

NGQuark

www.promax.it

User Guide



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Rev. 3.00.5

1 Features

The system NGQUARK is a numerical control based on the Freescale MCF5213 ColdFire microprocessor. NGQUARK born as a stand alone and can also be used as SLAVE CANOPEN with appropriate firmware.

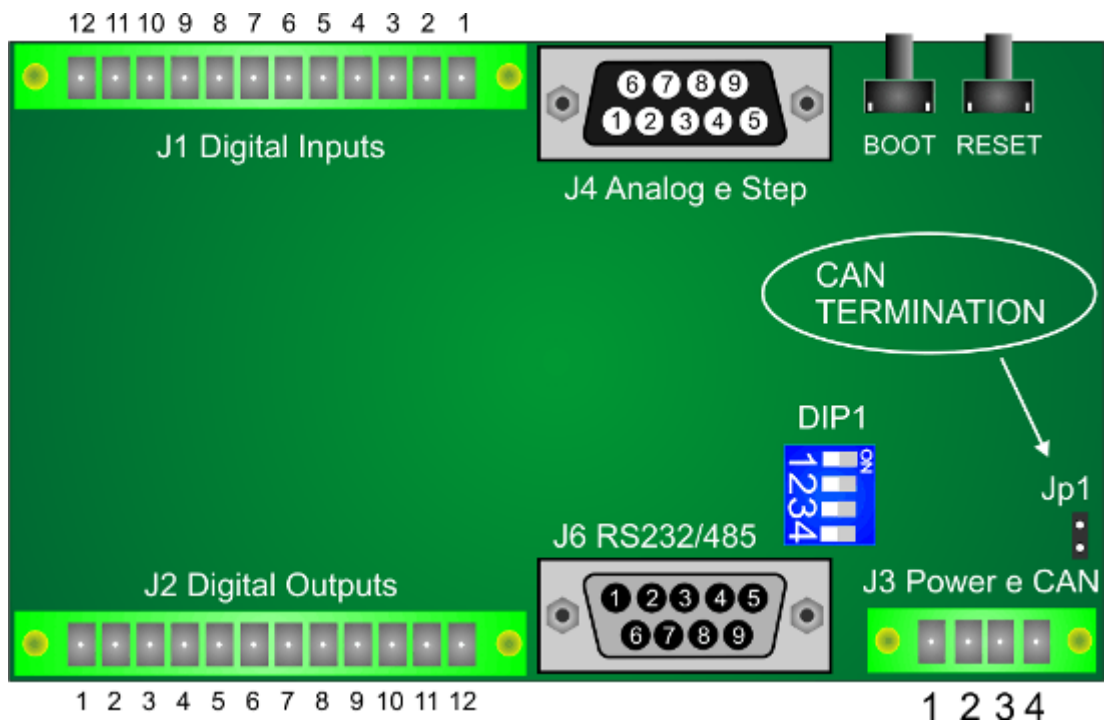
NGQuark

- **Microprocessor MCF 51JM128 at 48MHz**
- **128 KbFlash**
- **16 Kb RAM**
- **16 kB FRAM permanent memory**
- **2 Serial ports RS232 (1/RS485)**
- **1 CAN OPEN Master/Slave**
- **4 analog-innputs 12 bit**
- **2 Analog Outputs +/-10V**
- **11 Digital Inputs PNP 24 Vdc**
- **8 Digital Outputs PNP 24 VDC up to 1 A**
- **4 Channels STEP/DIR Line Drive o Open Collector**

2 Identification code

ORDER CODE NG Quark	
NGQ/	- - - -
0	Without Analog Inputs or STEP/DIR Channels
A	4 – Analog Inputs 5 V
B	4 – Analog Inputs 12 V
C	4 – Analog Inputs 10 V
D	4 – Analog Inputs 4-20 Ma
E	4 – Analog Inputs 24 V
P	4 – STEP/DIR Channels Open Collector
L2	2 – STEP/DIR Channels Line Drive
L4	44 – STEP/DIR Channels Line Drive
0	SER1 RS232 - SER2 RS 232
1	SER1 RS232 - SER2 RS 485
0	Without Analog Outputs
1	2 – Analog Outputs +/- 10V
A	Default Analog Input 5 V
B	Default Analog Input 12 V
C	Default Analog Input 10 V
D	Default Analog Input 4-20 Ma
E	Default Analog Input 24 V
The 4 analog inputs configuration excludes the default analog input	
0	Without Expansion permanent memory
1	16 Kb Expansion permanent memory

