

# NGM EVO

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## User Guide



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Rev. 4.00.0

## 1 Features

The system **NGMEVO** is a numerical control based on the Freescale MCF52259.

### NGM EVO CPU

- *Microprocessor type MCF52259 up to 80MHz*
- *192 KbFlash*
- *32 Kb RAM*
- *16/32 Kb FRAM Permanent Memory*
- *1 ETHERNET port 10/100 Mb RJ45*
- *2 RS232 ports (1 RS485)*
- *1 CAN OPEN Master/Slave*
- *8 analog-inputs 12 bit configurable (0-10V dc) or (4-20mA)*
- *1 Analog Output 0-10 V*
- *16 Digital Inputs PNP 24 Vdc*
- *14 Digital Outputs PNP 24 VDC up to 0,5 A with internal protection*
- *4 Channels STEP/DIR 400 Khz Position Mode, 125 Khz Interpolation Mode. Line Drive or Open Collector*
- *1 Input encoder Line Drive*

### NGMIO EXPANSION (Max 4 Expansions) 1)










- *16 Digital Inputs PNP 24 Vdc*
- *14 Digital Outputs PNP 24 VDC up to 1 A*

### NGMsX EXPANSION (Max 3 Expansions) 1)

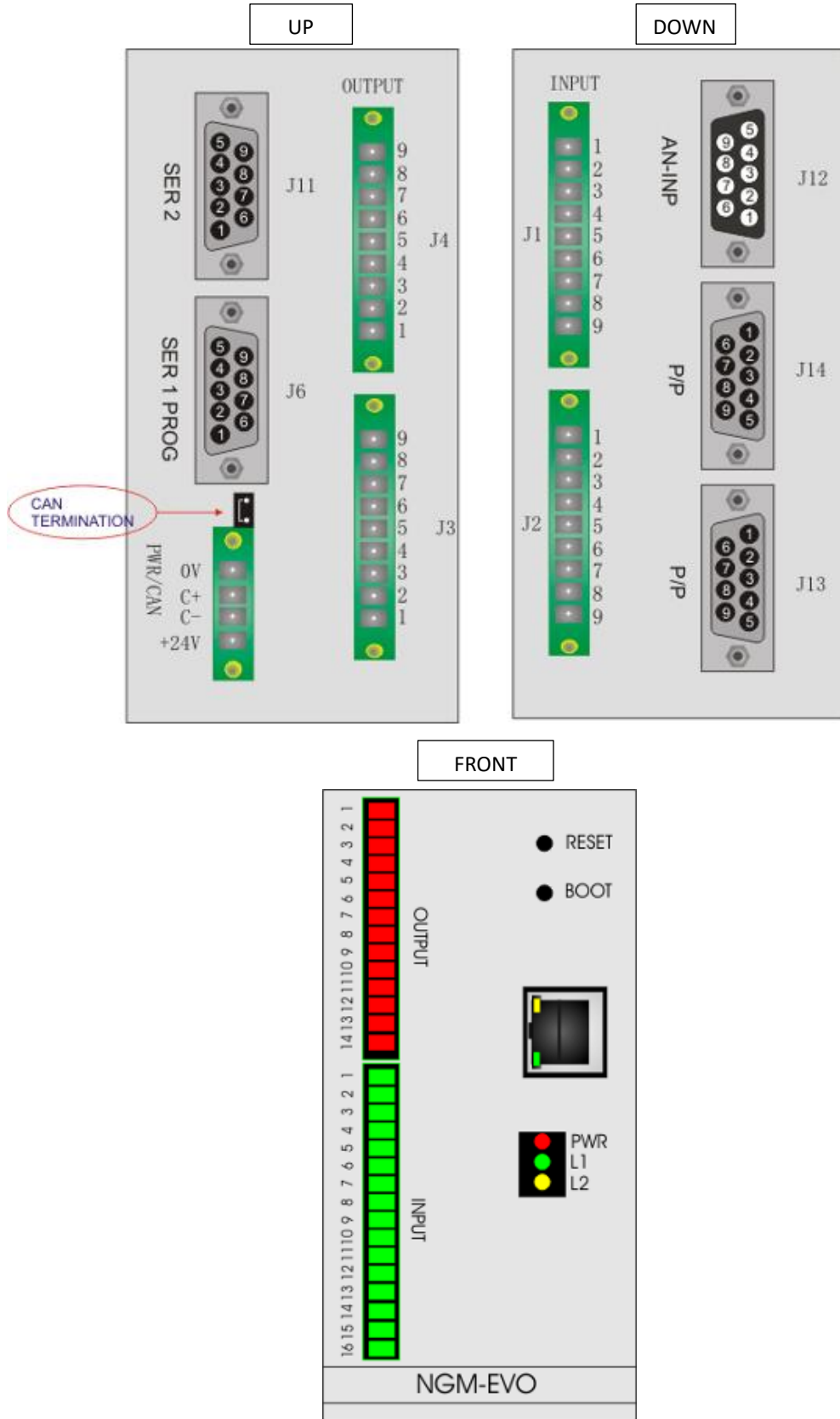
- *2 Channels STEP/DIR 500 Khz Position Mode e Interpolation Mode. Line Drive*
- *2 Channels encoder Line Drive 500 Khz*
- *2 Analog Outputs +/- 10V 12 bit*

1) The max number of expansions combined, NGMIO and NGMsX is 7

## 2 Identification Code NGM EVO

| ORDER CODE NGM EVO   |   |
|--|---|
| NGMEVO/  |       - - - xxx - xxx |
| 0  | Without STEP/DIR  |
| 1  | 4 – STEP/DIR Channels Open Collector  |
| 2  | 4 – STEP/DIR Channels Line Drive  |
| 3  | 2 – STEP/DIR Channels Line Drive 1 – Input Encoder Line Drive   |
| 0  | Without ETHERNET  |
| 1  | 1 - ETHERNET Port 10/100 Mb RJ45  |
| 0  | 2 - RS232   |
| 1  | 1 - RS232<br>1 - RS485 on SER2  |
| B  | Analog Inputs 0-10V   |
| C  | Analog Inputs i 4-20 Ma   |
| 0  | Without Analog Outputs  |
| 1  | 1 – Analog Output 0-10 V on Digital Out 1   |
| 0  | 16 Kb FRAM Permanent Memory   |
| 1  | 32 Kb FRAM Permanent Memory   |
| xxxxxxxx – Number configured channels analog inputs<br>ex: B123 – Channels 1,2,3 - 10 Volt |   |
| ORDER CODE NGMIO   |   |
| NGMIO  |   |
| ORDER CODE NGMsX   |   |
| NGMsX/   |      |
| 1  | 1 – Channel STEP/DIR Line Drive 500 Khz   |
| 2  | 2 – Channels STEP/DIR Line Drive 500 Khz  |
| 0  | Without Encoder Channel   |
| 2  | 2 – Channels Encoder Line Drive   |
| 0  | Without Analog Output   |
| 1  | 2 – Analog Outputs +/- 0V   |
| Possible combinations:<br>NGMsX/2-0-2 NGMsX/1-2-2<br>NGMsX/2-0-0 NGMsX/1-2-0               |   |

### 3 NGM EVO Connections



## 4 Connections Description

### 4.1 Power

The NGMEVO requires two separate power supplies:

- **Logical Power, PWR**
- **Digital Outputs Power, J3 e J4**

To supply the digital outputs, see the relevant [chapter 4.9](#)

As regards the supply of the logic section, this is necessary for normal operation of the card



#### 4.1.1 Electrical Characteristics

|                  | U.m. | Min | Standard | Max |
|------------------|------|-----|----------|-----|
| DC IN            | Vdc  | 12  | 24       | 35  |
| Power (to 24Vdc) | W    |     | 2,6      |     |

**THE SYSTEM IS PROTECTED FROM POLARITY INVERSION**



## 4.2 Serial Ports

The serial ports on the **NGMEVO** allow communication with external devices to the control, PC-type, PLC and other.

