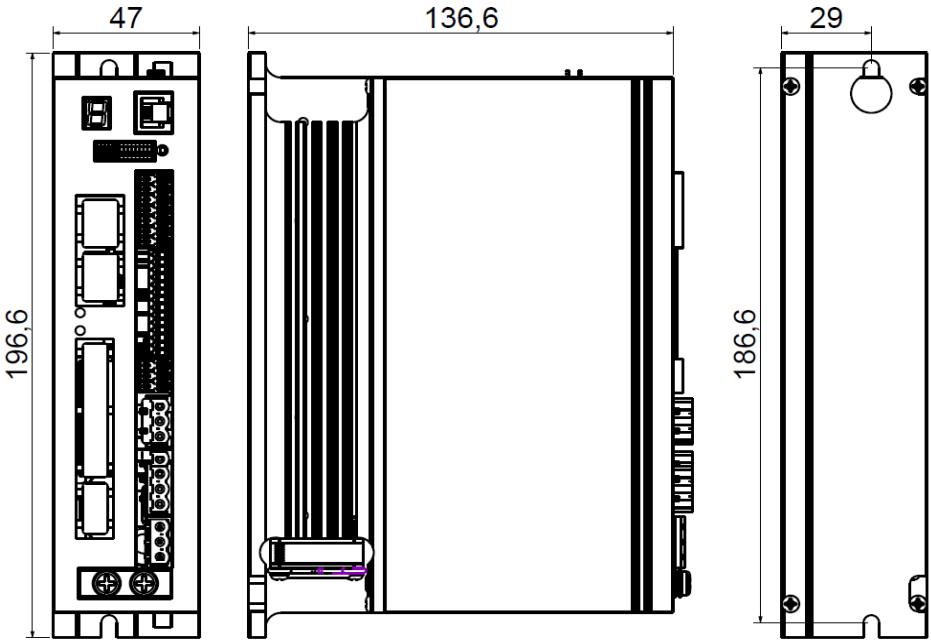


This manual contains the main information and the procedures for installation, start up and maintenance of the drive. Many functions of the drive depend on the drive version. *(refer to chapter 4 VERSIONS AVAILABLE for all possible versions).*

2 FUNCTIONAL CHARACTERISTICS

2.1 Mechanical and Environmental

		Unit	Notes
Dimensions	196,6 x 136,6x 47 (L x D x H)	mm	Excluding the footprint of the mating connectors. (For details check the following mechanical design).
Weight	max 930	gr	Excluding the mating connectors
IP protection class	IP20		
Pollution Degree	2		
Overvoltage category	III		
Operating temperature	5°C ÷ 50°C	°C	
Storage temperature	-25°C ÷ 55°C	°C	Without condensing
Umidity	5% ÷ 85%	%	
Short Circuit Current (SCC)	5	KA	
Protection class	Class I Equipment		



2.2 Electrical

2.2.1 Power supply

For the functioning of the drives an AC power supply is needed and also a 24Vdc for logic supply (mandatory and isolated).
For the technical specifications, limitations and connections regarding the power supply, refer to the chapters *3.2 Planning the power supply* and *3.3 Choosing the stepper motor*.

		MIN	TYP	MAX	Unit	Notes
AC Power Supply	Nominal Voltage	100	-	**240 (SW5A9052)** **120 (SW5A5080)**	Vac	Nominal range
	Input Limit Voltage	85		**265 (SW5A9052)** **140 (SW5A5080)**	Vac	Including the ripple and the network fluctuations.
	Maximum current			5,2	A_{RMS}	@ maximum motor current V+=maximum allowed, full step, maximum load to the shaft **(1)**
DC Logic Supply (mandatory and isolated)	Nominal Voltage	21	24	30	Vdc	Nominal range
	Current			500	mA	@VLOG=21Vdc
Motor	Current			**5.2 (SW5A9052)** **8.0 (SW5A5080)**	A_{RMS}	Settable by Software
				7.3 (SW5A9052) **11.3 (SW5A5080)**	A_{PK}	
	PWM Frequency	Ultrasonic 40KHz (one event every 25µsec)			KHz	
	Step Angle	Full step, ½, ¼, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/5, 1/10, 1/25, 1/50, 1/125, 1/250				Settable by Software
	Rotation speed			3000	RPM	**(2)**
Driver status	Display	7 Segment Display				
User settings		12 Dip-Switches				Depending by software

(1) the maximum current and power consuption depend from the motor, the load applied to the shaft and the motion parameters set.

(2) theoretical rotation limit managed by the drive, depending on the following physical parameters: power supply voltage, phase current, dynamic motor characteristics, load to the shaft.
Outside this limit, the drive is not able to guarantee a correct sequences control.

Protections:

Protection	*Trigger*	*Effect*	*Restore*
Over Current Fast electronic protection on the motor outputs against short circuits between the motor phases and between the phases and ground.	Short circuit or excessive current absorption.	- opening of the drive power stages - display signalling	It's advisory to remove the power supply to the drive to eliminate the cause of the protection. It's possible to restore protection by performing the procedure software reset alarm.

Protection	*Trigger*	*Effect*	*Restore*
Open Phase detects an open circuit on the motor phases	Motor connection not right	- opening of the drive power stages - display signalling	It's advisory to remove the power supply to the drive to eliminate the cause of the protection. It's possible to restore protection by performing the procedure software reset alarm.

Protection	*Trigger*	*Effect*	*Restore*
Over Temperature detects an over temperature of the heatsink.	Temperature of heatsink >75°C	- opening of the drive power stages - display signalling	It's necessary to wait until the temperature is within the acceptable range. It's possible to restore protection by performing the procedure software reset alarm.

Protection	*Trigger*	*Effect*	*Restore*
Over/Under Voltage detects a power supply voltage outside the functioning range.	(1) Low power supply voltage, too high, extra voltages due to BEMF generated by the motor dragged by the load.	- opening of the drive power stages - display signalling	It's necessary to wait until the voltage is within the acceptable range. It's possible to restore protection by performing the procedure software reset alarm.

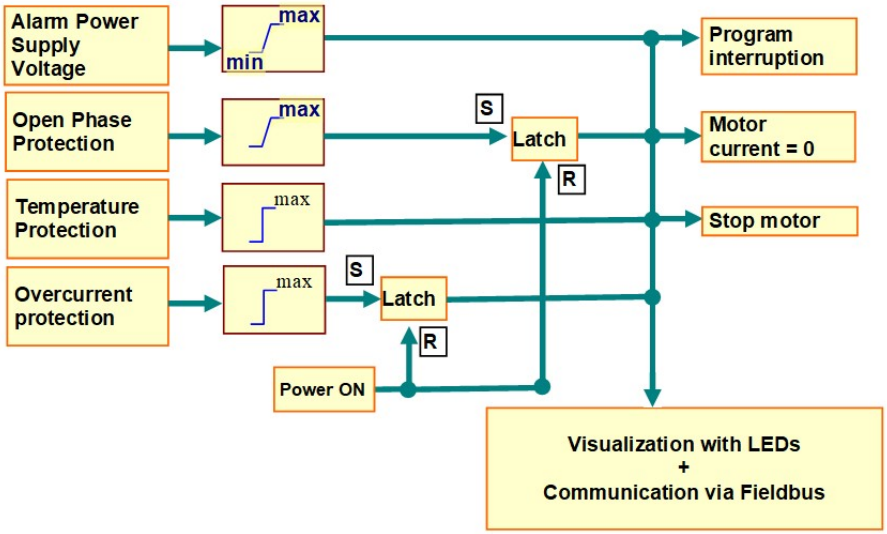
(1) Note : the voltage value is measured on base of the power supply for the motor. Eventual voltage out of range Range of 24V_{DC} for digital output can't be detected.

When the protection interrupt the power supply of the motor, no maintenance torque (Holding Torque) is supplied and the load can drag the motor shaft. **The user must provide devices which will ensure the safaty of the load.**

In deafault condition all Dip-Switches=OFF except DIP1.5 and DIP1.8 that are ON.

A detailed description of the protections and the related visualizations is given in paragraph 3.7 Analyses of malfunctions.

Functional diagram of the protections :



Note :

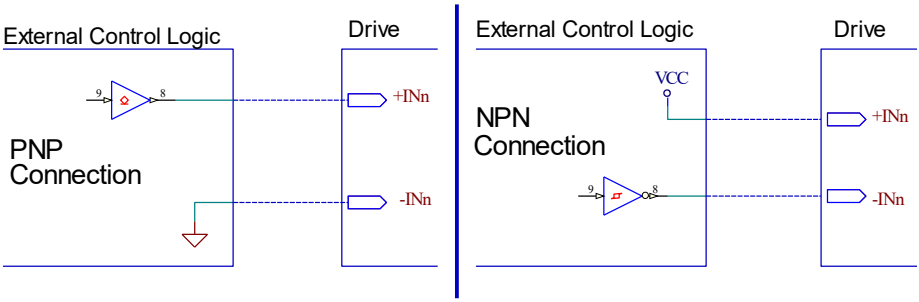
2.2.2 Digital Inputs

2.2.2.1 Digital Inputs (B0_IN0-B0_IN3)

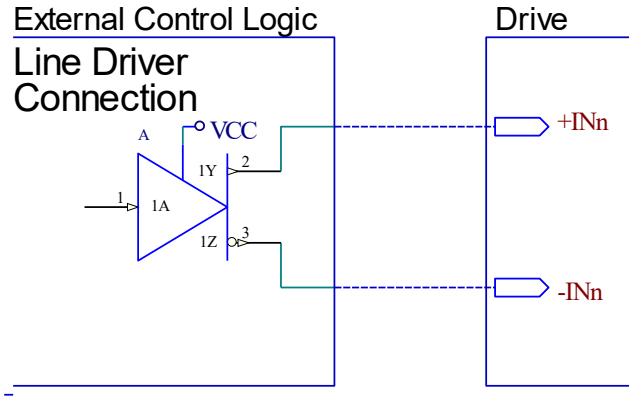
The drives are equipped on CN3 connector with 4 digital inputs optoisolated which can use between voltages **2-24Vdc** in PNP, NPN and Line-Driver connection.
For information regarding the connection to the digital inputs, refer to paragraph *3.5.1 Connection to the drive*.

The following figures supply some examples of possible connections to the digital inputs:

Voltage : 3.3 – 24 VDC



Voltage : 2 – 24 VDC



N.B. It's recommended to use 2Vdc digital inputs only in Line-Driver configuration to have more noise immunity.

Electrical Specification of Digital Inputs (B0_IN0-B0_IN3)

B0_IN0 and B0_IN1			
Characteristics	**MIN.**	**MAX.**	**Unit**
Supply Voltage	2	24	Vdc
Inputs Frequency	--	10	Khz
Threshold switching voltage	1,61	--	Vdc
Current at 2Vdc	--	2,53	mA
Current at 3,3Vdc	--	5,84	mA
Current at 5Vdc	--	6,28	mA
Current at 24Vdc	--	8,75	mA

B0_IN2 and B0_IN3			
Characteristics	**MIN.**	**MAX.**	**Unit**
Supply Voltage	2	24	Vdc
Inputs Frequency	--	500	Khz
Threshold switching voltage	1,61	--	Vdc
Current at 2Vdc	--	2,53	mA
Current at 3,3Vdc	--	5,84	mA
Current at 5Vdc	--	6,28	mA
Current at 24Vdc	--	8,75	mA

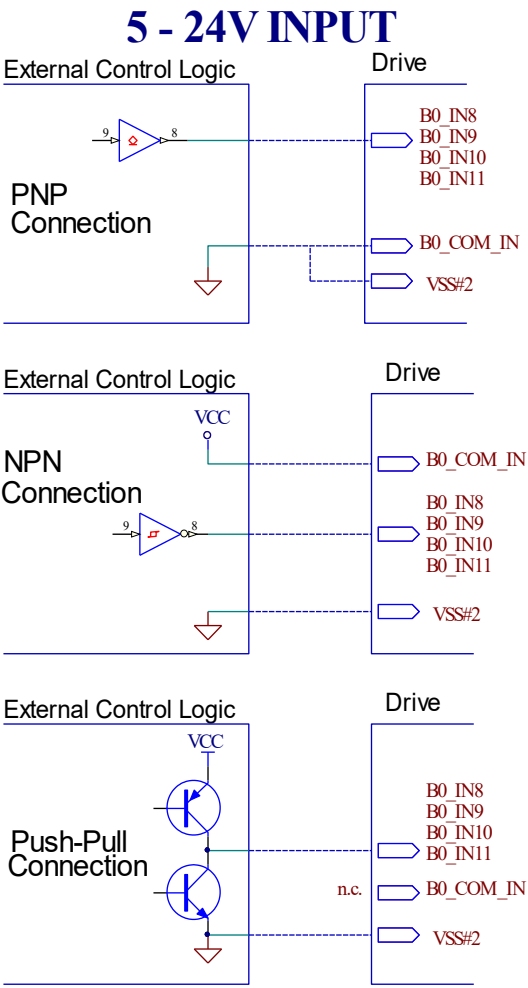
For a proper use, the Digital inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

The functions of the digital inputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.2.2 Digital Inputs (B0_IN8-B0_IN11)

Drives in version *SW5A9052x2**G**1-30 and SW5A5080x2**G**1-30* are equipped on CN10 connector with 4 digital inputs optoisolated which can use between voltages 5**-24Vdc** in Single-Ended PNP, NPN or Push-Pull connection.
For information regarding the connection to the digital inputs, refer to paragraph *3.5.1 Connection to the drive*.

The following figures supply some examples of possible connections to the digital inputs:



N.B.: All these inputs must be connected with the same configuration (PNP, NPN or Push-Pull).