4 NGQuark Connection



5 Connections description

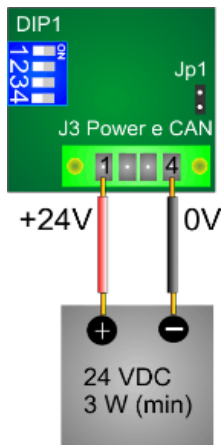
5.1 Power

The NGQuark requires two separate power supplies:

- **Logical Power J3**
- **Digital Outputs Power J1 e J2**

To supply the digital outputs, see the relevant **chapter 4.7**.

About the supply of the logic section, this is necessary for normal operation of the card.



5.1.1 Electrical Characteristics

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

PIN	Description
1	+ 24 VDC
2	CAN L
3	CAN H
4	GND

THE SYSTEM IS PROTECTED FROM POLARITY INVERSION



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

5.2 Serial Ports

The serial ports on the **NGQuark** 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 NGQuark ports

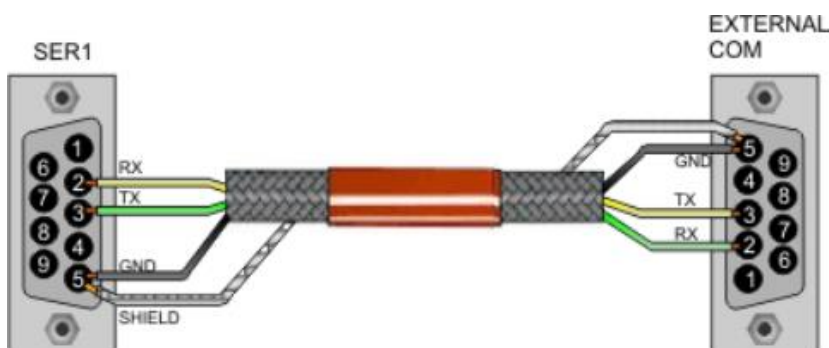
Generally the RS232 connection, uses a NULL MODEM cable (pin 2,3,5) CROSSOVER (with inversion on pin 2,3)

Always check the external device that type of connection it accepts

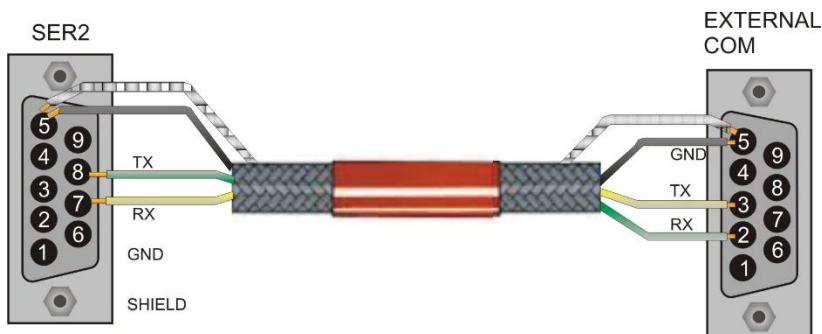
THE J6 CONNECTOR IS NOT IN STANDARD RS232 MODE