- **SER1-PRG:** is normally used both for the download of the programs on the control, both for the debugging from a PC application. It is also the port to use for updating the firmware
- **SER2:** Can be used for communication with other devices, such as a PLC, inverters or other. **CAN BE CONFIGURED RS485 MODE.**

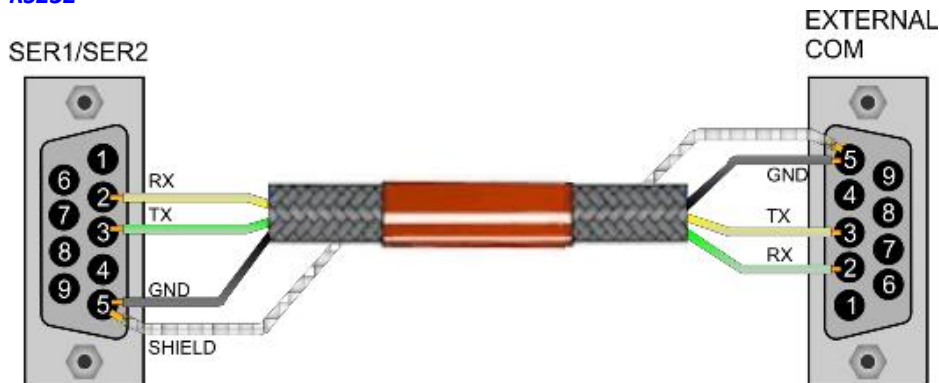
For the electrical signal, the serial ports are in compliance with RS232/RS485.

Use a **CABLE WITH SHIELD** for serial ports connections  
 Connect the **SHIELD to PIN 5** SER1 or SER2 to NGMEVO ports

Generally the RS232 connection, uses a NULL MODEM cable (pin 2,3,5) CROSSOVER (with inversion on pin 2,3)

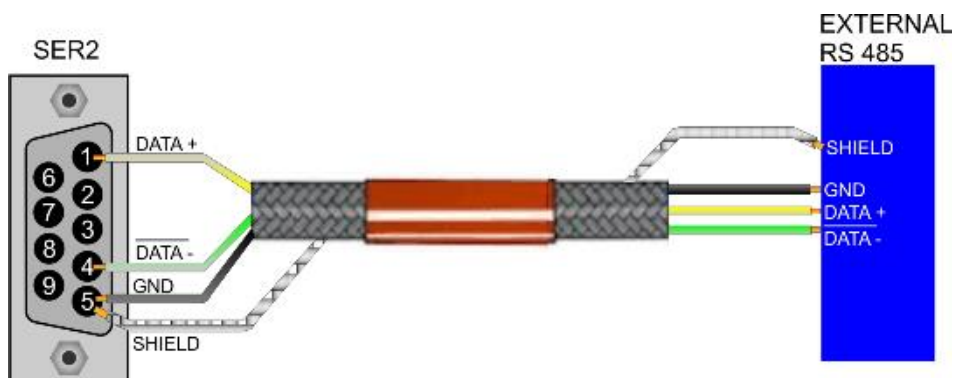
Always check the external device that type of connection it accepts

### RS232

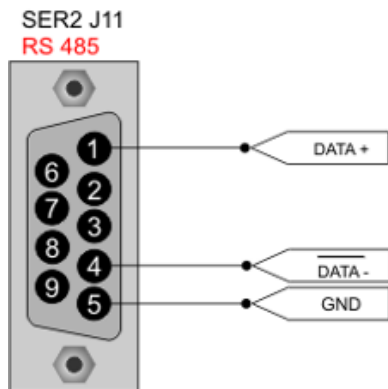
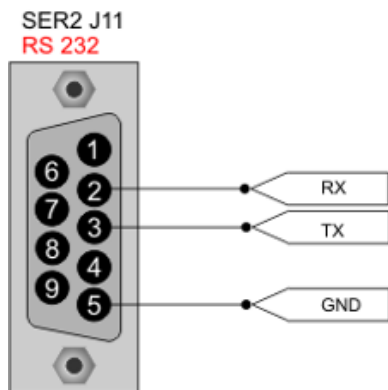
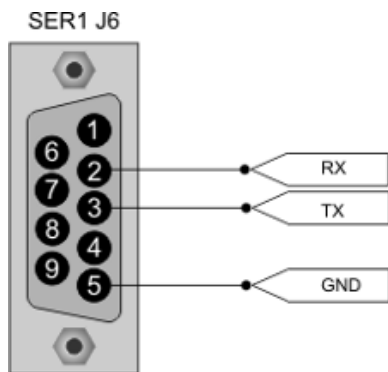


### RS485

Normally the GND pin is not connect



#### 4.2.1 Connections J6 SER1/PROG – J11 SER2




**WARNING**  
**DO NOT EXCEEDS THE MAXIMUM VOLTAGE VALUE ADMITTED**  
**BECAUSE THE CARD CAN BE DAMAGED**



### 4.3 CAN BUS Port

The port CAN BUS allows the communication of the card NGMEVO with type devices for motors drives, slave of various kinds, encoders, and more.

Communication takes place via the CAN OPEN protocol, based on its specifications DS401 and DS402 as regards the objects and the modes supported.

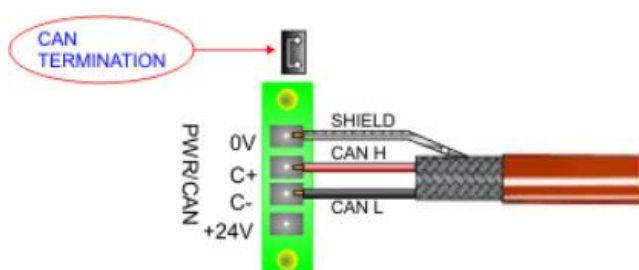
In terms of data exchange, the line complies with DS301.

The port can be configured as master or slave depending on the firmware present.

The port CAN-BUS meets the specifications of ISO 11898-24V.

#### 4.3.1 Connection CAN BUS

Is possible insert the TERMINATOR RESISTOR, inserting the JUMPER above the power connector.

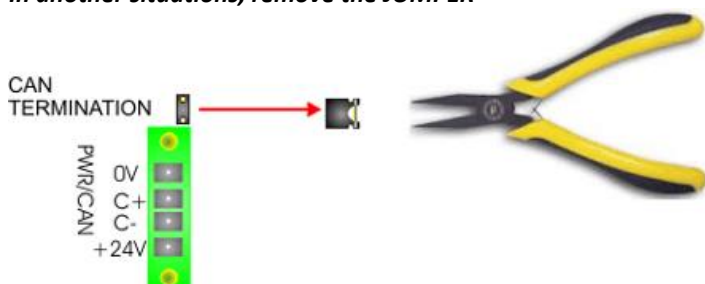


### WARNING

*If the NGMEVO board is configured as MASTER, insert always the TERMINATOR JUMPER*

*If the NGMEVO is configured as SLAVE, insert the TERMINATOR JUMPER if the board is the last node in the CanBus.*

*In another situations, remove the JUMPER*





**WARNING**  
**USE THE CABLE FOR CANOPEN COMMUNICATION**

#### 4.3.2 CanOpen Max PDO Number

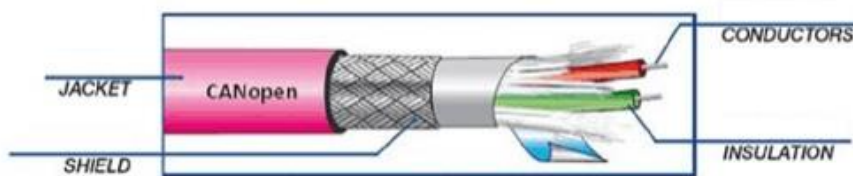
Normally the max PDO number managed by NGMEVO Canopen system , is **10**.

It is a total for PDO Rx and PDO Tx ex:

**7** → PDO Tx

**3** → PDO Rx

### 4.3.3 CanOpen Cable



### 4.3.4 CONDUCTORS ELETTRIC RESISTANCE

22AWG: < 55,4 Ohm/Km

21AWG: < 43,6 Ohm/Km



### PAIR CAPACITY

50 pF/m



### IMPEDENCE

120 Ohm



### TRASMISSION SPEED-CABLE LENGTH

Baud rate 1Mb                      Length Max 25 Mt

Baud rate 800 Kb Length Max 50 Mt

Baud rate 500 Kb Length Max 100 Mt

Baud rate 250 Kb Length Max 250 Mt

Baud rate 125Kb Length Max 500 Mt



### VOLTAGE EXERCISE

30 V

## 4.4 Ethernet Port

The Ethernet port, allows the **NGMEVO** to communicate with other devices, llike PC and others. On data exchange level, it complies 10 BaseT and 100 BaseT standards.