Electrical Specification of Digital Inputs (B0_IN8-B0_IN11)

Characteristics	MIN.	MAX.	Unit
Supply Voltage	5	24	Vdc
Inputs Frequency	--	100	KHz
Threshold switching voltage	2	--	Vdc
Current at 5Vdc	--	2	mA
Current at 24Vdc	--	12	mA

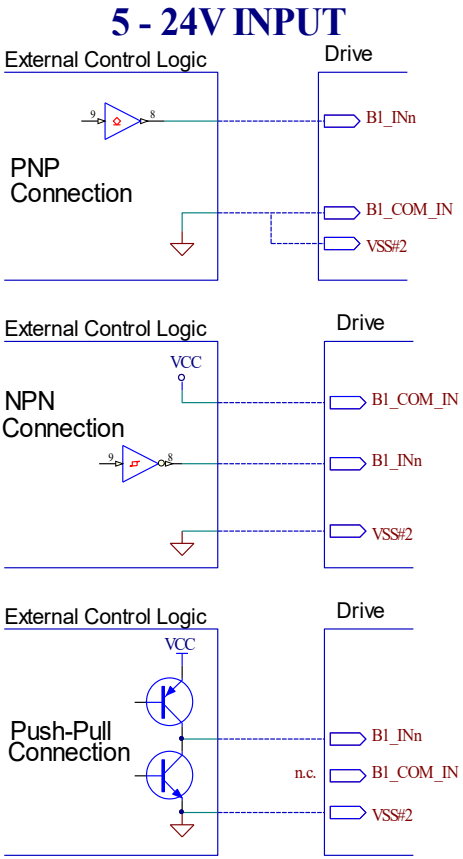
For a proper use, the Digital inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

The functions of the digital inputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.2.3 Digital Inputs (B1_IN0-B1_IN7)

Drives in version *SW5A9052x2**G**1-30 and SW5A5080x2**G**1-30* are equipped on CN10 connector with 8 digital inputs optoisolated which can use between voltages **5-24Vdc** in Single-Ended PNP, NPN or Push-Pull connection.
For information regarding the connection to the digital inputs, refer to paragraph *3.5.1 Connection to the drive*.

The following figures supply some examples of possible connections to the digital inputs:



N.B.: All these inputs must be connected with the same configuration (PNP, NPN or Push-Pull).

Electrical Specification of Digital Inputs (B1_IN0-B1_IN7)

Characteristics	MIN.	MAX.	Unit
Supply Voltage	5	24	Vdc
Inputs Frequency	--	250	Hz
Threshold switching voltage	2,5	--	Vdc
Current at 5Vdc	--	2	mA
Current at 24Vdc	--	12	mA

For a proper use, the Digital inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

The functions of the digital inputs depend on the firmware installed on the drive. Refer to the Software manuals.

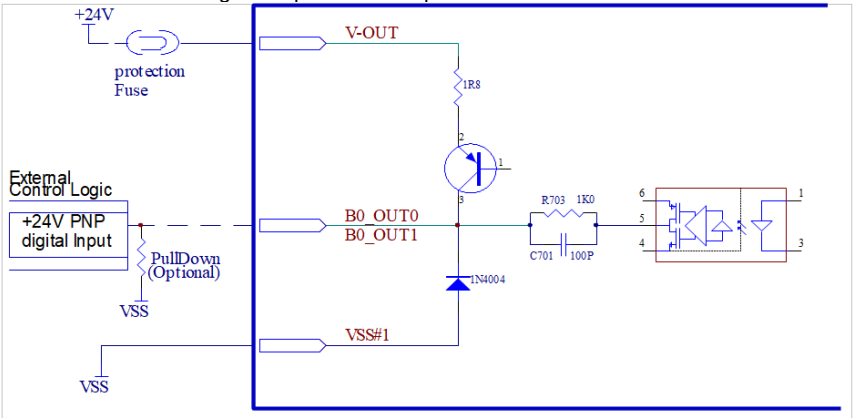
2.2.3 Digital Outputs

2.2.3.1 Digital Outputs (B0_OUT0-B0_OUT1)

Drives are equipped on CN3 connector with 2 digital outputs optoisolated which can be use at **24Vdc** in PNP connection (forcing at 24Vdc).
For information regarding the connection to the digital outputs, refer to paragraph *3.5.1 Connection to the drive*.

The digital outputs are dimensioned to function at V_{OUTmax}=24Vdc, I_{OUTmax}=100mA and they are protected from inversion of the polarity.

Schematic of the digital outputs for example of the connections.



Electrical specifications

Output type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply output voltage	19	24	30	V
	Output current (1)			100	mA
	Output frequency			500	KHz

(1) depends from the load

*Attention : **digital outputs are not protected in current.***
Provide an external current limitation device (I_{OUTmax} = 100mA).
The protective device may be placed on the output power conductor +24V_{DC} (CN3.2).

For a proper use, the Digital outputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

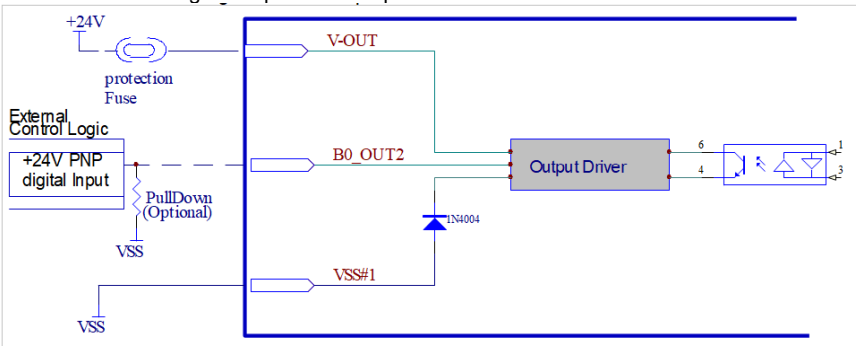
The functions of the digital outputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.3.2 *Digital Output (B0_OUT2)*

Drives are equipped on CN3 connector with a digital output optoisolated which can be use at **24Vdc** in PNP connection (forcing at 24Vdc).
For information regarding the connection to the digital outputs, refer to paragraph *3.5.1 Connection to the drive*.

The digital output is dimensioned to function at V_{OUTmax}=24Vdc, I_{OUTmax}=1.3A and it's protected from inversion of the polarity.

Schematic of the digital output for example of the connections.



Electrical specifications

Output type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply output voltage	19	24	30	V
	Output current (1)			1,3	A
	Output frequency			1	KHz

(1) dipendente dal carico

*Attention : **digital output is not protected in current.***
Provide an external current limitation device (I_{OUTmax} = 100mA).
The protective device may be placed on the output power conductor +24V_{DC} (CN3.2).

For a proper use, the Digital outputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

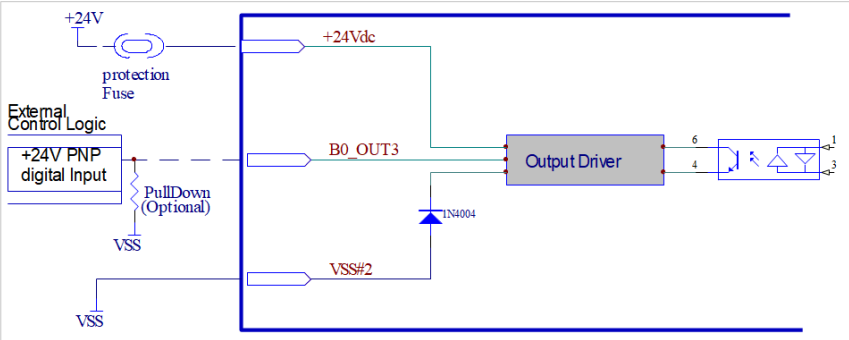
The functions of the digital outputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.3.3 Digital Output (B0_OUT3)

Drive in version *SW5A9052x2**G**1-30* and *SW5A5080x2**G**1-30* are equipped on CN10 connector with a digital output optoisolated which can be use at **24Vdc** in PNP connection (forcing at 24Vdc).
For information regarding the connection to the digital outputs, refer to paragraph *3.5.1 Connection to the drive*.

The digital output is dimensioned to function at V_{OUTmax}=24Vdc, I_{OUTmax}=500mA and it's protected from inversion of the polarity.

Schematic of the digital output for example of the connections.



Electrical specifications

Output type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply output voltage	19	24	30	V
	Output current (1)			500	mA
	Output frequency			1	KHz

(1) dipendente dal carico

*Attention : **digital output is not protected in current.***
Provide an external current limitation device (I_{OUTmax} = 100mA).
The protective device may be placed on the output power conductor +24V_{DC} (CN10.1).

For a proper use, the Digital outputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

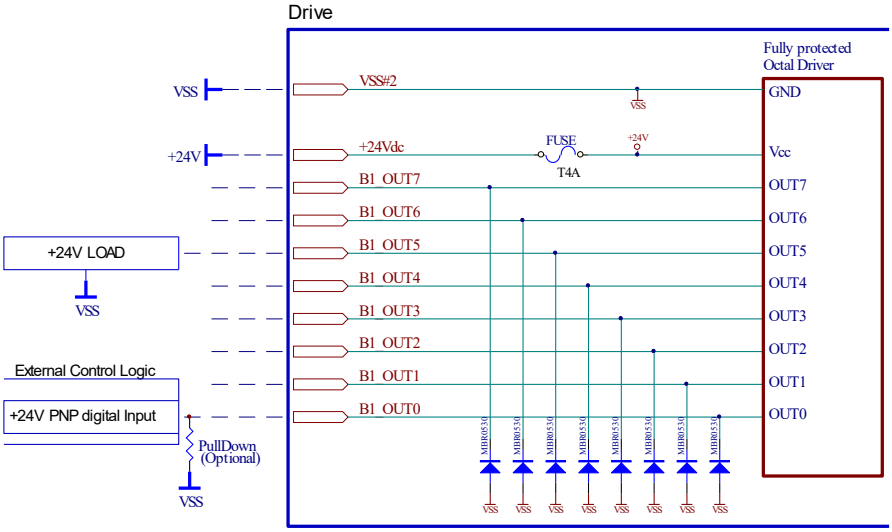
The functions of the digital outputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.3.4 Digital Outputs (B1_OUT0-B1_OUT7)

Drive in version *SW5A9052x2**G**1-30* and *SW5A5080x2**G**1-30* are equipped on CN10 connector with 8 digital outputs optoisolated which can be use at **24Vdc** in PNP connection (forcing at 24Vdc).
For information regarding the connection to the digital outputs, refer to paragraph *3.5.1 Connection to the drive*.

The digital output is dimensioned to function at V_{OUTmax}=24Vdc, I_{OUTmax}=100mA and it's protected from inversion of the polarity.

Schematic of the digital output for example of the connections.



Electrical specifications

Output type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply output voltage	19	24	30	V
	Output current (1)			100	mA
	Output frequency			250	Hz

(1) dipendente dal carico

For a proper use, the Digital outputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

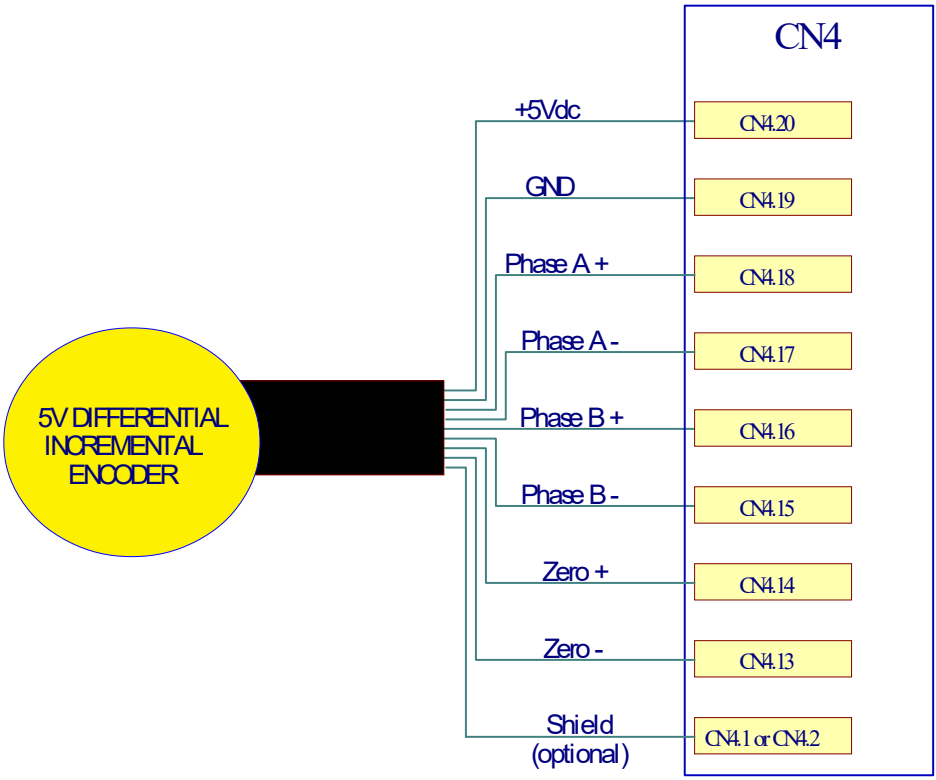
The functions of the digital outputs depend on the firmware installed on the drive. Refer to the Software manuals.