SER1 and SER2 are connect to same connector J6

SER1 in RS232 mode

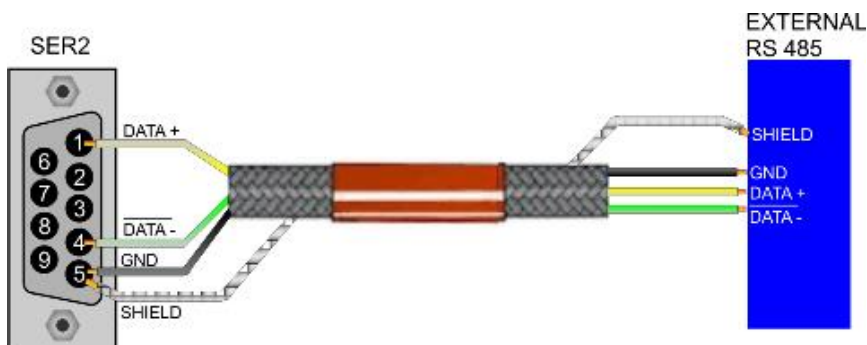


SER2 in RS232 mode

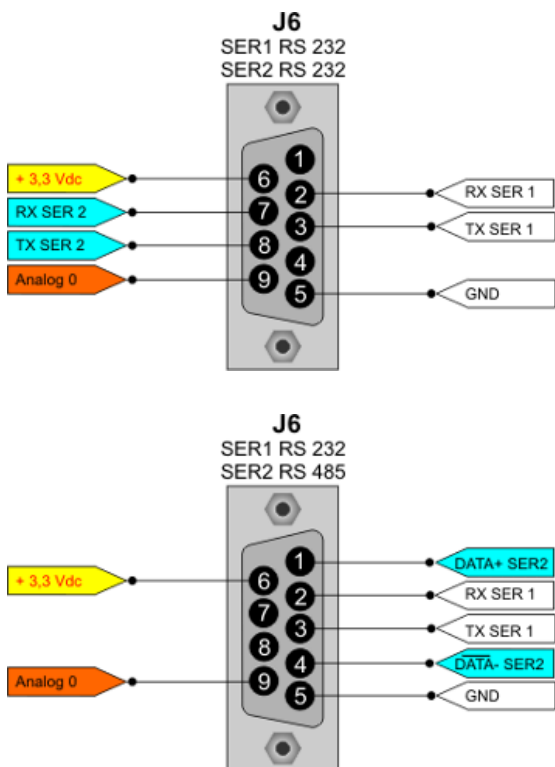


SER2 in RS485 mode

Normally the GND pin is not connect



5.2.1 J6 Connections



WARNING
 THE PIN 6 +3.3 Vdc
 MUST NOT BE CONNECTED
 ONLY FOR FUTURE EXPANSIONS

WARNING
 DO NOT INSERT THE CONNECTORS PORT WHEN THE POWER IS ON
 BECAUSE THE CARD CAN BE DAMAGED

5.3 CAN BUS port

The port CAN BUS allows the communication of the card NGQUARK 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.

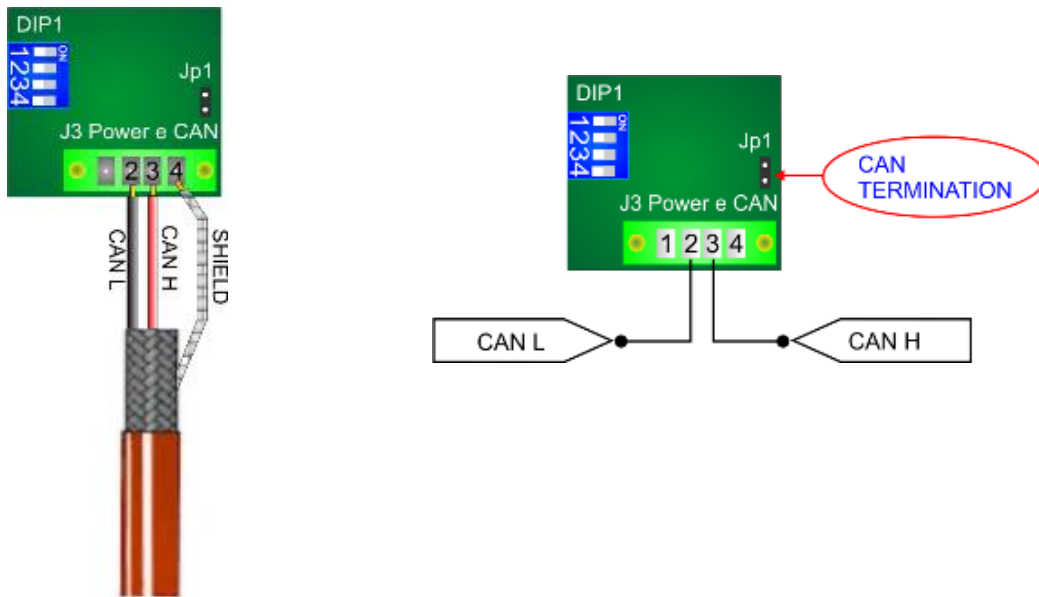
In terms of data exchange, the line complies with DS301.