About protocols, it can be used in many ways:

- **NGMEVO** to **PC** communication, about on-line assistance. In this case it's used a PROMAX specific protocol;
- **PLC** and other devices communication, with ModBus **TCP/IP** protocol;

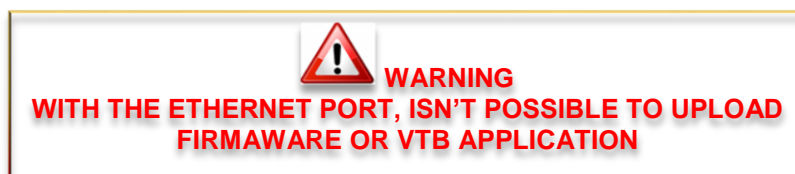
### 4.4.1 Connections

The on board connector, complies the RJ45 standard,

It's recommended to use PC with Ethernet ports complies this standard. It's recommended to use cables length conformed the standard.

The connection cable can be **CROSSOVER** or **NORMAL**

The port is automatically adapted to cable type



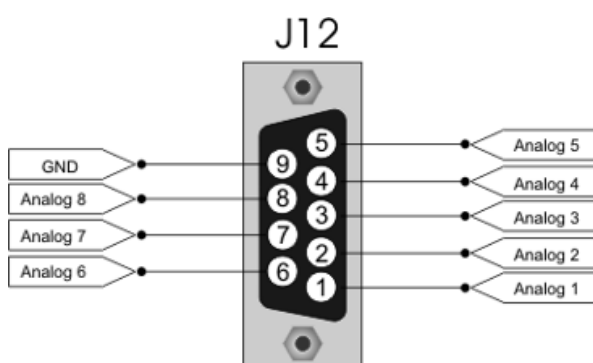
## 4.5 Analog inputs

The analog converter reads an input voltage from 0 to 10V or 4/20 mA with respect to GND. To get the full scale 12V or 24V, an external resistor must be inserted between the signal and card input. In any case, the value of the input voltage can exceed the full scale is not more than 0.2 V. **The use of analog input, remove automatically a digital input (see the following table)**

*Reference table for exclusion digital inputs*

| Analog Input Configured | Digital Input Removed |
|-------------------------|-----------------------|
| 1                       | 9                     |
| 2                       | 10                    |
| 3                       | 11                    |
| 4                       | 12                    |
| 5                       | 13                    |
| 6                       | 14                    |
| 7                       | 15                    |
| 8                       | 16                    |

### 4.5.1 Analog Inputs Connections J12



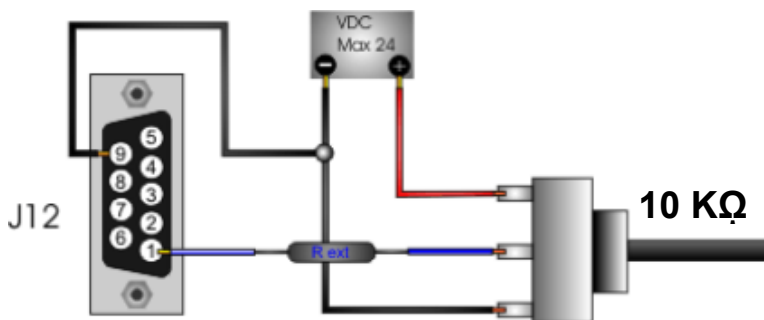
### 4.5.2 Input Resistance

|         | MIN   | TIPICA | MAX   |
|---------|-------|--------|-------|
| VDC     | 25 KΩ |        | 72 KΩ |
| 4-20 Ma |       | 175 Ω  |       |

### 4.5.3 External resistance for voltages other than 0-10V or 4-20Ma

| VIN    | Rext   |
|--------|--------|
| 0-12 V | 63 KΩ  |
| 0-24 V | 424 KΩ |

#### 4.5.4 Connection example



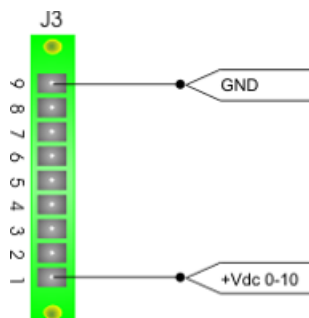

**WARNING**  
**DO NOT EXCEEDS 0,2 Volt THE MAXIMUM VALUE SELECTED THE ANALOG INPUT, CAN BE DAMAGED THE BOARD**

#### 4.6 Analog Output on NGMEVO

The NGMEVO board, can be configure one analog output 0-10V

##### 4.6.1 Electric characteristics

|               |         | U.m. | Min | Max |
|---------------|---------|------|-----|-----|
| Analog Output | Voltage | Vdc  | 0   | 10  |




**WARNING**  
**THIS CONFIGURATION, ELIMINATES THE DIGITAL OUTPUT 1**

## 4.7 Channels STEP/DIR

The board NGMEVO can use, up to four channels STEP / DIR for a total frequency of 400 KHz in position mode (125 KHz in interpolation mode).

The outputs can be configured with **OPEN COLLECTOR** signals, or **LINE DRIVE**.

### 4.7.1 OPEN-COLLECTOR

|                    |                                  |
|--------------------|----------------------------------|
| POWER              | MAX 48 VDC                       |
| LOAD               | 100 Ma continuativo 500 Ma picco |
| STATE ON (voltage) | MIN 0V MAX 1V                    |
| FREQUENCY          | MAX 30 KHz                       |

### 4.7.2 LINE DRIVE

|                     |  |
|---------------------|--|
| OUTPUT DIFFERENTIAL | MIN 2.2V MAX 3.3V specific TIA/EIA-422-B (RS422)             |
| FREQUENCY           | MAX 400 KHz in position mode – 125 KHz in interpolation mode |

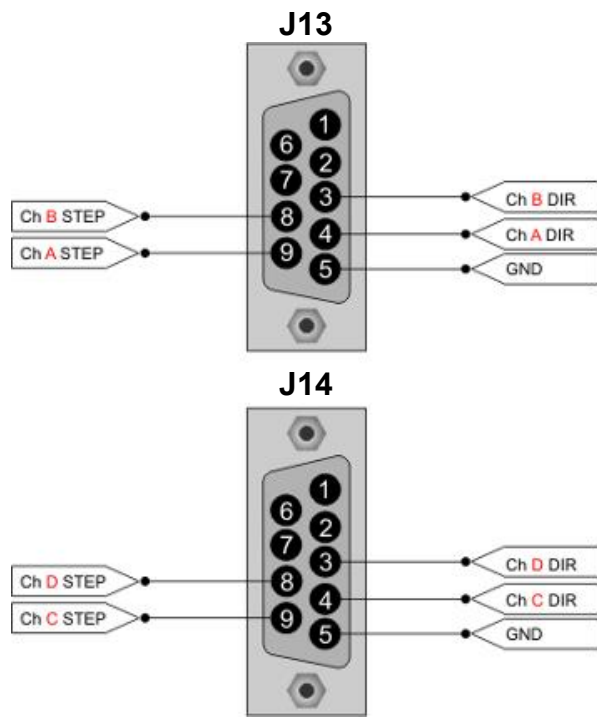
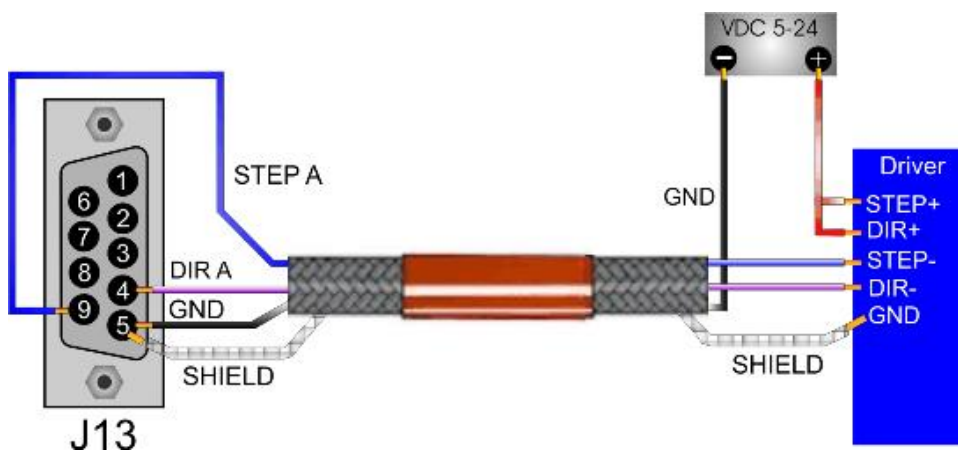
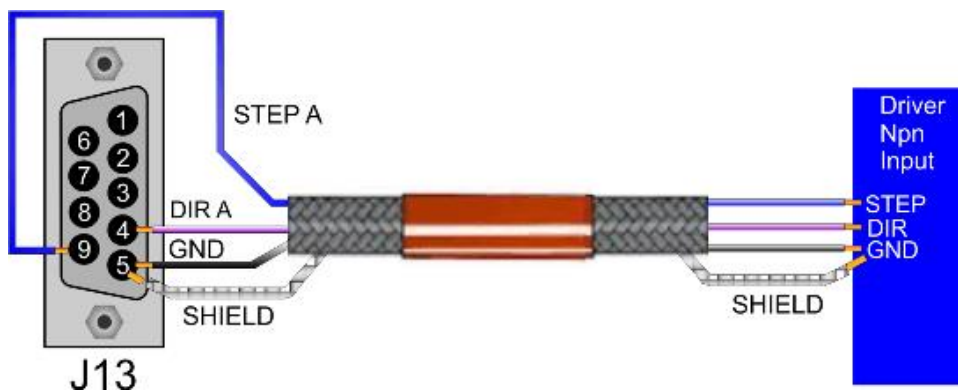
#### specifics TIA/EIA-422-B (RS422)