2.2.4 *Incremental Encoder Input*

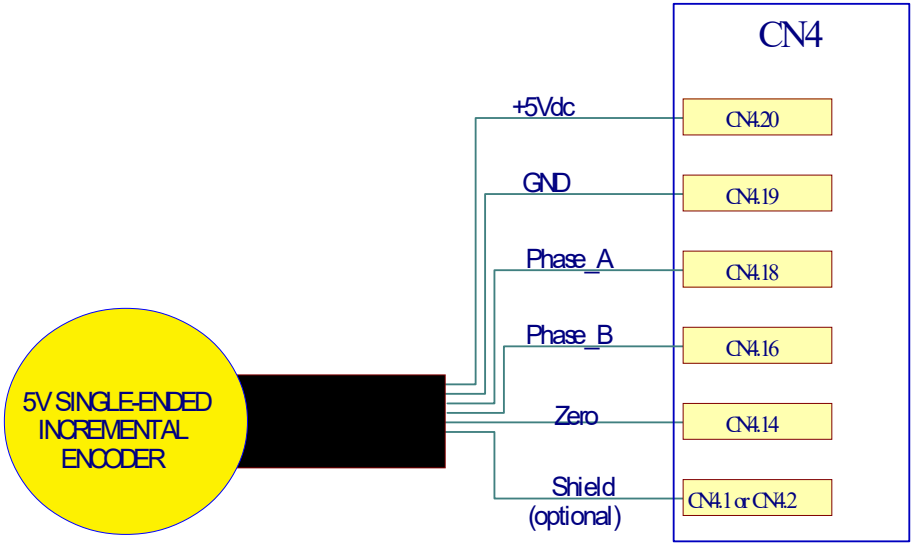
The drives are equipped on connector CN4 with a direct interface (isolated) for an incremental encoder connection in two configuration :
- differential 5Vdc that meet the requirements of RS422 standard
- single-ended 5Vdc TTL/CMOS

The maximum supply current reserved for the encoder is 100mA.

The following figure shows the connection to a differential incremental encoder :



The following figure shows the connection to a single-ended incremental encoder :



For a proper use, the Encoder Inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

2.2.5 Incremental Encoder Output

The drives are equipped on connector CN4 with a direct (isolated) differential encoder output at 5Vdc that meet the requirements of RS422 standard.
This interface replies exactly the encoder input signals connected on CN4 connector.
For information regarding the connection to the encoder output, refer to paragraph 3.5.1 Connection to the drive.

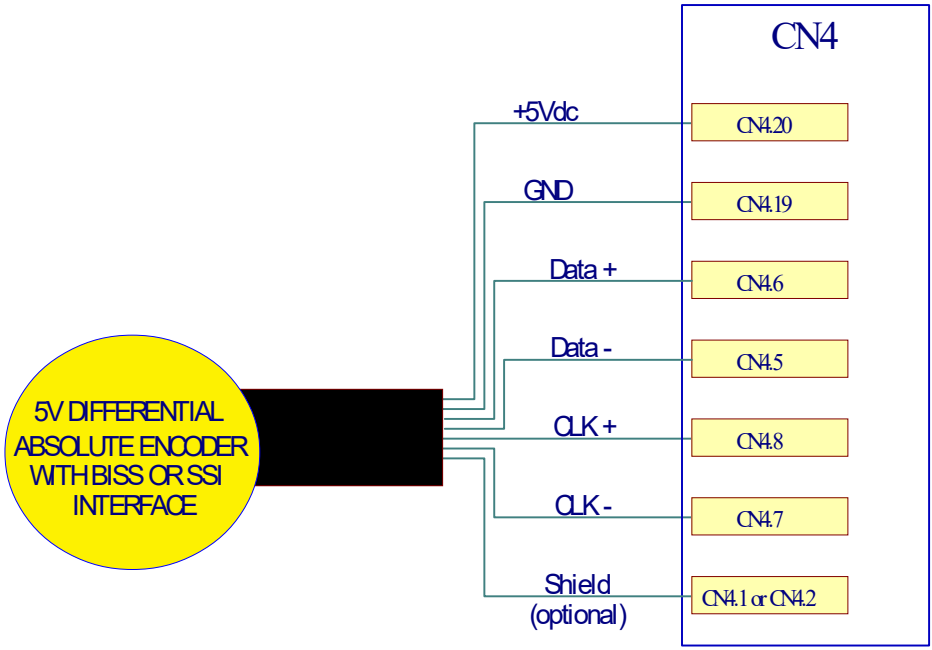
The following figure shows the connection to the differential encoder output :

2.2.6 *Absolute Encoder Input*

The drives are equipped on connector CN4 with a direct interface (isolated) for an absolute encoder connection in configuration differential 5Vdc that meet the requirements of RS422 standard.

The maximum supply current reserved for the encoder is 100mA.

The following figure shows the connection to an absolute encoder :



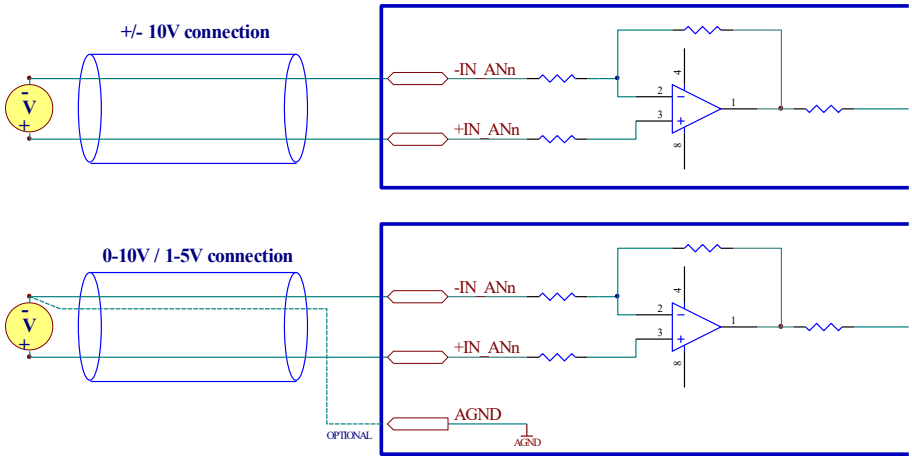
For a proper use, the Encoder Inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

2.2.7 Analog Inputs

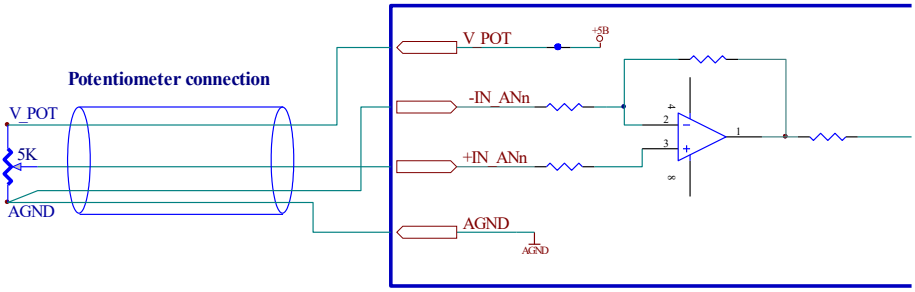
Drives in version *SW5A9052x2**G**1-30* and *SW5A5080x2**G**1-30* are equipped on connector CN11 with 2 analog inputs (isolated) that can be connected in various configuration.
For information regarding the connection to the analog inputs refer to paragraph 3.5.1 Connection to the drive.

The resolution of the analog inputs depends from the type of the connection which could be defined by software : differential or potentiometer.

Connection diagram of the digital inputs in "Differenzial" configuration :



Connection diagram of the digital inputs in "Potentiometer" configuration :



Electrical specifications

Type	CHARACTERISTICS			Unit
n. 2 differential analog inputs isolated compatible CEI EN61131-2	Input type	Differential	Potentiometer	
	Nominal input voltage	±10	0-5	V
	Input impedance	248	248	kΩ
	Read resolution (value LSB)	4.8	4.8	mV
	Resolution ADC	12	12	bit
	Maximum error over the entire temperature range.	0,3	0,3	%
	Maximal overload	27	18	V
	Digital output value in case of overload (with positive input)	4095	4095	ADC value
	Sampling period (minimum)	200	200	µs
	Characteristics of the input filter	RC Filter settable by software		

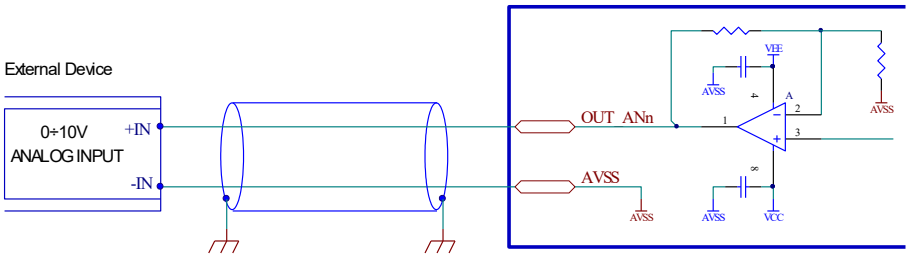
The functions of the analog inputs depend on the firmware installed on the drive. Refer to the Software manuals.

For a proper use, the Analog Inputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

2.2.8 Analog Outputs

Drives in version *SW5A9052x2**G**1-30* and *SW5A5080x2**G**1-30* are equipped on connector CN11 with 2 analog outputs (isolated) that can be connected in **0-10V**.
For information regarding the connection to the analog inputs refer to paragraph 3.5.1 Connection to the drive.

The following figure shows the connection to an analog output :



The functions of the analog outputs depend on the firmware installed on the drive. Refer to the Software manuals.

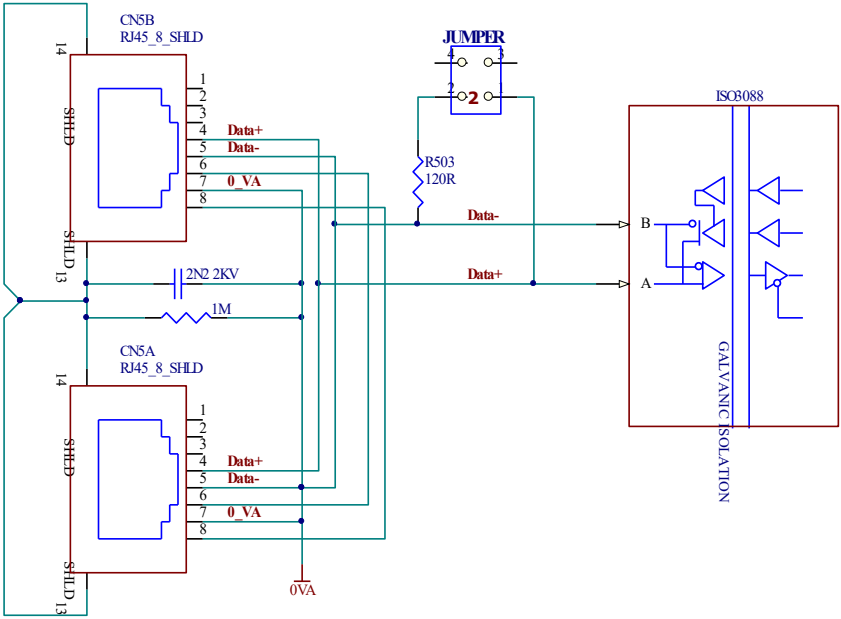
For a proper use, the Analog Outputs must be wired using shielded cables. The connection of the screen has to be valued for every application; depending on the lay-out of the machine. Generally, it's more utile to connect the screen from both sides to the ground. It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

2.2.9 *Modbus RS485 Interface*

Modbus interface allows a multi-point link connection conforming the standard RS-485 CCITT V.11 X.27. The isolated interface is supplied of power through an internally isolated DC/DC converter, no external power supply is needed.
The presence of the Modbus interface depends on the system version.

Drives in version S*W5A9052**L**2x1-30 and* S*W5A5080**L**2x1-30* are equipped with 2 connectors RJ45 8 parallel pins (CN5A and CN5B) to simplify the connection of the nodes to the MODBUS ® network.
N.B. : connectors pinout is in common with Canbus interface.

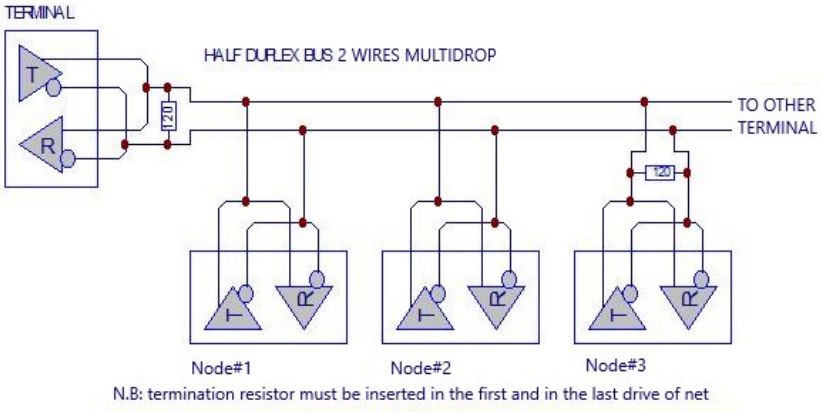
Schematic of the Modbus RS485 interface :



Refer to software manuals for information about the functioning of Modbus RS485 interface.

For a proper use, the communication interfaces must be wired using shielded cables. The connection to the screen must be evaluated for every application, following the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground, It's important that the cables are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph 3.5.1.4 Guideline for wiring .

Connection to the RS485 network



If a system is present in the beginning or at the end of the network, the terminal resistor can be inserted closing JUMPER in position 2.