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.

5.3.1 CAN BUS Connections

If possible insert the terminator resistor with jumper JP1



5.3.2 CanOpen Max PDO Number

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

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

7 → PDO Tx

3 → PDO Rx



WARNING
USE THE CABLE FOR CANOPEN COMMUNICATION

5.3.3 Set Slave Node Number

When the NGQUARK is in SLAVE MODE, you must select the CanOpen Node number by DIP 1. This is codified in binary mode (node 1 to 15)



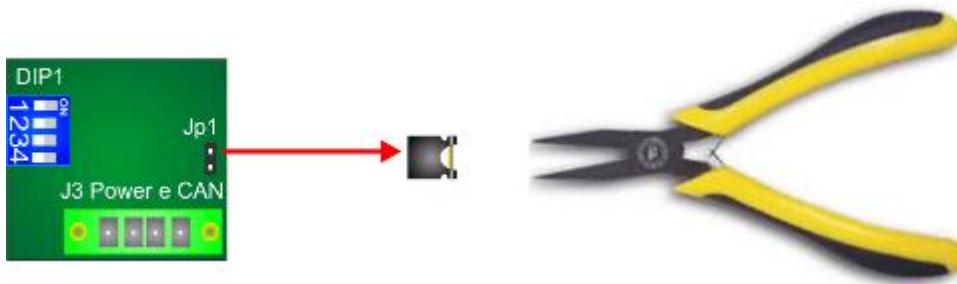


WARNING

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

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

In another situations, remove the JUMPER

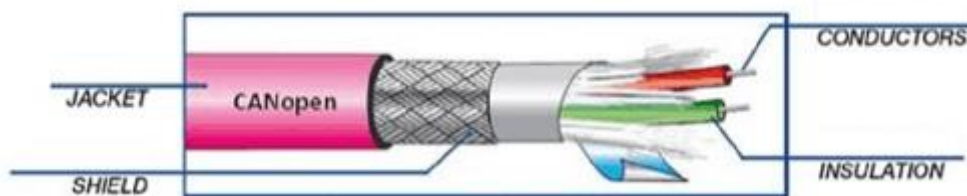




WARNING

USE THE CABLE FOR CANOPEN COMMUNICATION

5.3.4 CanOpen Cable



CONDUCTORS ELETTRIC RESISTANCE

22AWG: < 55,4 Ohm/Km

21AWG: < 43,6 Ohm/Km



PAIR CAPACITY

50 pF/m



IMPEDEANCE

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

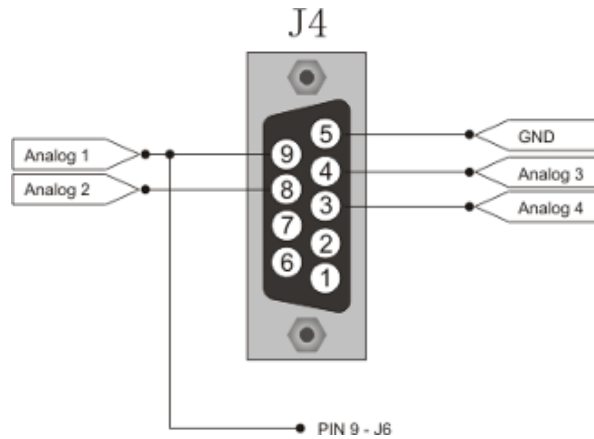
5.4 Analog Inputs

The analog inputs of the NGQuark can be configured to read voltage signals including 5-10-12-24 VDC, or in current between 4-20mA. Configuration is done for each input, making the system very flexible.