| LOAD           | V Min | V Typical |
|----------------|-------|-----------|
| 3,9 K $\Omega$ |       | 3,2 V     |
| 100 $\Omega$   | 2     | 2,6 V     |

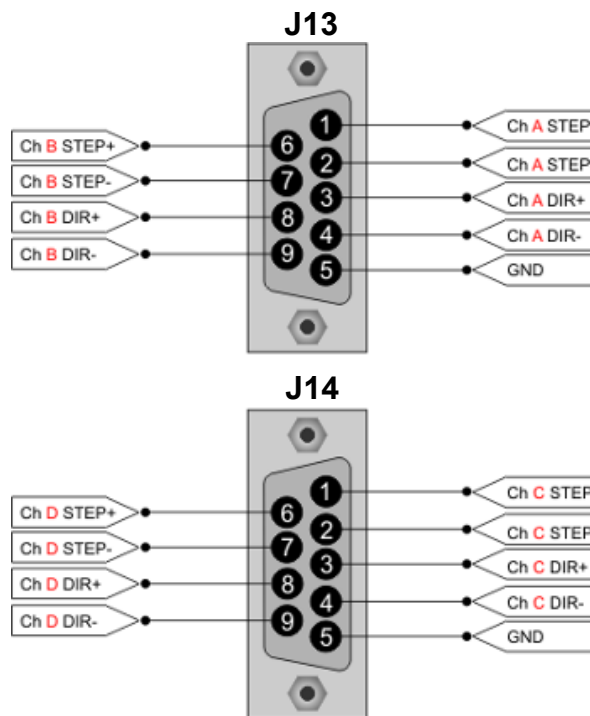
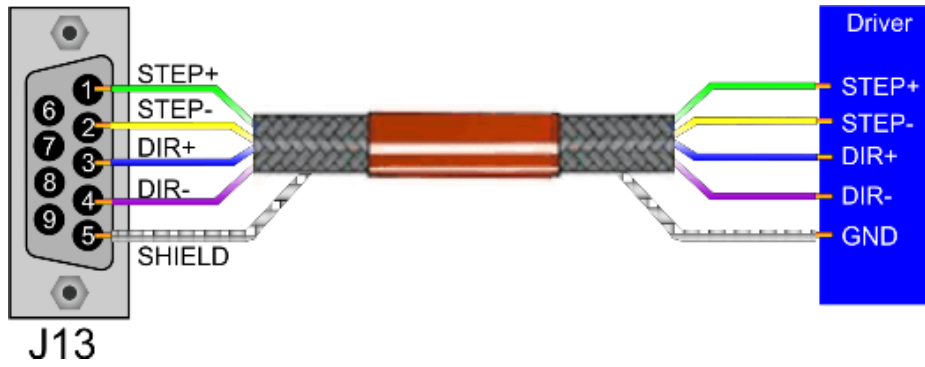


**WARNING**  
**USE A CABLE WITH SHIELD FOR THE CONNECTIONS**

4.7.3 Connections OPEN COLLECTOR J13 /J14



4.7.4 Connections LINE DRIVE





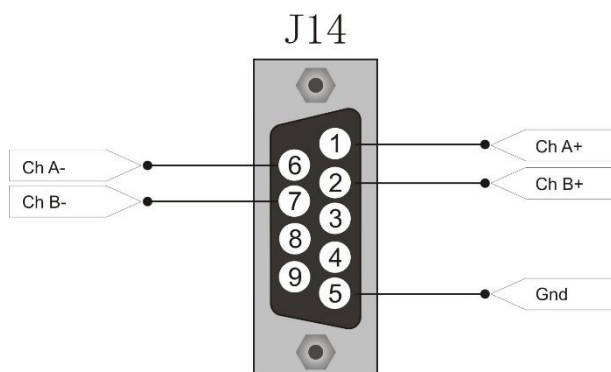
## 4.8 Encoder Input

The NGMEVO can use an internal input encoder Line Drive.  
 When this option is enabled, the number of PULSE/DIR channels is TWO.  
 This encoder input is normally used for **HANDWHEEL FUNCTION**  
 It means that the frequency inputs is not to high.

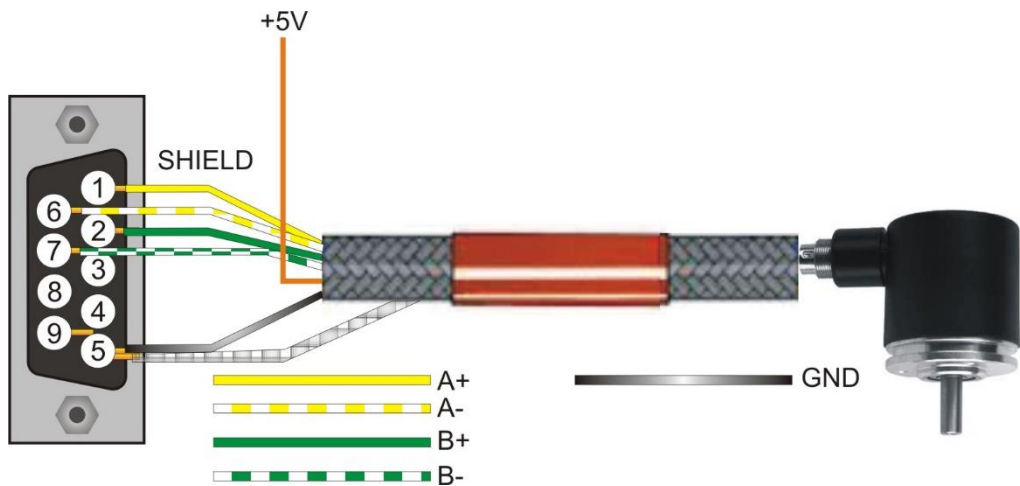
### 4.8.1 Electric characteristics

|                   |           | U.m. | Min | Soglia | Max  |
|-------------------|-----------|------|-----|--------|------|
| On voltage level  |           | Vdc  | 0   |        | 0,8  |
| Off volatge level |           | Vdc  | 4   |        | 12   |
| R input           |           | Ω    | 6   |        |      |
| Frequency         |           | KHz  |     |        | 32 * |
| TO PNP<br>Index   | On level  | Vdc  | 2,5 | 2,2    | 7,7  |
|                   | Off level | Vdc  | 0   |        | 1,5  |
| TO NPN<br>Index   | On level  | Vdc  | 0   | 1,4    | 1    |
|                   | Off level | Vdc  | 2   |        | 7,7  |