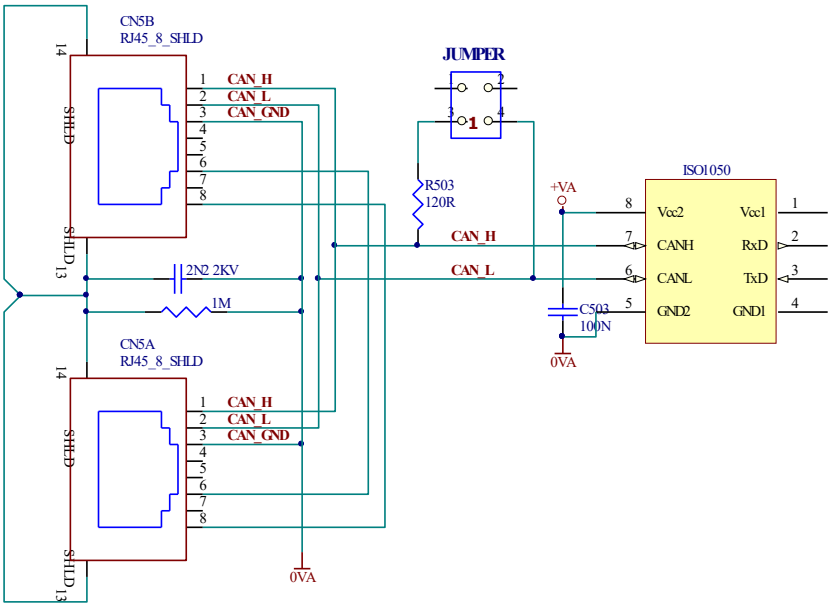
The position of the JUMPER is indicated in paragraph 3 DRIVE INSTALLATION.

2.2.10 Canbus interface

The CANbus interface allows a multi-point connection in accordance to the ISO 11898 standard. The isolated interface is supplied of power through an internally isolated DC/DC converter, no external power supply is needed.
The presence of the Canbus interface depends on the system version.

Drives in version S*W5A9052**L**2x1-30 and* S*W5A5080**L**2x1-30* are equipped with 2 connectors RJ45 8 parallel pins (CN5A and CN5B) to simplify the connection of the nodes to the CANBUS network.
N.B. : connectors pinout is in common with Modbus interface.

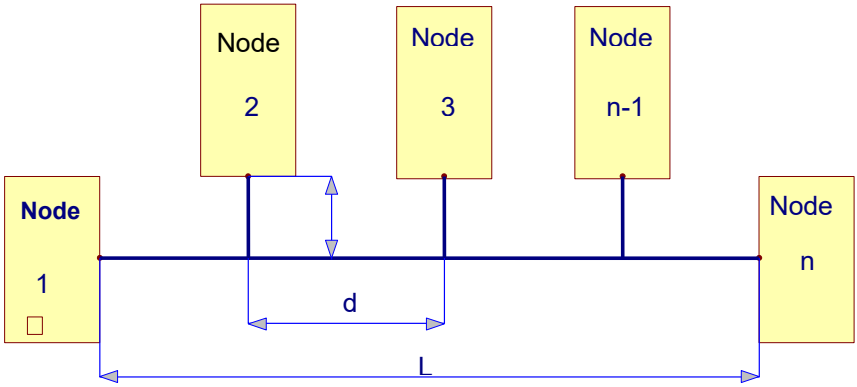
Schematic of the Canbus interface :



Refer to software manuals for information about the functioning of Canbus interface.

For a proper use, the communication interfaces must be wired using shielded cables. The connection to the screen must be evaluated for every application, following the lay-out of the machine. Generally, it's the best to connect the screen from both sides to the ground, It's important that the cables are not exposed to disturbances. Therefore it is important to follow the instructions defined in paragraph 3.5.1.4 Guideline for wiring .

Connection to the CANbus network

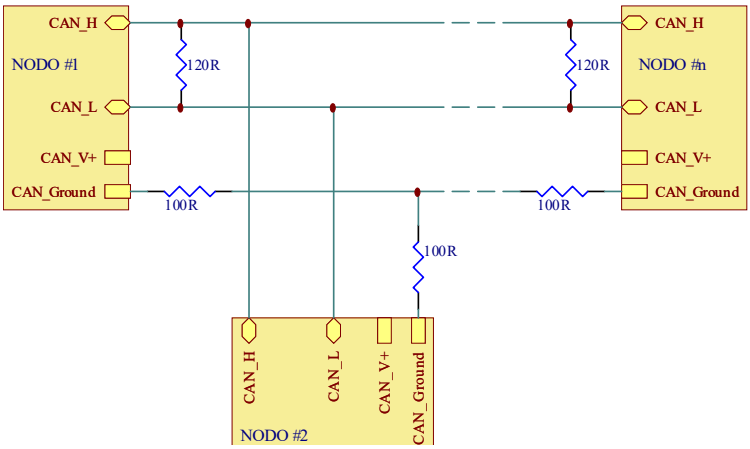


Network parameters (from ISO 11898)						
Parameters	**Size**	**Unit**	**Values**			**Conditions**
			Min.	**Nom.**	**Max.**	
Bus length	L	m	0		40	
Deviation length	l	m	0		0.3	Bit rate: 1Mbit/sec
Nodes distances	d	m	0.1		40	

From Can In Automation (CIA)				
Bus length	**Cable**		**Termination resistance**	**Data rate max [kbit/s]**
	Res/m	**Section**		
0..40m	70 mΩ/m	0.25mm²..0.34mm² AWG23, AWG22	124Ω (1%)	1 Mbit/s at 40m
40..300m	< 60 mΩ/m	0.34mm²..0.6mm² AWG22, AWG20	127Ω (1%)	500 Kbit/s at 100m
300..600m	< 40 mΩ/m	0.5mm²..0.6mm² AWG20	150Ω to 300Ω	100 Kbit/s at 500m
600m..1km	< 26 mΩ/m	0.75mm²..0.8mm² AWG18	150Ω to 300Ω	50 Kbit/s at 1Km

Cabling Used cables with braided and shielded wires.
requirements : ***Refer to the specifications defined by Can In Automation (CiA).***

Schematic of the CanOpen network:



Note: the first and last system connected to the network must have a termination resistance. The CAN_ground connection is optional.

If a system is present in the beginning or at the end of the network, the terminal resistor can be inserted closing JUMPER in position 1.

The position of the JUMPER is indicated in paragraph 3 DRIVE INSTALLATION.

2.2.11 Industrial-Ethernet Interface

Drives in version S*W5A9052**H**221-30,* S*W5A5080**H**221-30,* S*W5A9052**T**221-30 and* S*W5A5080**T**221-30* are equipped with 2 connectors RJ45 8 pins (CN12A and CN12B) to simplify the connection of the nodes to the Industrial-Ethernet network.
Drives in version S*W5A9052**E**2x1-30 and* S*W5A5080**E**2x1-30* are equipped with a connector RJ45 8 pins (CN12) to simplify the connection of the nodes to the Industrial-Ethernet network.

N.B. : Industrial-Ethernet type depends on drive version.
(refer to chapter 4 VERSIONS AVAILABLE for all possible versions)

Refer to software manuals for information about the functioning of Industrial-Ethernet interface.

The maximum lenght of each network segment have to be 100m.

Cabling Requirements Use *UTP (Unshielded Twisted Pair) cables with category CAT5E or higher It's also accepted the use of STP (Shielded Twisted Pair) or FTP (Foiled Twisted Pair) cables with category CAT5E or higher.*
Refer to the specifications defined by a TIA/EIA-568-B.

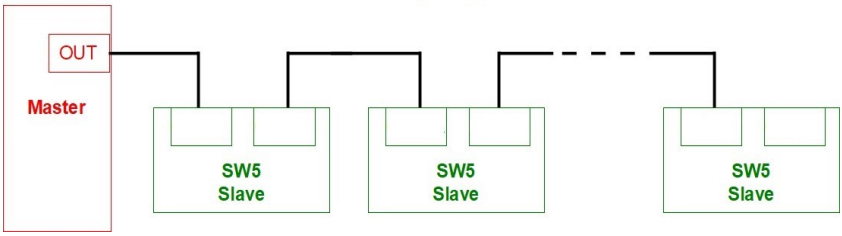
It's important that the cables are not exposed to disturbing sources. Therefore it's important to follow the instructions of paragraph 3.5.1.4 Guideline for wiring.

2.2.11.1 EtherCAT or Profinet network connection

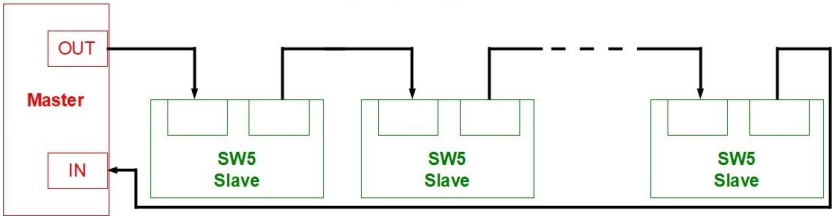
Schematic of the EtherCAT or Profinet network:

The network topology is daysi-chain. All connections are done using point-to-point cables. The global topology can be linear or ring:

- Linear, when the OUT port of the last drive in the chain remains not connected and the Master is only connected to the first drive.



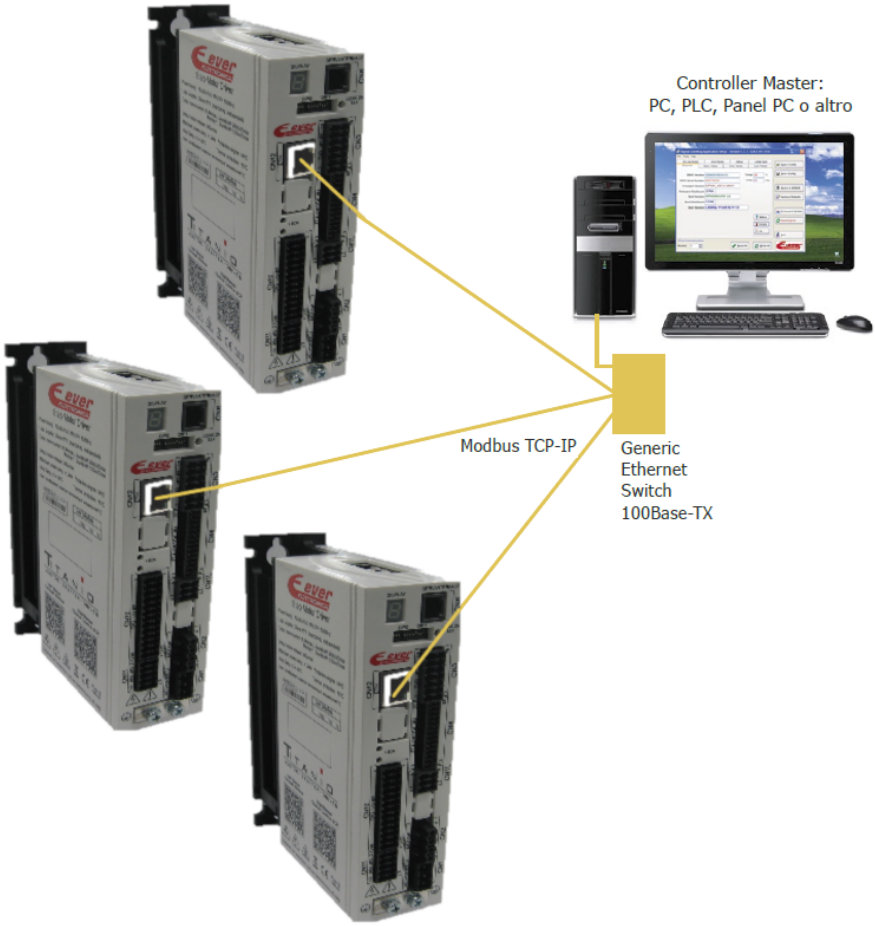
- Ring, when the OUT port of the last drive in the chain is connected back to the Master.



Ring topology is preferred for it's added security, since it is sensitive to one broken cable/ connection along the ring.

2.2.11.2 Modbus TCP/IP (Ethernet) network connection

Use a standard Ethernet Switch 100BASE-TX to connect the drive to an Ethernet network.

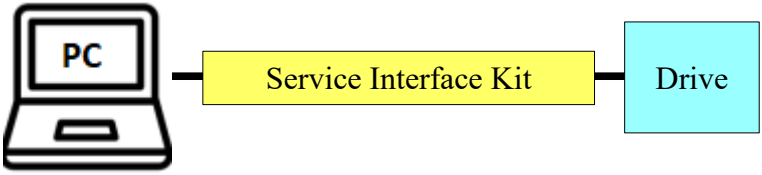


2.2.12 Service SCI Interface

Drives are equipped with CN6 connector dedicated for the Service SCI interface.

The Service SCI interface allows a point-to-point connection between the system and the PC.

This connection is only possible with hardware and software provided by Ever. (kit code SW5_SERV00-SL or SW5_SERV00-EE).

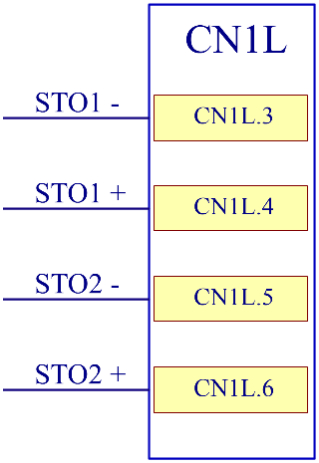


Refer to software manuals for information about the functioning of Service SCI interface.

2.2.13 Safe Torque Off (STO) inputs

Drives are equipped on CN1L connector of 2 Safe Torque Off (STO) inputs.