The input voltage can not exceed those limits by more than 0.2 V.

They can be configured up to a maximum of 4 analog inputs, one of which is always present.

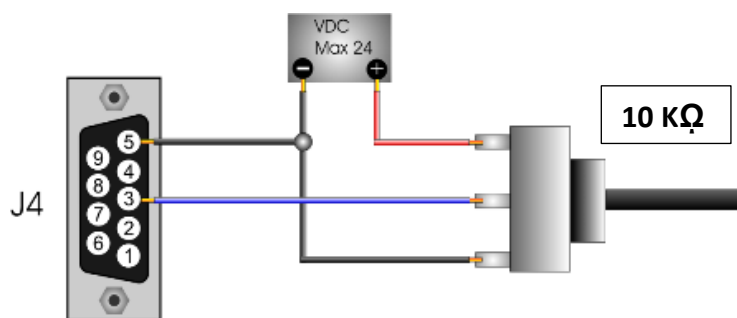
5.4.1 Analog Connections J4



5.4.2 Input Resistance

	MIN	Typical	MAX
VDC	25 K Ω		72 K Ω
4-20 Ma		175 Ω	

5.4.3 Connection Example



WARNING

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

THE 2 or MORE ANALOG INPUTS CONFIGURATION ESCLUDED THE OUTPUTS SETP/DIR

5.5 PULSE/DIR Outputs

The card NGQuark can use, up to four outputs STEP / DIR for a total frequency of 125 KHz in position mode and 35 KHz in interpolation mode.

The outputs can be configured with OPEN COLLECTOR signals, 5V or LINE DRIVE.

5.5.1 OPEN-COLLECTOR Signals

POWER	MAX 48 VDC
LOAD	100 Ma continuative 500 Ma peak
V STATE ON	MIN 0V MAX 1V
FREQUENCY	MAX 30 KHz

5.5.2 LINE DRIVE Signals

OUTPUT DIFFERENTIAL	MIN 2.2V MAX 3.3V specific TIA/EIA-422-B (RS422)*
FREQUENCY	MAX 125 KHz in position mode – 35 KHz in interpolation mode

specific TIA/EIA-422-B (RS422)