**\* If is used the PULSE/DIR channels, the frequency can be decreased**



### 4.8.2 Example



**WARNING**

**USE A CABLE WITH SHIELD FOR THE CONNECTIONS**



**WARNING**

**The Power for encoder MUST BE EXTERNAL**

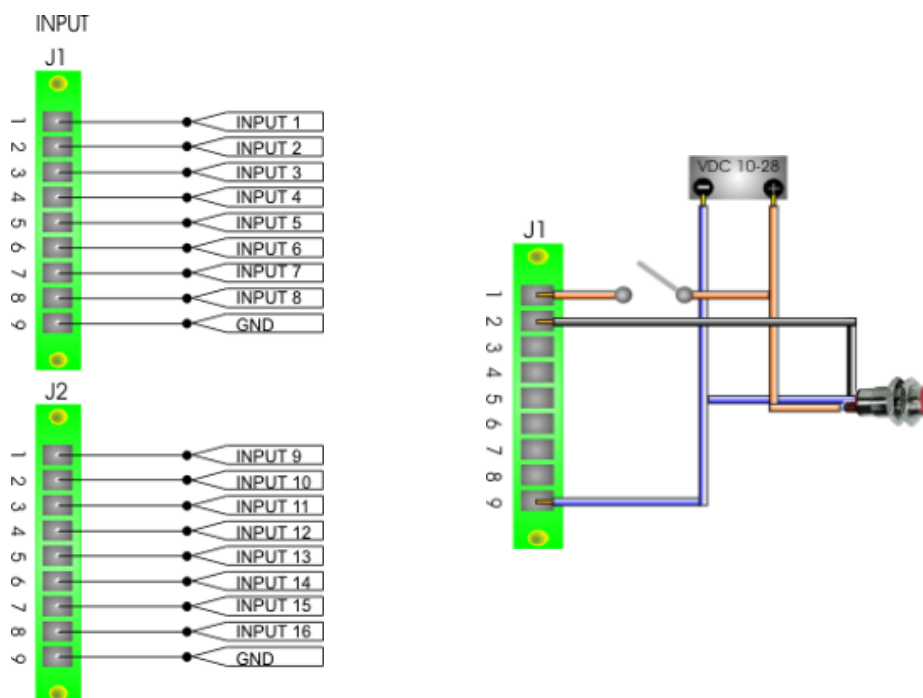
## 4.9 Digital Inputs

All these signals are PNP Type optically isolated. Therefore, to enable an input must bring a positive VDC (24 Vdc typical) on the desired channel refers to the common inputs.

### 4.9.1 Electric characteristics

|           |     | U.m. | Min       | Standard | Max          |
|-----------|-----|------|-----------|----------|--------------|
| State On  |     | Vdc  | 10        | 24       | 28           |
| State Off |     | Vdc  | 0         |          | 4            |
| Delay     | ON  | ms   |           |          | 3 (@ 24Vdc)  |
|           | OFF | ms   |           |          | 2 (@ 24Vdc)  |
| Current   |     | mA   | 4 (10Vdc) |          | 14 (@ 28Vdc) |

### 4.9.2 Connections J1/J2





**WARNING**  
DO NOT EXCEEDS THE VOLTAGE LEVEL ABOVE DESCRIBED

### 4.10 Digital Outputs

These outputs are optically isolated with respect to GND. In order to function should therefore feed them separately with a voltage of 24 Vdc. The load is driven by a transistor of the PNP type which when activated will provide a positive voltage equal to the voltage supply of the outputs.

The outputs have a protection:

**REVERSE TENSION**

**TEMPERATURE**

**SHORT**

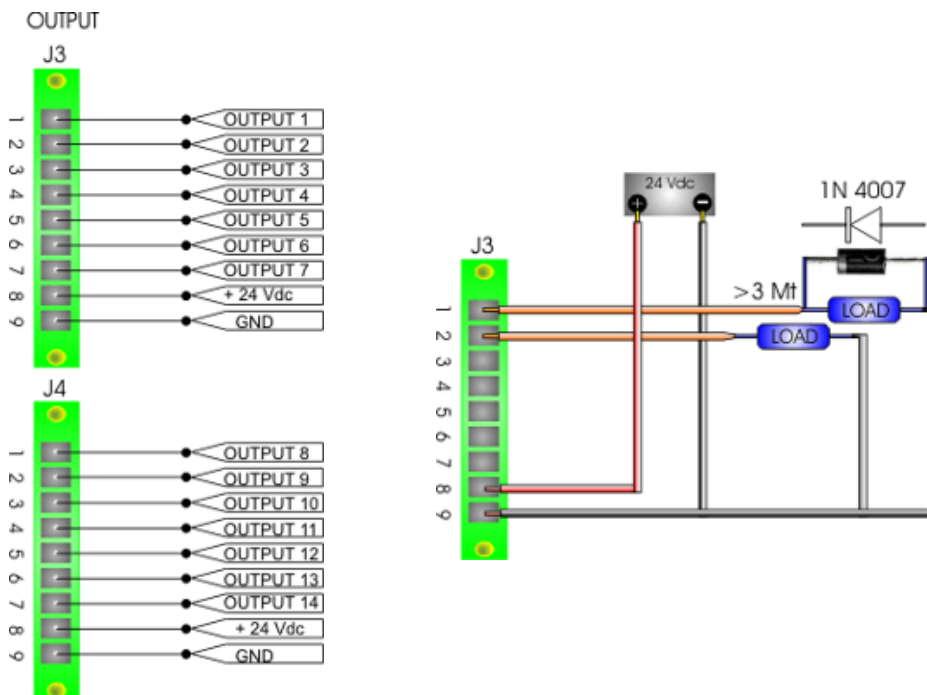
**CIRCUIT**

On the card there is a protection diode so you can also directly drive inductive loads. In case of inductive loads with absorption greater than or equal to 0,5 A or when the cable connection between the load and board exceeds a length of 3 meters, you should put the protection diode also close to the load (diode type 1N4007 or similar).

#### 4.10.1 Electric characteristics

|                       | U.m. | Min | Standard | Max | Note                            |
|-----------------------|------|-----|----------|-----|---------------------------------|
| Power                 | Vdc  | 12  | 24       | 30  |                                 |
| Load                  | A    |     | 0,5      |     | Continue (T <sub>amb</sub> 25°) |
| Short Circuit Current | A    | 0,7 |          | 1,7 |                                 |
| Delay                 | ON   | µs  |          | 100 |                                 |
|                       | OFF  | µs  |          | 150 |                                 |

#### 4.10.2 Connections J3/J4



**WARNING**

**DO NOT EXCEEDS THE VOLTAGE LEVEL ABOVE DESCRIBED  
THE DIGITAL OUTPUTS, ARE NOT PROTECTED BY OVERLOAD OR SHORT CIRCUIT**

## 5 Programming

### 5.1 Manual Boot

The board usually uses an automatic boot.

In case, the automatic boot is not available, it is necessary to proceed in the following way:

- 1) Run the program NGPROG (if used VTB skip step 2 and 3)
- 2) Set the COM and the type of card NGMEVO
- 3) Load the application. SREC and press TRANSFER APPLICATION
- 4) Press the keys simultaneously within 15 seconds RESET AND BOOT on the board
- 5) Release the RESET button

### 5.2 Upload VTB application

For upload VTB application, is possible use the following mode:

The board NGMEVO is automatically in BOOT MODE (if is not available, see 5.1) when you use the BUTTON UPLOAD APPLICATION. The application is automatically RUN when the transfer is finish.

### 5.3 NGPROG

The application was developed by Promax NGPROG to allow the update software and firmware of the new controls based on  $\mu$ P ColdFire.

#### 5.3.1 Upload firmware

- 1) Press button **"FIRMWARE MANAGEMENT"** on NGProg
- 2) If you use **"UPDATE da File"** use the standard windows Browser for find the .SREC file
- 2) If you use **"UPDATE da Server"** you must have a internet active connection, NGPROG search in Promax server the new version of firmware
- 3) Select the serial port to PC and NGMEVO (or NGM13 if not present) board type
- 4) Start the upload firmware

#### 5.3.2 Upload VTB application

- 1) Select the NGMEVO (or NGM13 if not present) Board
- 2) Select the COM on PC
- 3) Selct the .SREC file by button **"LOAD"**
- 4) Start the upload by button **"Upload Application"**

## 6 Status Led

**ST-1/L1** (Green led):

- Fast blink – board in BOOT MODE
- blink1 sec – application RUN

**ST-2/L2** (Yellow led):

- NO BLINK - No activity on RS232 or CAN SLAVE
- BLINK - activity on RS232 or CAN SLAVE