2 digital inputs 24Vdc (optoisolated)



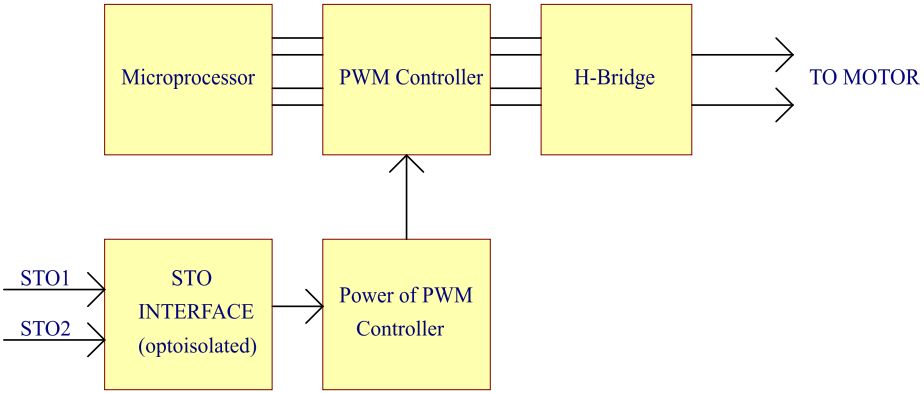
STO1	STO2	Drive status	Motor status
+24Vdc	+24Vdc	Enabled	Controlled by SW
+24Vdc	Not connected	Disabled	Stop for inertia
Not connected	+24Vdc	Disabled	Stop for inertia
Not connected	Not connected	Disabled	Stop for inertia

STO inputs are optoisolated, shall not be used the same 24Vdc of logic supply for their connection.

Safety specifications		
Safety function Category Performance Level Safety Integrity Level	STO 4 PLe SIL3	Safe Torque Off In accordance with EN ISO 13849-1 In accordance with EN ISO 13849-1 In accordance with EN ISO 13849-1 table 3
DC_{avg} [%]	99	Average Diagnostic Coverage
PFH_D [1/h]	6,44 x 10^{-9}	Probability of dangerous failure per hour
T Service Life [Years]	20	In accordance with EN ISO 13849-1
Type test	The STO function has been certified by an independent testing body.	

Refer to the "Safety Manual_STO on SW5-AW5 Series" for more details of the Safe Torque Off function characteristics.

Principle of operation:



The drive has a safety feature that is designed to provide the Safe Torque Off (STO) function. Two input signlas 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.

If not using the STO feature, both signals must be connected to a 24Vdc supply in order enabled the drive.

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.

2.3 Standards

The EVER drives have been designed and produced observing the following Directives and Standards:

Directives :	2014/35/EU	Low Voltage
	2014/30/EU	Electromagnetic compatibility
Standards :	EN 61800-3	Variable speed drives – Electromagnetic compatibility and specific testing methods.
	EN 61800-5-1	Variable speed drives – Safety requirements
	UL 61800-5-1	Variable speed drives – Safety requirements (File number E363861)

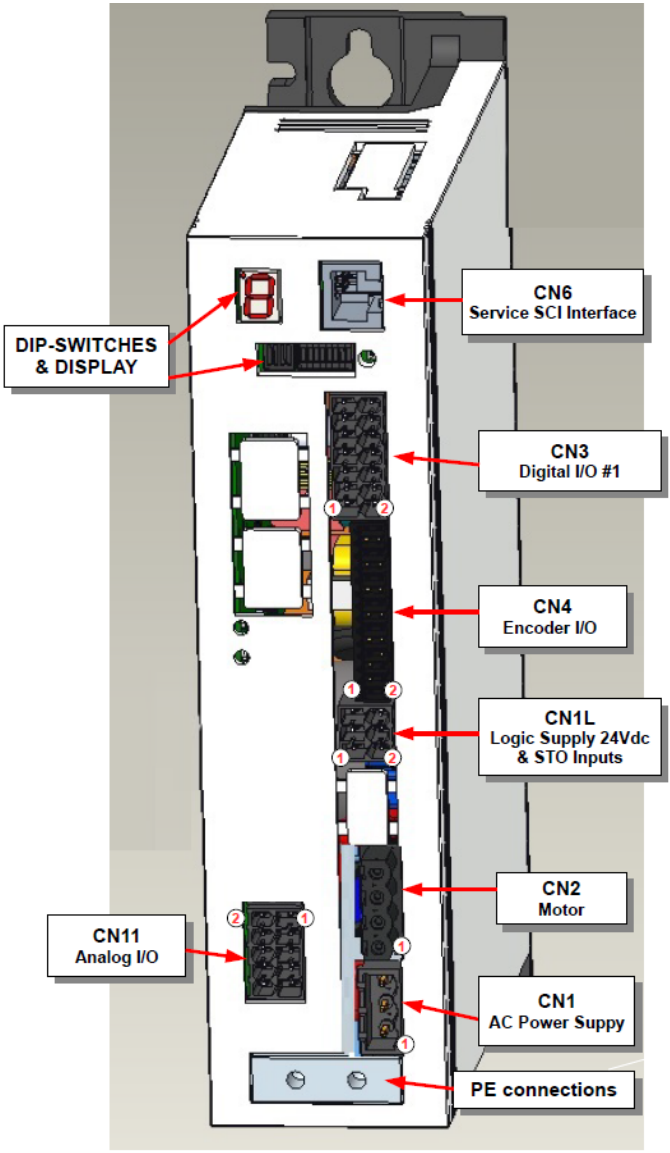
The compliance with the Electromagnetic Compatibility directives of the EVER product can only be verified if the entire machine, where from the drive is a component, has been designed and realized in compliance with the requirements for Electromagnetic Compatibility.

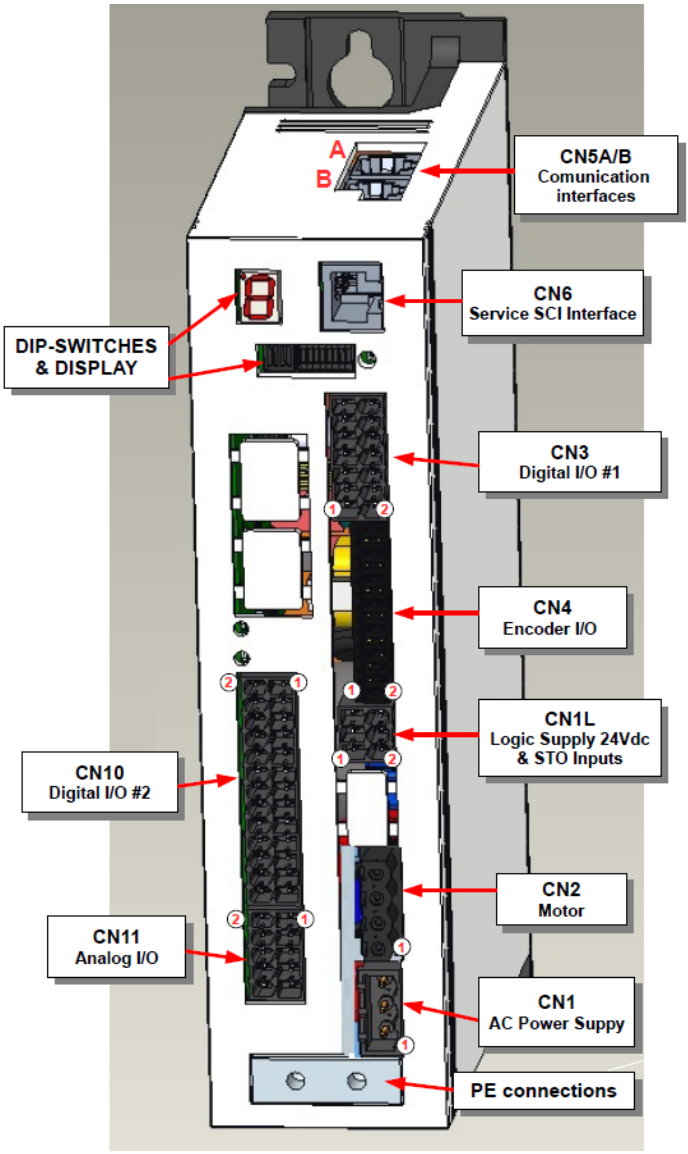
The installation of the drive has to be executed in accordance with the guidelines outline in chapter *3 DRIVE INSTALLATION* .

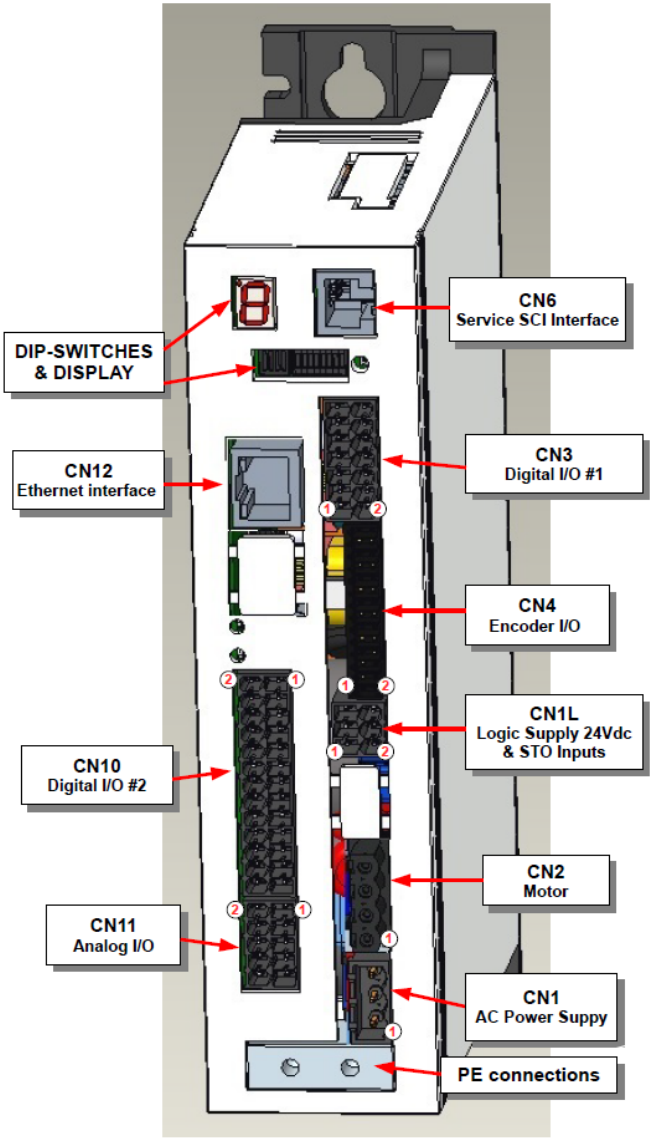
3 DRIVE INSTALLATION

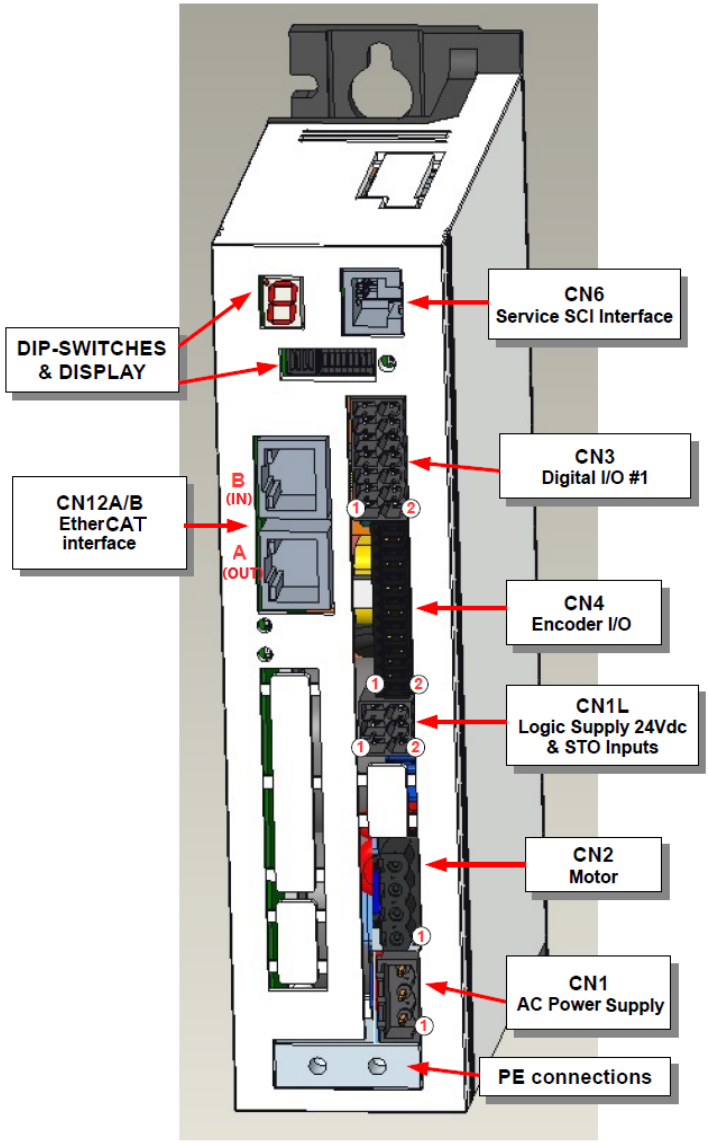
In this section are given some guidelines for the safe installation of the drives and the stepper motor.