LOAD	V Min	V Typical
3,9 K Ω		3,2 V
100 Ω	2	2,6 V



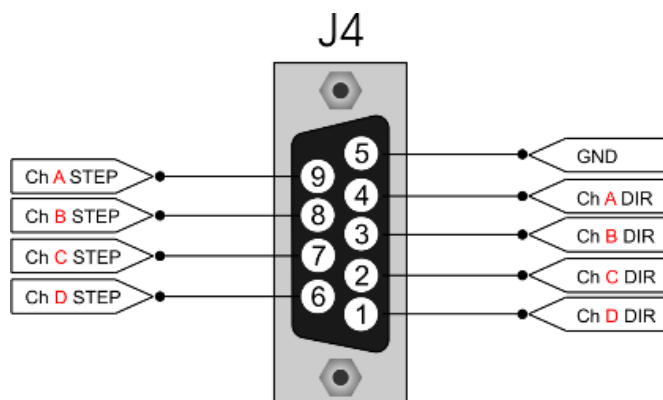
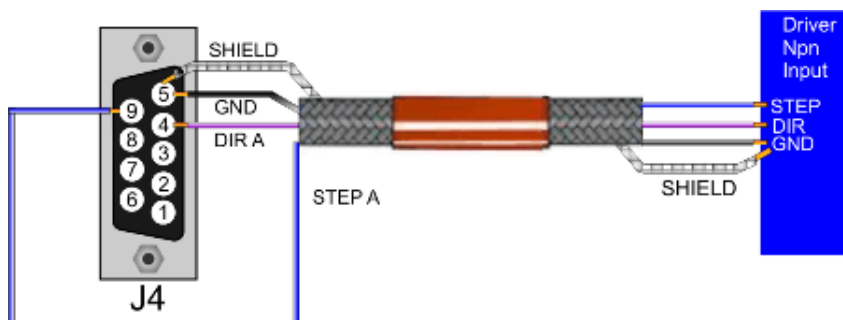
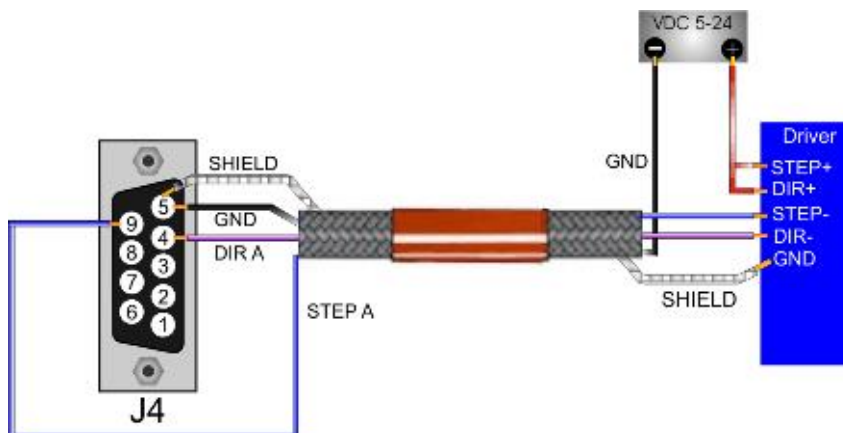
WARNING

USE A CABLE WITH SHIELD FOR THE CONNECTIONS

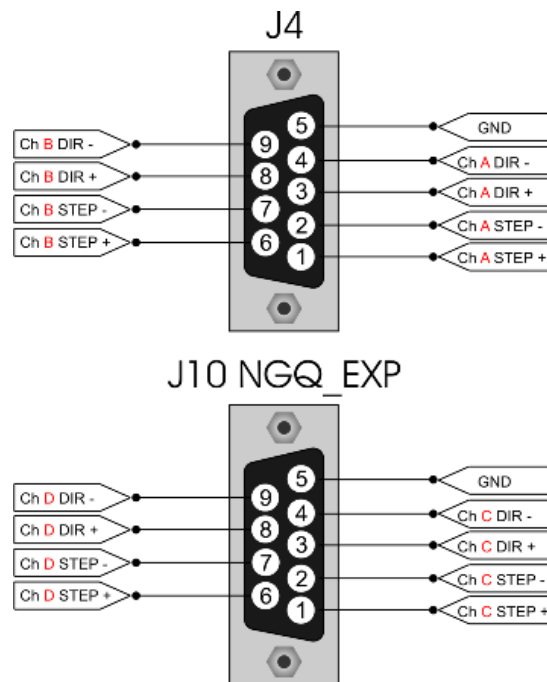
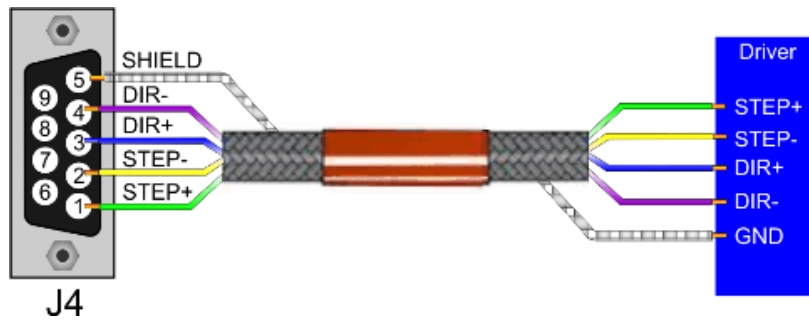
THE STEP/DIR OUTPUTS CONFIGURATION ESCLUDED THE 4 ANALOG INPUTS