**PWR** (Red led): Power On

## 7 NGMIO Connections

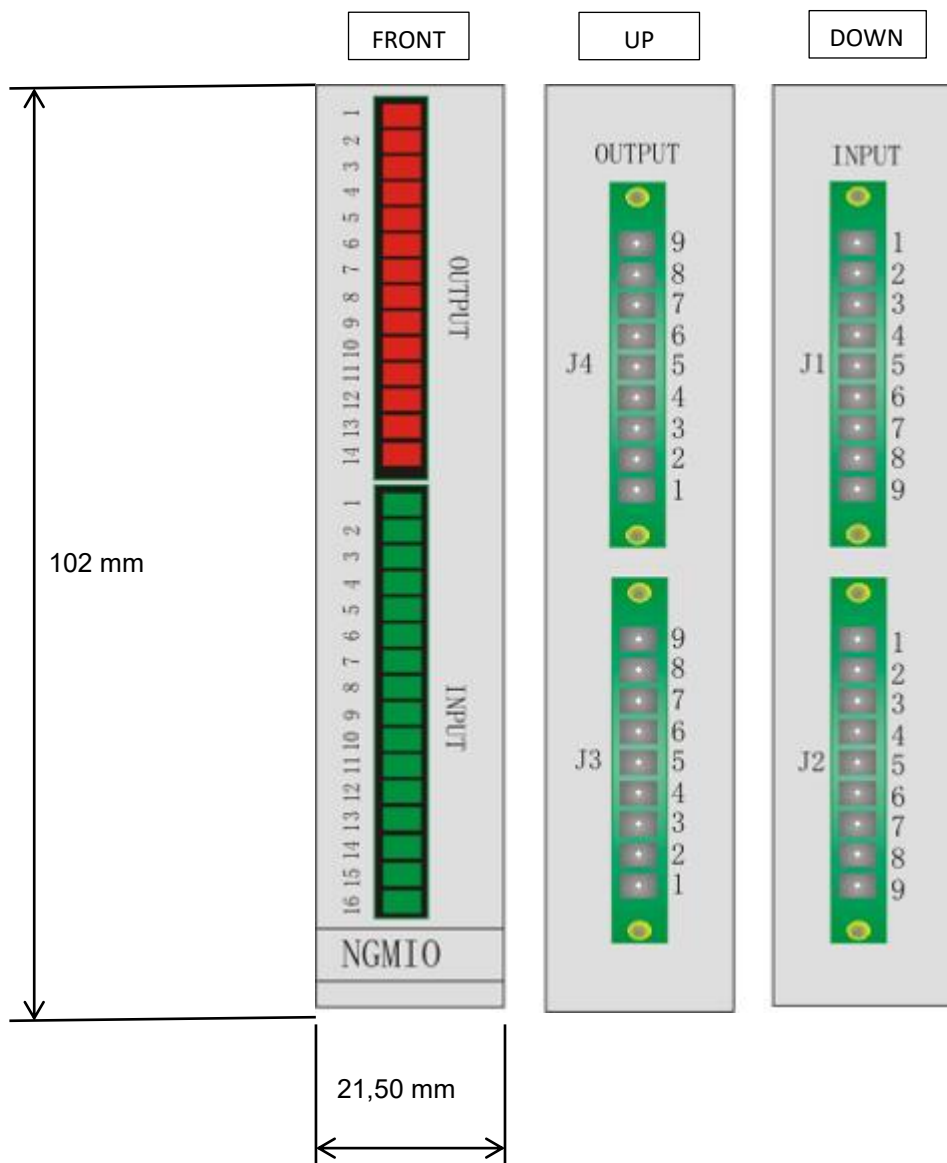
The NGMIO board, is an expansion for NGMEVO local BUS:

- **16 Digital Inputs**
- **14 Digital Outputs**

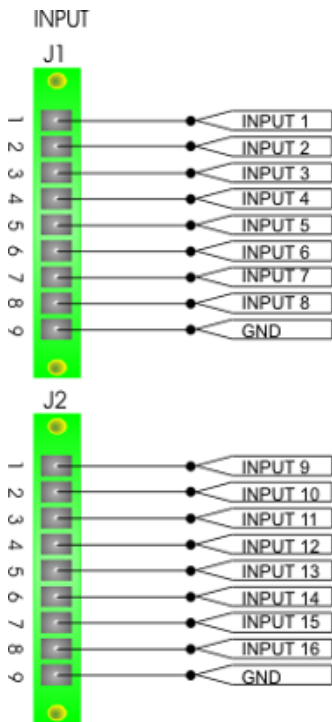
Can Be insert up to 4 expansions NGMIO for a total:

- **80 Digital Inputs**
- **70 Digital Outputs**

The digital I/O are the same specifics to NGMEVO I/O, see Chapr. [4.8](#) and [4.9](#)

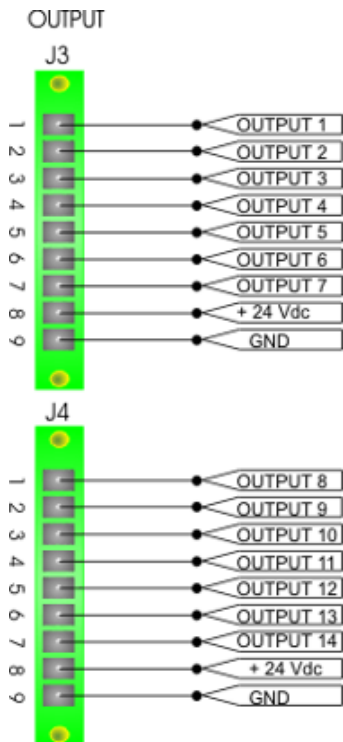


### 7.1 Connections NGMIO J1/J2



**REFER TO CHAPTERS [4.8](#) AND [4.9](#) FOR CONNECTIONS AND WARNINGS**

### 7.2 Connections NGMIO J3/J4



## 8 NGMsX Connections

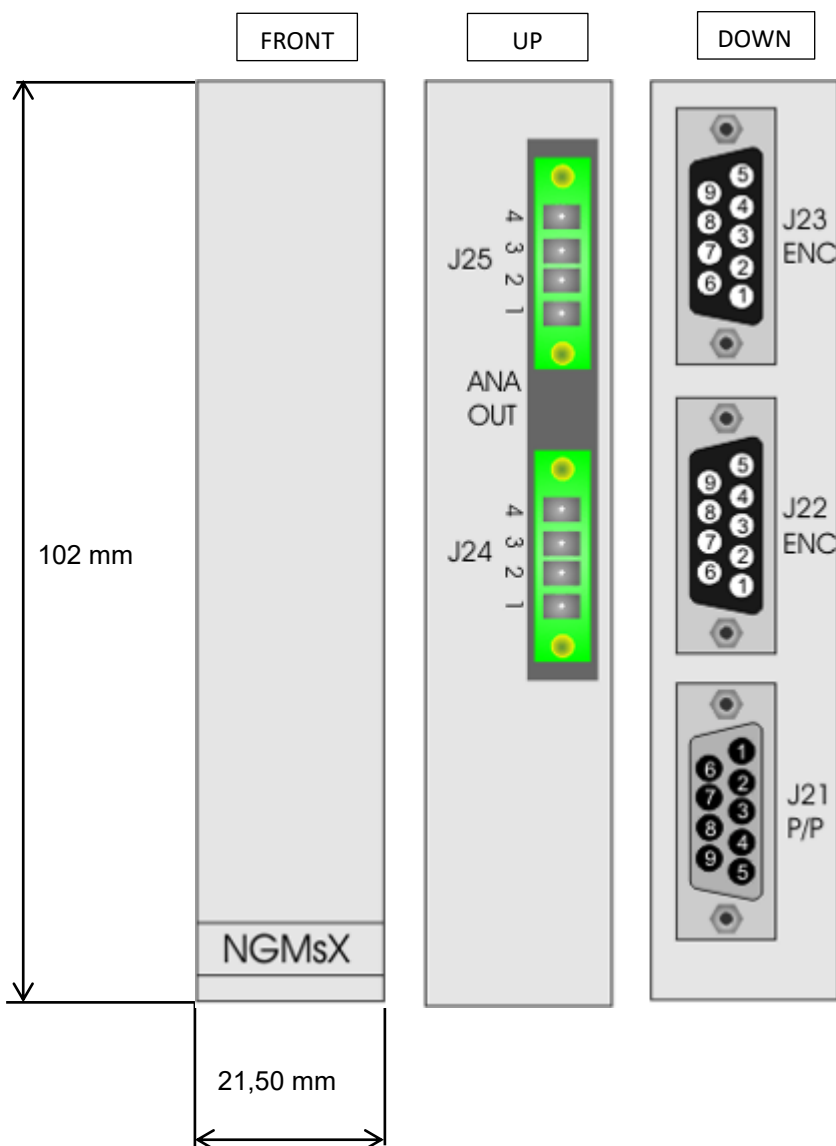
The NGMsX board, is an expansion for NGMEVO local BUS:

- 2 Channels STEP/DIR 500 Khz clock interpolation and position mode
- 2 Channels encoder Line Drive 500 Khz
- 2 Analog Outputs +/- 10 V 12 bit