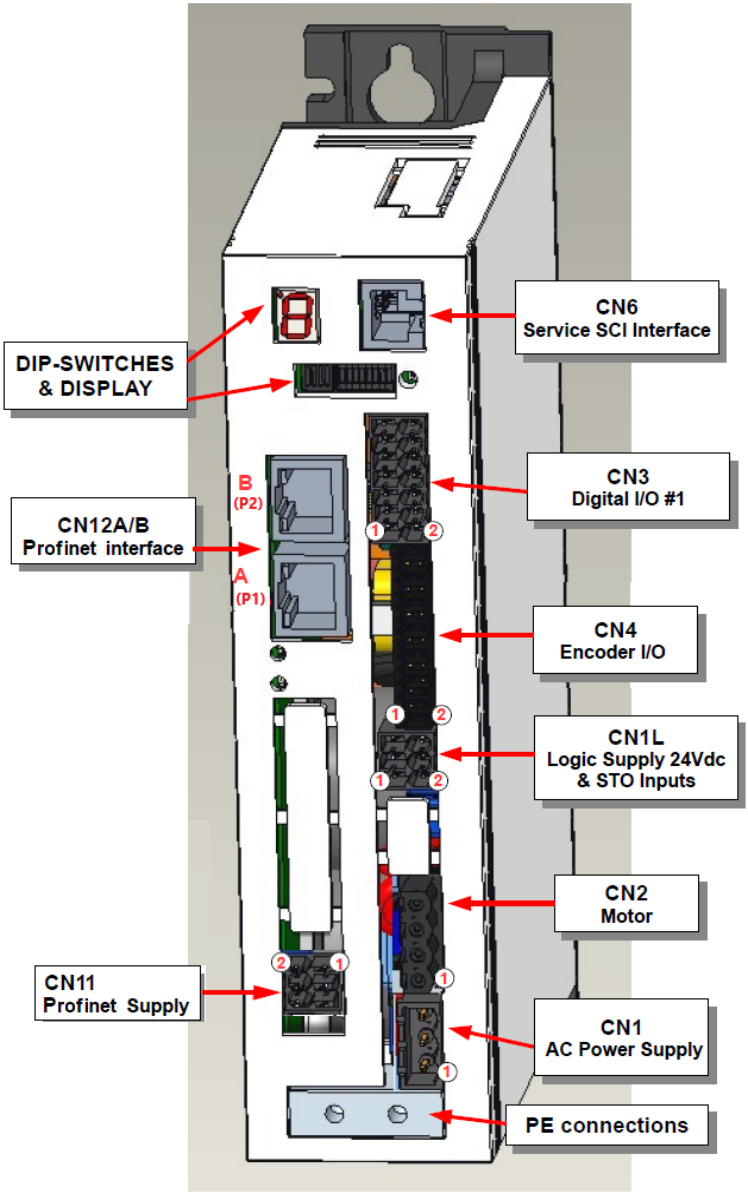
Versions S*W5A9052**N**2x1-30 and* S*W5A5080**N**2x1-30*




A
B
CN5A/B
Comunication interfaces
CN6
Service SCI Interface
DIP-SWITCHES & DISPLAY
CN3
Digital I/O #1
CN4
Encoder I/O
CN1L
Logic Supply 24Vdc & STO Inputs
CN10
Digital I/O #2
CN2
Motor
CN11
Analog I/O
CN1
AC Power Suppy
PE connections


CN6
Service SCI Interface
DIP-SWITCHES
& DISPLAY
CN12
Ethernet interface
CN3
Digital I/O #1
CN4
Encoder I/O
CN1L
Logic Supply 24Vdc
& STO Inputs
CN10
Digital I/O #2
CN2
Motor
CN11
Analog I/O
CN1
AC Power Suppy
PE connections


DIP-SWITCHES
& DISPLAY
CN12A/B
EtherCAT
interface
B
(IN)
A
(OUT)
CN6
Service SCI Interface
CN3
Digital I/O #1
CN4
Encoder I/O
CN1L
Logic Supply 24Vdc
& STO Inputs
CN2
Motor
CN1
AC Power Supply
PE connections


DIP-SWITCHES
& DISPLAY
CN6
Service SCI Interface
CN3
Digital I/O #1
B
(P2)
CN12A/B
Profinet interface
A
(P1)
CN4
Encoder I/O
CN1L
Logic Supply 24Vdc
& STO Inputs
CN2
Motor
CN11
Profinet Supply
CN1
AC Power Supply
PE connections

3.1 Safe installation and use of the unit

Only qualified staff is allowed to install the drives, after having read and understood the information in this manual. The installation instructions have to be followed and approved. Eventual doubts need to be clarified with the supplier of the equipment before using.

EVER will not take any responsibility for indirect damage due to negligence, wrong installation, modifications to the product without approval or wrong connections of the equipment to the wiring.

SECURITY
In particular, the user must:

- Remove the power supply before realizing or removing a connection:
- Not work on the drive without that has been realized a ground connection for the drive and the motor. The Protective Earth connection (PE) has to comply with the local requirements in force.
- Not establish connections to the internal circuit of the drive;

- Wait until the green LED light is switched off before manipulating or executing maintenance to the drive;
- Not use the function ENABLE as safety stop. Always remove the power supply voltage from the drive to establish a safe switching off;
- Pay attention to the heat loss of some parts of the drive: using the drive in extreme applications, some surfaces reach high temperatures. Before disconnecting the device, wait until it has cooled down;
- In case of missing voltage the motor is not able to keep the load: it's thus forbidden to use the motor if the condition of missing holding torque of the motor can create a dangerous situation, unless the user provides special devices to block the load.

The negative pole of the power supply is NOT connected to the ground through an internal connection to the drive. If this default connection doesn't suit the requirements of the application, the user needs to refer to support@everelettronica.it for the necessary technical information.

ELECTROMAGNETIC COMPATIBILITY

Take all precautions and requirements which are necessary for the compliance with the electromagnetic compatibility (drive is in Category C3 following standard EN 61800-3).

Some disturbances generated by other insufficiently filtered and/or shielded equipment, can cause malfunctions in the drive which can result into uncontrolled movements.

When making the connections, take into account the requirement of paragraph *3.5.1.4 Guideline for wiring*.

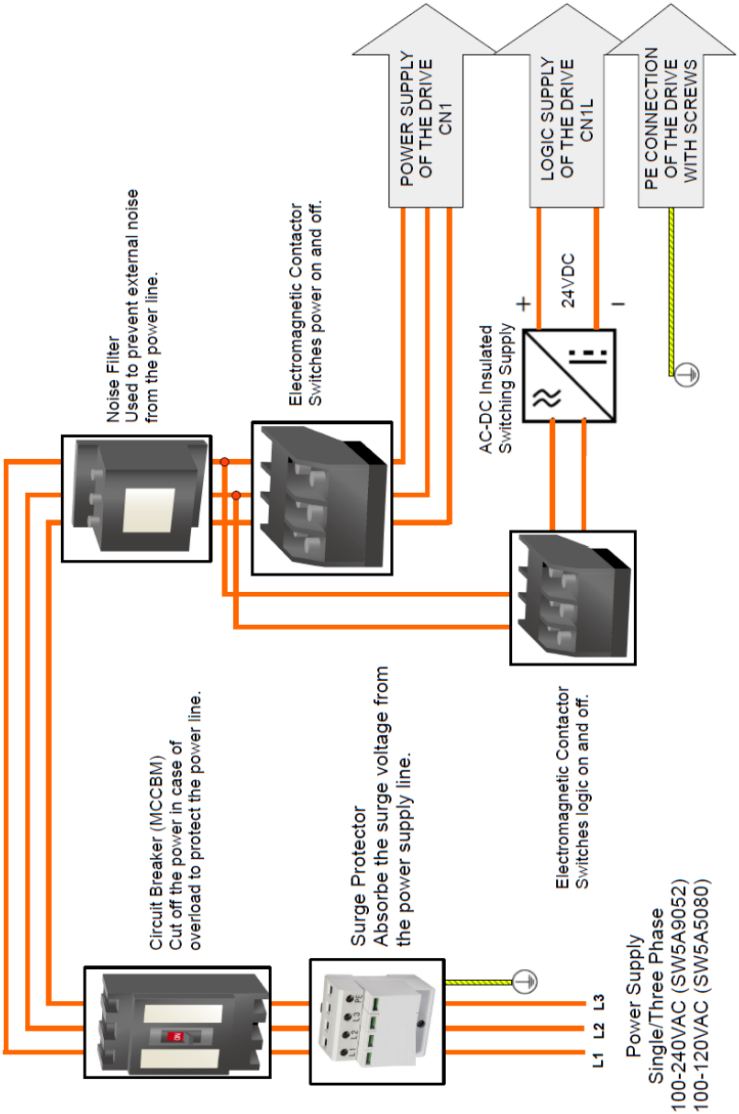
When the emissions generated by the working drive are not adequately filtered, the correct functioning of other devices can be disturbed.

Note :

3.2 Planning the power supply

The drives must be supplied with AC Power Supply.
Logic Supply must be 24Vdc (mandatory and isolated).
Supply of the digital outputs must be 24VDC.

Circuit and power supply connection schemes.



Main characteristics of the drive power supply:

AC network Switch: is a recommended safety device.

Primary protections: use fuses on the AC bus or an equivalent safety switch.

Surge suppressors: on the primary circuit, they protect the drive against Surges coming from the primary network power supply.

EMC Filter: is generally necessary to satisfy the EMC compatibility requirements related to the emissions. An EMC filter is recommended in case of sensible circuits powered by an AC line. If a commercial line filter is chosen, one needs to take into account the total RMS current of the powered system.

The AC line filter needs to be installed following the builder's directives. Generally, the filter needs to be inserted between the principal AC line and the transformer, if the last one is positioned near the drive or to the electrical cabinet, between the transformer and the rectifier bridge in the other cases, keeping the bridge near the drive, and keeping the connection between the filter and the transformer as short as possible.

Transformer: The primary circuit of the transformer must be dimensioned in function of the characteristics of the AC power supply line. The voltage peaks on the secondary circuit of the transformer are equal to 1.41*secondary RMS voltage. The DC power supply voltage must not exceed the Vdc power supply voltage of the drive.

DON'T use an Auto-transformer to interface with the electric network. Only a transformer guarantees the galvanic isolation necessary for electrical safety.

The power of the transformer depends on the power required by the motor: to define the motion characteristics under control (dimensioning of the power supply and the motor), it's possible to contact our support department by the e-mail address: support@everelettronica.it. Alternatively the following procedure can be used to define approximately the power supply characteristics:

1. Power to the motor shaft for every axle in watts:
   Wn =π*Nn[RPM]*Tn[Nm]/30
2. Power to the total load in watts :
   WS = sum of the Wn of the axles moving simultaneously;
3. Power of the transformer in watts:
   TW = 2 * WS (efficiency = 0.5)
4. power of the transformer in VA:
   TVA=TW / 0,7 (single phase) or TVA= TW / 0,8 (three phase);
5. Take into account a voltage drop of about 8% for the transformer during the application of the load (the secondary voltage must not exceed a voltage value of 108% of the nominal value when the load is zero).

A simple and fast alternative method to calculate the power in VA of the transformer is:
$TVA(VA) = \sqrt{2} * Vdc_{BUS} * Imax_{PHASE(RMS)}$

Secondary sectioning : Should be placed on the secondary AC power supply for sectioning power and leave enabled the logic.

Secondary protections: Must be placed before the rectifier bridge and must be calibrated depending on the set phase current. Instead of the secondary protections can be used an automatic safety switch.

3.3 Choosing the stepper motor

The drives have been designed to function with 2 phase stepper motors with the following characteristics:

- The nominal winding current depends on drives model

		SW5A5080			SW5A9052			Unit	Notes
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Motor current				8			5.2	A_{RMS}	SW setting
				11.3			7.3	A_{PK}	

- With connection of the Bipolar Parallel windings: the motor is supplied by the drive with a winding current equal to 1.41 times the unipolar nominal current (I_{PHASE} * 1.41).
- With connection of the Bipolar Series windings: the motor is powered by the drive with a winding current equal to 0.7 times the unipolar nominal current (I_{PHASE} * 0.70).

The stepper motor is chosen on base of a series of variables that depend on the application: torque required by the shaft, speed, dimension of the motor, current, inductance etc.

The dinamic performaces of the motors depend on the power supply : higher power supply----> higher performances.

3.4 Assembling of the drive

For the mounting refers to paragraph :*2.1 Mechanical and Environmental*.
Use the M4 screws to fix the drive to a wall of the electric cabinet.

The environment in which the drive will be installed needs to be free of impurities, corrosive vapour, gases or liquids. Avoid environments where in vapour and humidity will condensate.

When installing the drive in an electrical switchboard, make sure that the opening of the air stream or the cooling system of the switchboard doesn't make the internal temperature rise above the maximum allowed working temperature.

Every local security aspect concerning the installation of the drive has to be considered a project standard for the electrical switchboard.

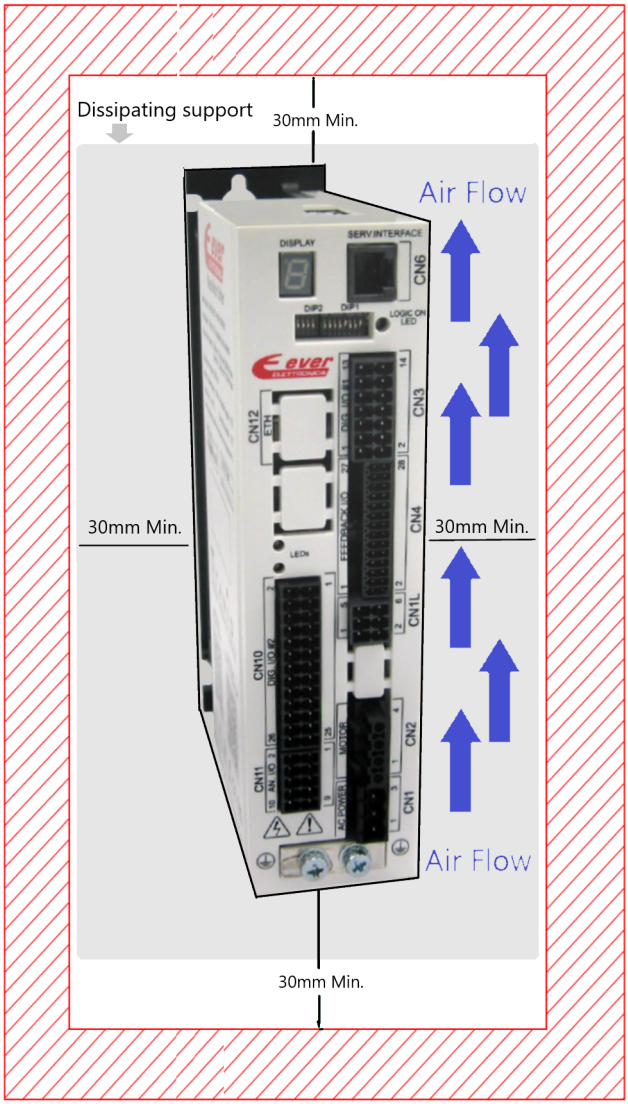
Assembling Guide

The installation has to meet at least the following requirements:

- *maintain the vertical orientation of the drive;*
- *avoid excessive vibrations or shocks;*
- *Foresee free space for the air stream above and under the drive;*
- *Respect the minimal distances indicated in the following figure;*

The cooling of the drives occurs mainly through radiation of the heat sink fins and secondary, by means of contact through the clamping surface of the electrical switchboard. An insufficient heat exchange can increase the drive temperature until the threshold of the heat protection, including a system block reported by the display. In the installation project, this two dissipation channels need to be optimized.