The default analog input 1 is always available

5.5.3 Connection STEP/DIR OPEN COLLECTOR J4



5.5.4 Connection STEP/DIR LINE DRIVE



WARNING

THE J10 CONNECTOR IS PRESENT ONLY IF USED CHANNELS LINE DRIVE 3 and 4

THIS CONNECTOR IS ON EXPANSION NGQ_EXP

USE A CABLE WITH SHIELD FOR THE CONNECTIONS

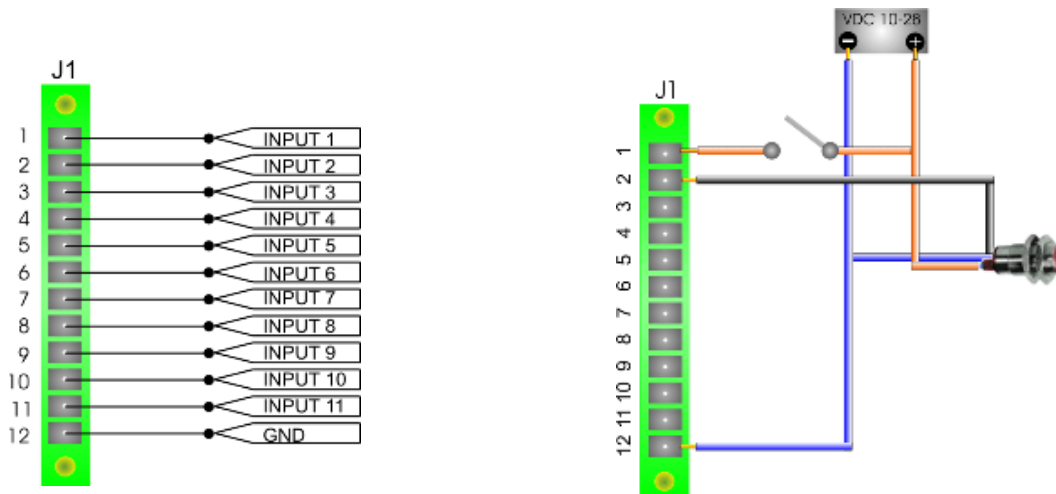
5.6 Digital Inputs

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

5.6.1 Electrical

		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)

5.6.2 Connection J1



WARNING
DO NOT EXCEEDS THE VOLTAGE LEVEL ABOVE DESCRIBED

5.7 Digital Outputs

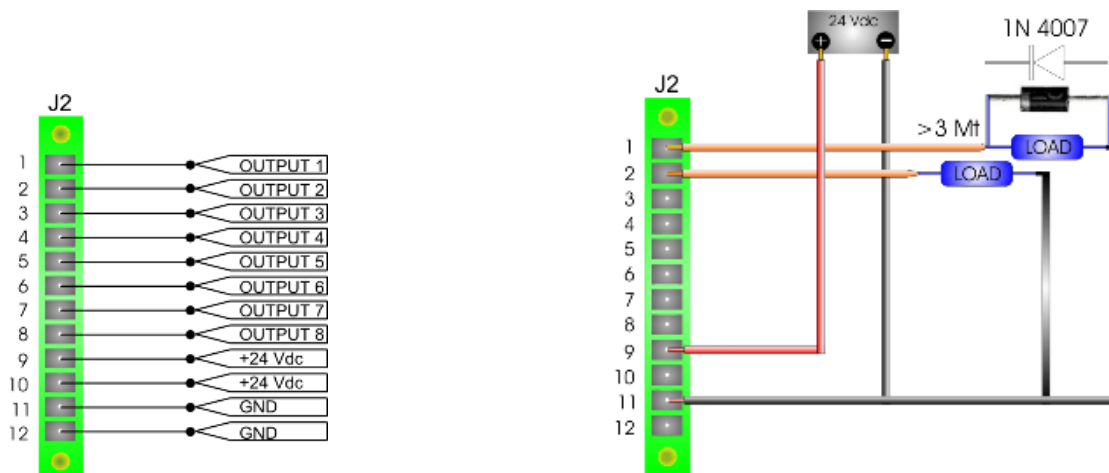
These outputs are optically isolated with respect to GND. In order to function should therefore feed them separately with a voltage of 24 Vdc. The load is driven by a transistor of the PNP type which when activated will provide a positive voltage equal to the voltage supply of the outputs.