Can Be insert up to 3 expansions NGMsX

Can be managed the following combinations for a NGMsX expansion:

- 2 Channels STEP/DIR
- 2 Channels STEP/DIR and 2 Analog Outputs
- 1 Channel STEP/DIR , 2 Analog Outputse 2 Channels Encoder
- 1 Channel STEP/DIR and 2 Channels Encoder

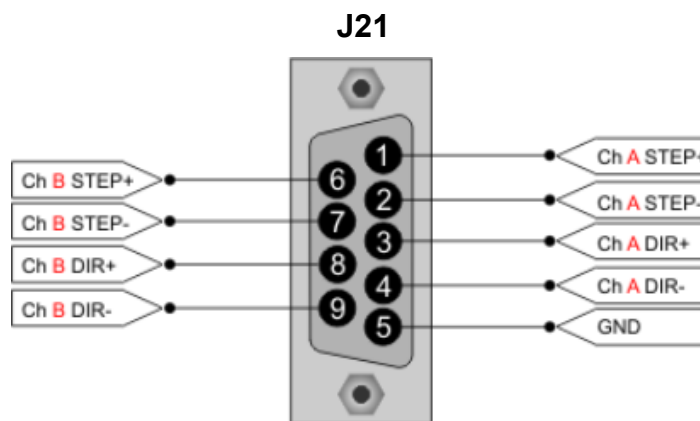
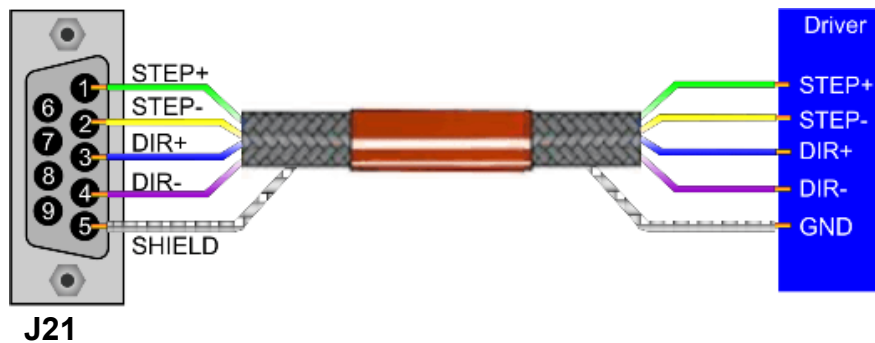




### 8.1 Channels STEP/DIR on NGMsX Expansion

The NGMsX board can use 2 channels STEP/DIR up to 500 KHz clock for single channel  
 The outputs are type LINE DRIVE 5V

|               |                      |
|---------------|----------------------|
| <b>OUTPUT</b> | <b>MIN 3V MAX 5V</b> |
| <b>CLOCK</b>  | <b>MAX 500 KHz</b>   |





**WARNING**

**USE A CABLE WITH SHIELD FOR THE CONNECTIONS**

## 8.2 Channels ENCODER on NGMsX Expansion

The NGMsX can use TWO channels ENCODER LINE DRIVE up to 500 KHz for channel.

The encoder (or optical line) must be connected with a shielded cable, to prevent electromagnetic interference. It's also recommended to have separated cable for each encoder and put far away the connection by interference sources (inverters, high voltage cable, AC motors, etc.).

NGIO is ready to use LINE-DRIVE encoders, also supplies the +5Vdc source voltage. It can't be used with PUSH-PULL or OPEN-COLLECTOR encoders.

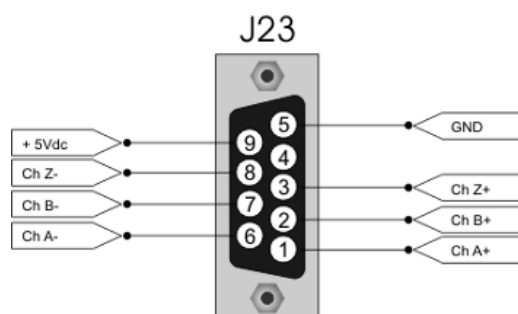
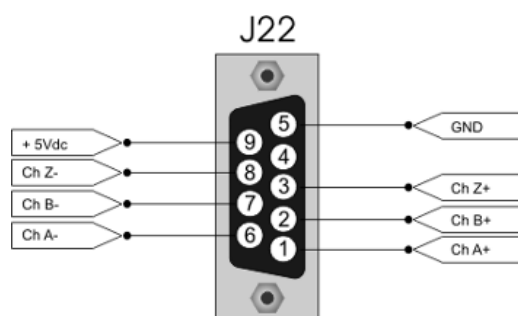
In case of motor-drives encoder simulation, it is not necessary to connect the Vdc supply, but only the GND.

### 8.2.1 Electric characteristics

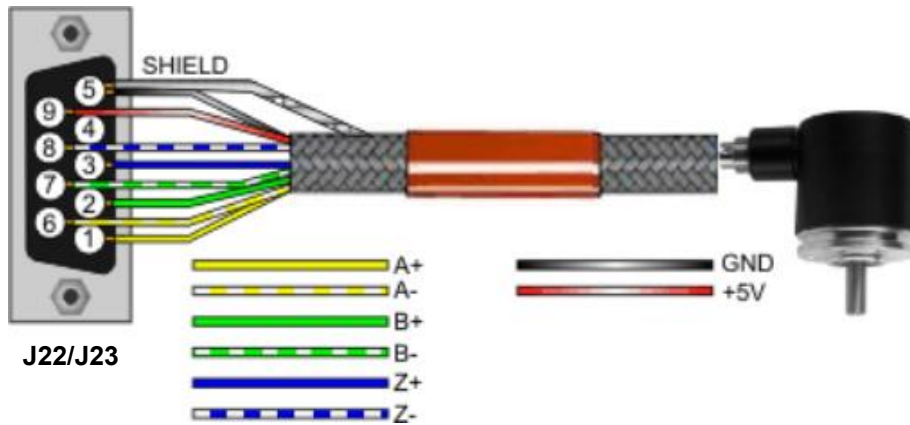
|                   |           | U.m. | Min | Soglia | Max |
|-------------------|-----------|------|-----|--------|-----|
| On voltage level  |           | Vdc  | 0   |        | 0,8 |
| Off voltage level |           | Vdc  | 4   |        | 12  |
| R input           |           | Ω    | 6   |        |     |
| Frequency         |           | KHz  |     |        | 500 |
| TO PNP            | On level  | Vdc  | 2,5 | 2,2    | 7,7 |
|                   | Off level | Vdc  | 0   |        | 1,5 |
| TO NPN            | On level  | Vdc  | 0   | 1,4    | 1   |
|                   | Off level | Vdc  | 2   |        | 7,7 |

### 8.2.2 Electric characteristics +5vdc output encoder supply

| Channel | Min      | Max      | Output Current |
|---------|----------|----------|----------------|
| Ch1 J22 | 4,75 Vdc | 5,25 Vdc | 100 Ma         |
| Ch2 J23 | 4,75 Vdc | 5,25 Vdc | 100 Ma         |



### 8.2.3 Example



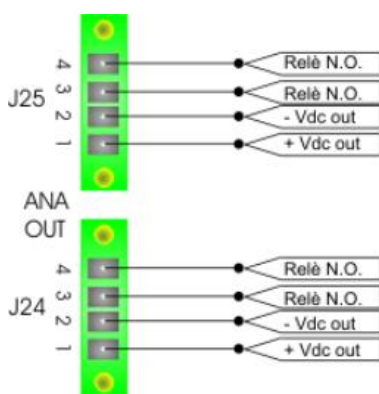
 **WARNING**  
**USE A CABLE WITH SHIELD FOR THE CONNECTIONS**