Distance minimum for installation



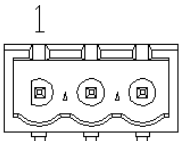
3.5 Connections, user settings and visualizations

Please refer to paragraph *3 DRIVE INSTALLATION* for position of connectors, dip-switches and Display.

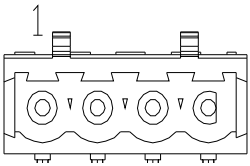
3.5.1 Connection to the drive

3.5.1.1 Pinout of the connectors

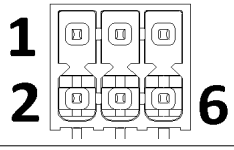
CN1 : AC Power Supply – 3 position, pitch 5.08mm single row			
Pos	**Name**	**Characteristics**	
1	ACin	PWR Input	AC power Supply (mono or three phase)
2	ACin	PWR Input	AC power Supply (mono or three phase)
3	ACin	PWR Input	AC power Supply (mono or three phase)



CN2 : Motor – 4 position, pitch 5.08mm single row			
Pos	**Name**	**Characteristics**	
1	A/	PWR Output	Motor Phase A/
2	A	PWR Output	Motor Phase A
3	B	PWR Output	Motor Phase B
4	B/	PWR Output	Motor Phase B/

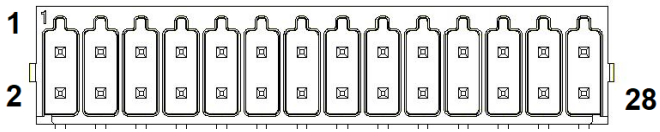


CN1L : 24Vdc Logic Supply & STO inputs – 6 position, pitch 3.5mm double row			
Pos	**Name**	**Characteristics**	
1	VLOG-	PWR Input	Negative DC logic supply input
2	VLOG+	PWR Input	Positive DC logic supply input
3	STO1 -	PWR Input	STO1 input negative side
4	STO1 +	PWR Input	STO1 input positive side
5	STO2 -	PWR Input	STO2 input negative side
6	STO2 +	PWR Input	STO2 input positive side

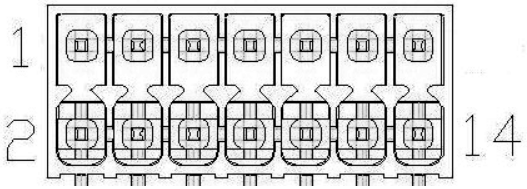


LOGIC 24Vdc MANDATORY and ISOLATED

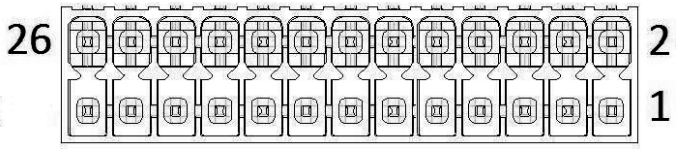
CN4 : Encoder I/O – 28 position, pitch 2.54mm double row			
Pos	**Name**	**Characteristics**	
1	SHIELD	/	Cable Shield connection for feedback interface
2	SHIELD	/	Cable Shield connection for feedback interface
3	N.C.	--	Not connected
4	N.C.	--	Not connected
5	DATA-	DIG_IN	Absolute encoder data input negative
6	DATA+	DIG_IN	Absolute encoder data input positive
7	CLK-	DIG_OUT	Absolute encoder clock output negative
8	CLK+	DIG_OUT	Absolute encoder clock output positive
9	Reserved	--	Reserved pin
10	Reserved	--	Reserved pin
11	Reserved	--	Reserved pin
12	N.C.	--	Not connected
13	ENCZ-	DIG_IN	Encoder Zero differential input negative
14	ENCZ+	DIG_IN	Encoder Zero differential input positive
15	ENCB-	DIG_IN	Encoder Phase B differential input negative
16	ENCB+	DIG_IN	Encoder Phase B differential input positive
17	ENCA-	DIG_IN	Encoder Phase A differential input negative
18	ENCA+	DIG_IN	Encoder Phase A differential input positive
19	0VE	PWR_OUT	Negative side of supply
20	+5E	PWR_OUT	+5Vdc power supply output
21	OUT_ENCZ-	DIG_OUT	Encoder Zero differential output negative
22	OUT_ENCZ+	DIG_OUT	Encoder Zero differential output positive
23	OUT_ENCB-	DIG_OUT	Encoder Phase B differential output negative
24	OUT_ENCB+	DIG_OUT	Encoder Phase B differential output positive
25	OUT_ENCA-	DIG_OUT	Encoder Phase A differential output negative
26	OUT_ENCA+	DIG_OUT	Encoder Phase A differential output positive
27	0VE	PWR_OUT	Reference ground for feedback interface
28	0VE	PWR_OUT	Reference ground for feedback interface



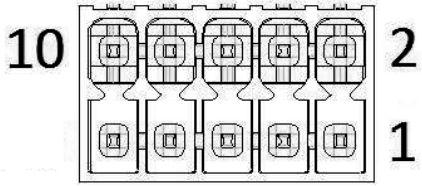
CN3 : Digital I/O #1 – 14 position, pitch 3.5mm double row			
Pos	**Name**	**Characteristics**	
1	VSS#1	PWR Input	Negative supply for digital outputs B0 on CN3
2	V-OUT	PWR Input	24Vdc supply for digital outputs B0 on CN3
3	B0_OUT0	Digital Output	PNP digital output B0_OUT0
4	B0_OUT1	Digital Output	PNP digital output B0_OUT1
5	B0_OUT2	Digital Output	PNP digital output B0_OUT2
6	n.c.	--	Not connected
7	-B0_IN0	Digital Input	Digital input B0_IN0 negative side
8	+B0_IN0	Digital Input	Digital input B0_IN0 positive side
9	-B0_IN1	Digital Input	Digital input B0_IN1 negative side
10	+B0_IN1	Digital Input	Digital input B0_IN1 positive side
11	-B0_IN2	Digital Input	Digital input B0_IN2 negative side
12	+B0_IN2	Digital Input	Digital input B0_IN2 positive side
13	-B0_IN3	Digital Input	Digital input B0_IN3 negative side
14	+B0_IN3	Digital Input	Digital input B0_IN3 positive side



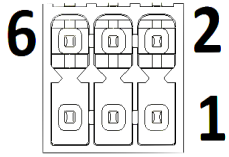
CN10 : Digital I/O #2 – 26 position, pitch 3.5mm double row			
Pos	**Name**	**Characteristics**	
1	+24Vdc	PWR Input	24Vdc supply for digital outputs B1 on CN10
2	VSS#2	PWR Input	Negative reference for digital inputs and outputs on CN10
3	VSS#2	PWR Input	Negative reference for digital inputs and outputs on CN10
4	B0_OUT3	Digital Output	PNP digital output B0_OUT3
5	B1_OUT0	Digital Output	Digital output B1_OUT0 (PNP)
6	B1_OUT1	Digital Output	Digital output B1_OUT1 (PNP)
7	B1_OUT2	Digital Output	Digital output B1_OUT2 (PNP)
8	B1_OUT3	Digital Output	Digital output B1_OUT3 (PNP)
9	B1_OUT4	Digital Output	Digital output B1_OUT4 (PNP)
10	B1_OUT5	Digital Output	Digital output B1_OUT5 (PNP)
11	B1_OUT6	Digital Output	Digital output B1_OUT6 (PNP)
12	B1_OUT7	Digital Output	Digital output B1_OUT7 (PNP)
13	B0_IN8	Digital Input	Digital input B0_IN8
14	B0_IN9	Digital Input	Digital input B0_IN9
15	B0_IN10	Digital Input	Digital input B0_IN10
16	B0_IN11	Digital Input	Digital input B0_IN11
17	B0_COM_IN	PWR Input	Reference common inputs B0 on CN10
18	B1_IN0	Digital Input	Digital input B1_IN0
19	B1_IN1	Digital Input	Digital input B1_IN1
20	B1_IN2	Digital Input	Digital input B1_IN2
21	B1_IN3	Digital Input	Digital input B1_IN3
22	B1_IN4	Digital Input	Digital input B1_IN4
23	B1_IN5	Digital Input	Digital input B1_IN5
24	B1_IN6	Digital Input	Digital input B1_IN6
25	B1_IN7	Digital Input	Digital input B1_IN7
26	B1_COM_IN	PWR Input	Reference common inputs B1 on CN10



CN11 : Analog I/O – 10 position, pitch 3.5mm double row			
Pos	**Name**	**Characteristics**	
1	AVSS	PWR Output	Negative output reference for analog outputs
2	OUT_AN0	Analog Output	Analog output 0 positive side
3	AVSS	PWR Output	Negative output reference for analog outputs
4	OUT_AN1	Analog Output	Analog output 1 positive side
5	-IN_AN0	Analog Input	Analog input 0 negative side
6	+IN_AN0	Analog Input	Analog input 0 positive side
7	-IN_AN1	Analog Input	Analog input 1 negative side
8	+IN_AN1	Analog Input	Analog input 1 positive side
9	AGND	PWR Output	Negative output reference for potentiometer
10	V_POT	PWR Output	Voltage supply output for potentiometer



CN11 : 24Vdc Profinet Supply – 6 position, pitch 3.5mm double row **(only Profinet version)**			
Pos	**Name**	**Characteristics**	
1	VSS_EXP	PWR Input	Negative DC Profinet supply input
2	VIN_EXP	PWR Input	Positive DC Profinet supply input
3	N.C.	--	Not connected
4	N.C.	--	Not connected
5	N.C.	--	Not connected
6	N.C.	--	Not connected



24Vdc MANDATORY and ISOLATED

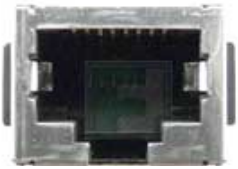
CN6 : Service SCI Interface – RJ11 connector, 6P4C		
Pos	**Name**	**Characteristics**
1	TX/RX	Transmit / Receive Line
2	$\overline{DE}$/RE	Drive Enable Negated / Receive Enable
3	+5V	+5V power out
4	GND	GND power out

1

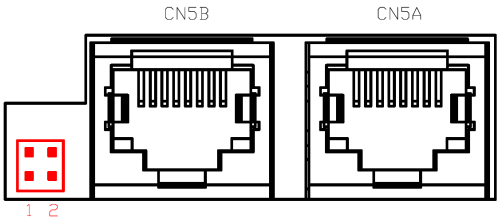
This connection is ***only*** possible with hardware and software provided by Ever.

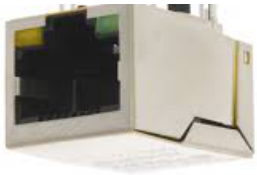
CN5A/B : Canbus & Modbus Interface – RJ45 connector 8pins, shielded			
Pos	**Name**	**Characteristics**	
1	CAN_H	Digital I/O	Bus Line Dominant HIGH (Canbus)
2	CAN_L	Digital I/O	Bus Line Dominant LOW (Canbus)
3	CAN_GND	PWR Output	Signal Ground for Canbus
4	Data +	Digital I/O	Positive RS485 signal (Modbus)
5	Data -	Digital I/O	Negative RS485 signal (Modbus)
6	Cto-Cto tra i pin6 di CN5A e CN5B	--	IN-OUT for CAN_SHLD (Canbus)
7	0V_A	PWR Output	Signal Ground for Modbus
8	Cto-Cto tra i pin8 di CN5A e CN5B	--	IN-OUT for CAN_V+ (Canbus)

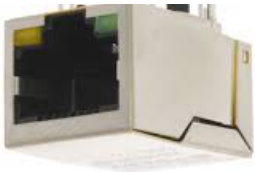
1

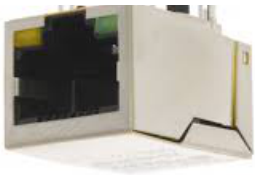


JUMPER - Termination Resistor	
Position 1	120ohm resistor INSERTED on Canbus network
Position 2	120ohm resistor INSERTED on Modbus network



CN12 : Modbus TCP/IP (Ethernet)
Single RJ45 Connector 100BASE-TX (100Mb/sec) port Accept standard Ethernet cable (CAT5 or higher)
 CN12A

CN12A/B : Ethercat	
Dual RJ45 Connectors 100BASE-TX (100Mb/sec) ports Accept standard Ethernet cable (CAT5 or higher)	
 CN12A (OUT)	 CN12B (IN)

CN12A/B : Profinet	
Dual RJ45 Connectors 100BASE-TX (100Mb/sec) ports Accept standard Ethernet cable (CAT5 or higher)	
 CN12A (P1)	 CN12B (P2)

3.5.1.2 Mating connectors

In case it is necessary to purchase mating connectors, the client can order them also from third parties with the codes:

CN1	Phoenix 1762208 (Green) or 1759509 (Black)
CN1L	Phoenix 1790111 (Green) or 1708329 (Black)
CN2	Phoenix 1786190 (Green) o 1731196 (Black)
CN3	Phoenix 1790153 (Green) o Phoenix 1107114 (Black)
CN4	Phoenix 1844691
CN5A/B	RJ45, 8 position
CN10	Phoenix 1790218 (Green) o DFMC 1,5/13-ST-3,5 BK (Black)
CN11	Phoenix 1790237 (Green) o 1812542 (Black)
CN11 (Profinet version)	Phoenix 1790111 (Green) or 1708329 (Black)
CN12A/B	Ethernet standard cables (CAT5 or higher)

3.5.1.3 Cables section

Power supply and PE	Minimum	0.5mm^2 (AWG20)
	Maximum	2.5mm^2 (AWG12)
Motor output	Minimum	0.5mm^2 (AWG20)
	Maximum	2.5mm^2 (AWG12)
Logic supply and STO	Minimum	0.5mm^2 (AWG20)
	Maximum	1.3mm^2 (AWG16)
Inputs and outputs	Minimum	0.5mm^2 (AWG20)
	Maximum	1.3mm^2 (AWG16)
Encoder	Minimum	0.12mm^2 (AWG26)
	Maximum	0.5mm^2 (AWG20)
Communication Interface	Minimum	0.25mm^2 (AWG23)
	CANbus CIA-CANOpen	
Ethernet/EtherCAT Profinet	Ethernet standard cables (CAT5 or higher)	

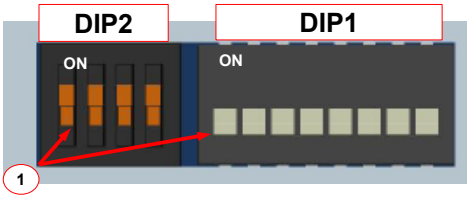
3.5.1.4 Guideline for wiring

For a correct drive installation:

Guideline for wiring	*Effects*
Establish the PE connection on the drives by means of a mechanical screw.	Necessary electrical safety connection. Increases the immunity against irradiated disturbances and electrostatic discharges (ESD).
Connect both ends of the signal cables shields to the earthing.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
Must be used shielded cables for the motor connection. When a shielded cable is used for the motor, connect the screen to PE screw on the drive. AVOID the connection of the screen to the motor body.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
Connect the body of the motor to the earthing with a special cable. *The motor body and the cable shield must be connected to the ground terminal by means of 2 separated cables.*	Necessary electrical safety connection. Reduces the conducted emissions.
When powering different drives with a single power supply, create a star connection of every drive to the terminals of the filter capacitor of the power supply (star center).	Reduce the disturbances due to pulse current.
Keep the connections (cables) as short as possible and avoid ground loops.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
The paths of the signal cables and controls must be separated and/or shielded from the motor cables and power supply to avoid that the inductive coupling can cause incorrect operations.	Increases the immunity against disturbances.

3.5.2 User configurations

The drives are equipped with a series of Dip-Switches within it's possibile to set the user parameters.



NOTE:the device reads the Dips-Switch only during the Power up.
If it's necessary a setting change, shut down the system, change the settings and start up the system again to make the changes operating.

Before setting the user configuration, shut down the system, remove the connettors CN1 and CN1L and wait untill all leds are switched off.

Dip-Switches functionalities depends on Firmware installed in the drive.
Refer software manual .

*Default position is **all DIPs in OFF except DIP1.5 and DIP1.8 that are ON.***

3.5.2.1 Dip-Switches

Dip-switch allocation											
DIP2				DIP1							
U1	U0	ID6	ID5	ID4	ID3	ID2	ID1	ID0	BD2	BD1	BD0
1			4	1							8

Drive's Baud Rate selection				
BD2	BD1	BD0	Modbus	CANOpen
OFF	OFF	OFF	115200	1 M
OFF	OFF	ON	57600 (default)	500 K (default)
OFF	ON	OFF	38400	250 K
OFF	ON	ON	19200	125 K
ON	OFF	OFF	9600	100 K
ON	OFF	ON	4800	50 K
ON	ON	OFF	2400	50 K
ON	ON	ON	1200	50 K

Drive's ID number selection							
ID6	ID5	ID4	ID3	ID2	ID1	ID0	Node Id #
OFF	OFF	OFF	OFF	OFF	OFF	OFF	Not allowed
OFF	OFF	OFF	OFF	OFF	OFF	ON	1 (default)
OFF	OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	OFF	ON	OFF	OFF	4
OFF	OFF	OFF	OFF	ON	OFF	ON	5
OFF	OFF	OFF	OFF	ON	ON	OFF	6
OFF	OFF	OFF	OFF	ON	ON	ON	7
OFF	OFF	OFF	ON	OFF	OFF	OFF	8
OFF	OFF	OFF	ON	OFF	OFF	ON	9
OFF	OFF	OFF	ON	OFF	ON	OFF	10
OFF	OFF	OFF	ON	OFF	ON	ON	11
OFF	OFF	OFF	ON	ON	OFF	OFF	12
OFF	OFF	OFF	ON	ON	OFF	ON	13
OFF	OFF	OFF	ON	ON	ON	OFF	14
OFF	OFF	OFF	ON	ON	ON	ON	15
OFF	OFF	ON	OFF	OFF	OFF	OFF	16
OFF	OFF	ON	OFF	OFF	OFF	ON	17
OFF	OFF	ON	OFF	OFF	ON	OFF	18
OFF	OFF	ON	OFF	OFF	ON	ON	19
OFF	OFF	ON	OFF	ON	OFF	OFF	20
OFF	OFF	ON	OFF	ON	OFF	ON	21
OFF	OFF	ON	OFF	ON	ON	OFF	22
OFF	OFF	ON	OFF	ON	ON	ON	23
OFF	OFF	ON	ON	OFF	OFF	OFF	24
XX	XX	XX	XX	XX	XX	XX	....
ON	ON	ON	ON	ON	ON	ON	127

3.5.3 Operational status and their signals

Operational statuses and their signals	
L	Missing Operating System: no software application stored on drive
U	Firmware update: Updating of new software in progress.
I	Initialization: the drive executes the start-up procedure (a few seconds after the start-up procedure has begun).
S	Correct functioning
S + 1	Voltage of the DC bus near to the limit value (minimum or maximum)
S + 3	Drive temperature is near to the maximum value
S + 7	Warning: EEprom near Write Overrun
S + 8	Warning: EEprom near End of Life
S flashing	Enable OFF, current zero
- flashing	$I_{nominal}$ not computed
E + 3	Error: expired eePLC software trial
F + 0	Security intervention of watchdog;
F + 1	Internal Software Error;
F + 2	Missing calibration values;
F + 3	Management EEPROM;
F + 4	EEPROM fail;
F + 6	Error: eePLC application error
F + 7	Error: EEprom Write Overrun
F + U	Error: Feature Unavailable
P + 0	Open motor phases
P + 1	over/under voltage;
P + 2	over current on the motor output;
P + 3	over temperature of the drive;
P + 5	Missing Torque Enable (“missing Safe Torque Off”)
P + 6	Drive Over Power Protection and/or Current Regulation out of range
P + 7	eePLC User Protection (generated by setting bit #0 of eePLC_User_Settings)
P + 9	Motor feedback error

3.6 First start up procedure

- Check all connections: power supply, logic supply and motor.
- Make sure that the application settings are correct.
- Make sure that the supply characteristics are suitable for the drive.
- If possible, remove the load from the motor shaft to avoid that wrong movements cause damage.
- Power the drive and make sure that the green LED is switched on or blinking.
  IF the green LED remain off, turn down the system immediately and verify if all connections are present and if they are correct.
- Enable the current to the motor and verify if the torque is present.
- Execute a movement of some steps and verify if the rotation direction is the desired one.

To reverse the rotation direction of the motor shaft, reverse the connection of one of the motor phases, for example A with A/, after having removed the power supply.

- Remove the power supply, fixate the motor to the load and check the full functionality.

3.7 Analyses of malfunctions

If only the green LED is power ON, the drives are powered correctly.

When one of the following situations occurs, the drive enters an alarm status signalled by DISPLAY.

DEFECT	Intervention of the thermal protection
CAUSE	May be caused due to a heavy working cycle or high current.
ACTION	Improve the thermal exchange by facilitating the air stream on the heatsink or by applying a fan.

DEFECT	Intervention of the over/under voltage protection.
CAUSE	Supply voltage out of range.
ACTION	Check the value of the supply voltage.

DEFECT	Intervention by the current protection.
CAUSE	Short circuit on the motor outputs.
ACTION	Control the motor windings and cables, remove the short circuit replacing the broken cable or the broken motor.

DEFECT	Open phase motor protection.
CAUSE	Open circuit from motor windings and drive.
ACTION	Check motor cables and connections to the drive.

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

DEFECT	Noisy motor movement with vibrations.
CAUSE	Can be caused due to a missing power supply to a motor phase, or to a situation of resonance.
ACTION	Check the motor cables and/or change the velocity of the motor to exit a resonance region.

DEFECT	The external fuse on the power supply of the drive is burned.
CAUSE	Can be caused due to a wrong connection of the power supply.
ACTION	Connect the power supply correctly and replace the fuse. Use only fuse with characteristic indicated in paragraph 3.2 Planning the power supply

DEFECT	At high speed, the motor hasn't sufficient torque.
CAUSE	It can be due to a motor current self-limitation.
ACTION	Increase the motor current (always within the limits), increase the supply voltage, change motor connection from series to parallel.

3.8 Return procedure

In case it's not possible to resolve the problem and thinking that the system isn't damaged, contact the EVER technical support dpt providing the following information:

- The system version (SW5A___) and serial number printed on the label
- The complete problem description and the conditions where in the problem occurs.
- The description of the drive configuration in the application (Current, step type, functioning type, etc.)
- The value of the power supply voltage and the characteristics (single phase, three phase,ripple....).
- The description of the power feeding and the control signals cabling and the presence of other components in the installation.
- The description of the application (motor movements, loads, velocity, etc.).

Return procedure To return a damaged drive to EVER please fill the RMA form available at www.everelettronica.it or through this direct link :

http://www.support-everelettronica.com/en/rma.asp

An email including the RMA number and the return procedure will be send by EVER to the customer.

4 VERSIONS AVAILABLE

Drive code	Power Supply	Motor current	Fieldbus	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
SW5A9052N221-30	100-240 VAC	5,2 Arms	Not present	4	3	0	0
SW5A9052N2E1-30	100-240 VAC	5,2 Arms	Not present	4	3	1	0
SW5A9052L221-30	100-240 VAC	5,2 Arms	Canopen+Modbus RTU	4	3	0	0
SW5A9052L2E1-30	100-240 VAC	5,2 Arms	Canopen+Modbus RTU	4	3	1	0
SW5A9052L2G1-30	100-240 VAC	5,2 Arms	Canopen+Modbus RTU	16	12	2	2
SW5A9052E221-30	100-240 VAC	5,2 Arms	Modbus TCP/IP	4	3	0	0
SW5A9052E2G1-30	100-240 VAC	5,2 Arms	Modbus TCP/IP	16	12	2	2
SW5A9052H221-30	100-240 VAC	5,2 Arms	EtherCAT	4	3	0	0
SW5A9052T221-30	100-240 VAC	5,2 Arms	Profinet	4	3	0	0
SW5A5080N221-30	100-120 VAC	8 Arms	Not present	4	3	0	0
SW5A5080N2E1-30	100-120 VAC	8 Arms	Not present	4	3	1	0
SW5A5080L221-30	100-120 VAC	8 Arms	Canopen+Modbus RTU	4	3	0	0
SW5A5080L2E1-30	100-120 VAC	8 Arms	Canopen+Modbus RTU	4	3	1	0
SW5A5080L2G1-30	100-120 VAC	8 Arms	Canopen+Modbus RTU	16	12	2	2
SW5A5080E221-30	100-120 VAC	8 Arms	Modbus TCP/IP	4	3	0	0
SW5A5080E2G1-30	100-120 VAC	8 Arms	Modbus TCP/IP	16	12	2	2
SW5A5080H221-30	100-120 VAC	8 Arms	EtherCAT	4	3	0	0
SW5A5080T221-30	100-120 VAC	8 Arms	Profinet	4	3	0	0

5 UL REGULATION REQUIREMENTS

In order to comply with cURus certification according to the UL 61800-5-1 standard, the following requirements must be met:

File number E363861

- Earting system

IT or TN (not corner earthed).
The drive shall considered only for use in system voltage where the maximum voltage between the ungrounded conductors and ground does not exceed 150 V

- Maximum lenght of the cables

Cable	***Lenght***
AC Power Supply	No limitation
24VDC Logic Supply & STO	No limitation
Motor	< 30m
Feedback	< 30m
Input & Output	< 30m
Fieldbus	< 30m

- Motor cable must be shielded

- Fuses on AC Power Supply

In the final installation use only Cooper Bussmann FWX-20 A14F fast fuses on AC bus with 20Arms of current, 250Vac voltage and interrupt rating 200KA or any equivalent UL Listed or UL Recognized External Semiconductor Fuses, on condition that these fuses have the same ratings of the above fuse in particular with “Peak-let-trough-current Ip“ and “Clearing I2t”

- Discharge time of the capacitors on the AC power supply

CAUTION – Risk of Electric Shock
Time required for the discharge of the capacitors after the removal of the AC power supply : 4 minutes

- Dissipation

To reach the maximum performances with 100% of duty cycle, the drive shall be fixed on the side to an aluminum heat-sink with dimension of 330x305 mm with 5 mm in thickness and with an external R/C Fans, Electric (GPWV2/8) with an Air flow rate minimum of 50 m^3/h positoned on the bottom side of the device like indicated in the picture above. Use with a smaller aluminum heat-sink and a lower Fan Air Flow shall be taken into consideration in the end-use application.