### 8.3 Analog Outputs on NGMsX Expansion

The NGMsX board can use TWO analog outputs +/-10 V 12 bit and TWO RELE' CONTACTS

#### 8.3.1 Electric characteristics

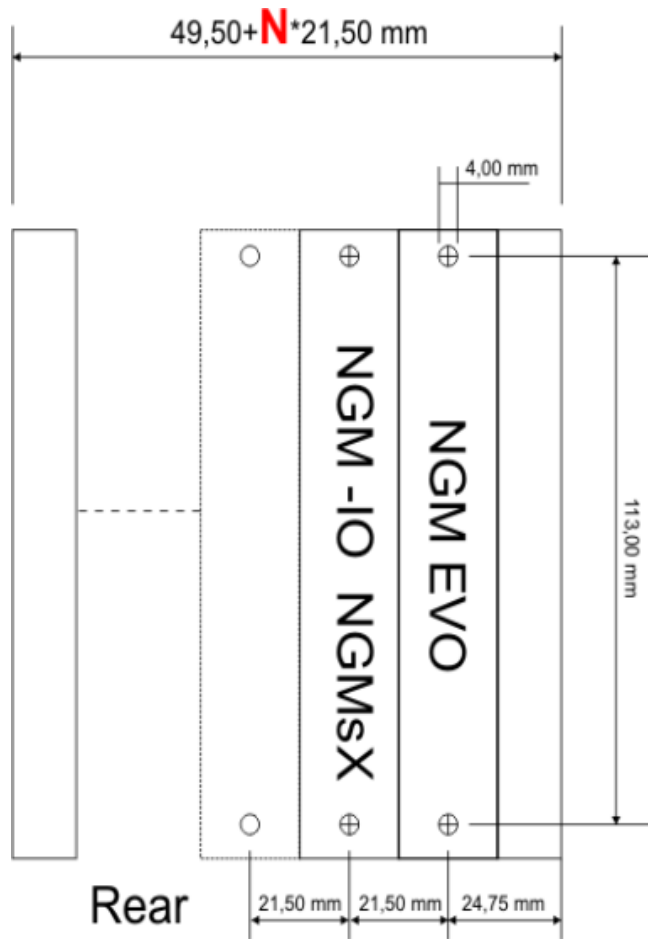
|               |                  | U.m.     | Min | Standard | Max   |
|---------------|------------------|----------|-----|----------|-------|
| Analog Output | Output voltage   | Vdc      | -10 |          | 9,995 |
|               | Output impedance | $\Omega$ | 250 |          | 290   |
| Relè Conctat  | Voltage          | Vdc      |     |          | 35    |
|               | Current          | A        |     |          | 1     |



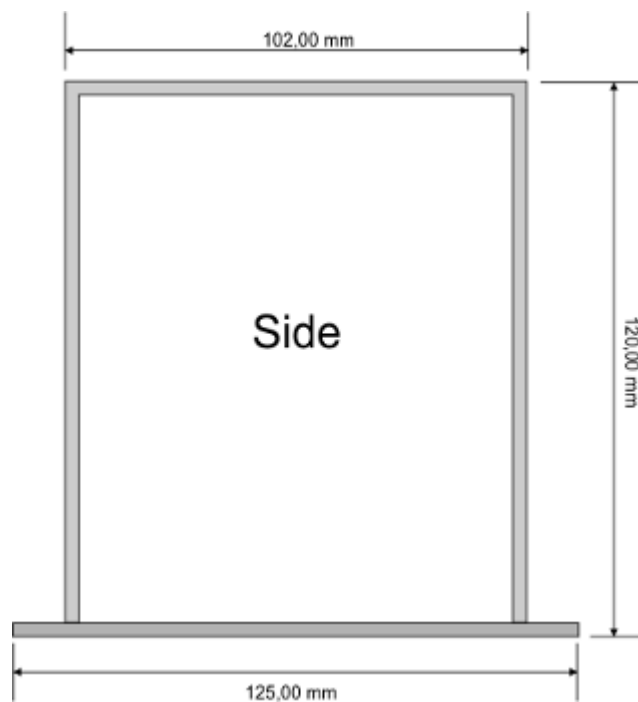
**WARNING**

**USE A CABLE WITH SHIELD FOR THE CONNECTIONS**

## 9 Dimensions



**N**=expansions number  
NGMIO or NGMSx



## 10 Notes on the CE legislation

### NGMEVO

We have two directives about electronic devices, regarding the NGMEVO : the 2006/42/CE (machine directive) about safety use of the devices and 2004/108/CE about electromagnetic compatibility.

About the first (machine directive) electric/electronic devices, must complies the "low voltage" directive (2006/95/CE) but it can be applied on devices supplied at 50-1000Vac or 75-1500Vdc. NGMEVO works at a voltage of 24Vdc (thus Intrinsically "safe" ), so it belongs to "very low voltage" devices (class 0 legislation CEI 11.1), on which it isn't no legislation about.

On electromagnetic compatibility, regarding the 2004/108/CE norm, this device can be classified as a "finished appliance". Due to the fact that the NGMEVO will be normally integrated inside a complex electromechanics system, the machine electric board, by a manufacturer in an industrial ambit and not by a final customer, it haven't any certification duty.

PROMAX however, can institute some specific measure as a pre-compliance, in case of particular demands of costumers, regarding the device electromagnetic characterization.

For example, can be made some measure under the CEI EN 61000-6-1 norm (2007 generic norms – residential , commercial and light industrial ambient immunity) or CEI EN 61000-6-1 (2007 generic norms - residential , commercial and light industrial ambient emission)

## Index

|  |    |
|--|----|
| .....  | 2  |
| 1 Features .....   | 3  |
| 2 Identification Code NGM EVO.....                                     | 4  |
| 3 NGM EVO Connections .....  | 5  |
| 4 Connections Description .....  | 6  |
| 4.1 Power .....  | 6  |
| 4.1.1 Electrical Characteristics .....                                 | 6  |
| 4.2 Serial Ports.....  | 7  |
| 4.2.1 Connections J6 SER1/PROG – J11 SER2 .....                        | 8  |
| 4.3 CAN BUS Port.....  | 9  |
| 4.3.1 Connection CAN BUS.....  | 9  |
| 4.3.2 CanOpen Max PDO Number .....                                     | 9  |
| 4.3.3 CanOpen Cable.....   | 10 |
| .....  | 10 |
| 4.3.4 CONDUCTORS ELETTRIC RESISTANCE .....                             | 10 |
| 4.4 Ethernet Port.....   | 11 |
| 4.4.1 Connections.....   | 11 |
| 4.5 Analog inputs .....  | 12 |
| 4.5.1 Analog Inputs Connections J12 .....                              | 12 |
| 4.5.2 Input Resistance .....   | 12 |
| 4.5.3 External resistance for voltages other than 0-10V or 4-20Ma..... | 12 |
| 4.5.4 Connection example .....   | 13 |
| 4.6 Analog Output on NGMEVO .....                                      | 13 |
| 4.6.1 Electric characteristics .....                                   | 13 |
| 4.7 Channels STEP/DIR.....   | 14 |
| 4.7.1 OPEN-COLLECTOR .....   | 14 |
| 4.7.2 LINE DRIVE.....  | 14 |
| 4.7.3 Connections OPEN COLLECTOR J13 /J14 .....                        | 15 |
| 4.7.4 Connections LINE DRIVE.....                                      | 16 |
| 4.8 Encoder Input.....   | 17 |
| 4.8.1 Electric characteristics .....                                   | 17 |
| 4.8.2 Example.....   | 18 |
| 4.9 Digital Inputs .....   | 19 |
| 4.9.1 Electric characteristics .....                                   | 19 |
| 4.9.2 Connections J1/J2 .....  | 19 |

|        |  |    |
|--------|--|----|
| 4.10   | Digital Outputs .....                                      | 20 |
| 4.10.1 | Electric characteristics.....                              | 20 |
| 4.10.2 | Connections J3/J4.....                                     | 20 |
| 5      | Programming.....   | 21 |
| 5.1    | Manual Boot.....   | 21 |
| 5.2    | Upload VTB application.....                                | 21 |
| 5.3    | NGPROG .....   | 21 |
| 5.3.1  | Upload firmware.....                                       | 21 |
| 5.3.2  | Upload VTB application .....                               | 21 |
| 6      | Status Led .....   | 21 |
| 7      | NGMIO Connections .....                                    | 22 |
| 7.1    | Connections NGMIO J1/J2.....                               | 23 |
| 7.2    | Connections NGMIO J3/J4.....                               | 23 |
| 8      | NGMsX Connections.....                                     | 24 |
| 8.1    | Channels STEP/DIR on NGMsX Expansion .....                 | 25 |
| 8.2    | Channels ENCODER on NGMsX Expansion .....                  | 26 |
| 8.2.1  | Electric characteristics .....                             | 26 |
| 8.2.2  | Electric characteristics +5vdc output encoder supply ..... | 26 |
| 8.2.3  | Example.....   | 27 |
|        | .....  | 27 |
| 8.3    | Analog Outputs on NGMsX Expansion .....                    | 28 |
| 8.3.1  | Electric characteristics .....                             | 28 |
| 9      | Dimensions .....   | 29 |
| 10     | Notes on the CE legislation .....                          | 30 |