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 1 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).

5.7.1 Electrical

		U.m.	Min	Standard	Max	Note
Power Supply		Vdc	10	24	30	
Load		A		1		Continue (T 25°)
		A		2		Duty Cycle 25% (T 25°)
		A			6	Peak (10 ms)
Delay	ON	µs			5	
	OFF	µs			30	

5.7.2 Connection J2





WARNING
DO NOT EXCEEDS THE VOLTAGE LEVEL ABOVE DESCRIBED

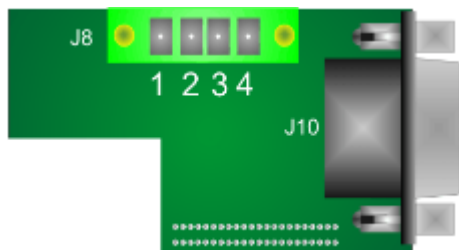
THE DIGITAL OUTPUTS, ARE NOT PROTECTED BY OVERLOAD OR SHORT CIRCUIT

5.8 Expansion Board

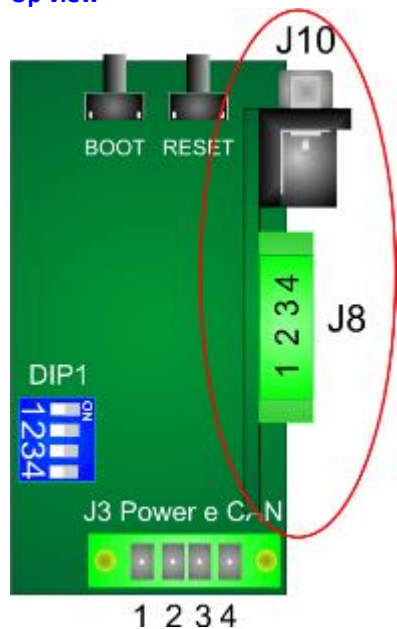
The NGQ Expansion Board contain the following features:

- **2 Channels STEP/DIR Line Drive J10 See Chapr 4.5.4**
- **2 Analog Outputs +/- 10 V J8**
- **Permanent memory expansion FRAM 16 Kb**

Side view



Up view



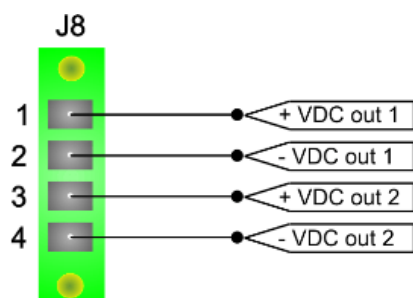
5.9 Analog Outputs

The two Analog Outputs, are on the Expansion Board in the Connector **J8**

5.9.1 Electrical

		U.m.	Min	Standard	Max
Analog Output	Output Voltage	Vdc	-10		9,995
	Output impedance	Ω	250		290

5.9.2 Analog Outputs on J8 Expansion Board



6 Programming

6.1 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 NGQUARK
- 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

6.2 Upload VTB application

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

The board NGQUARK 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.

6.3 NGPROG

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

6.3.1 Upload firmware (If not present NGQUARK select NGM13)

- 1) Press button "GESTIONE FIRMWARE" 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 NGM13 board type
- 4) Start the upload firmware

6.3.2 Upload VTB application (If not present NGQUARK select NGM13)

- 1) Select the NGM13 Board
- 2) Select the COM on PC
- 3) Select the .SREC file by button "LOAD"
- 4) Start the upload by button "TRASFERISCI APPLICAZIONE"

7 Status Led

ST-1/L1 (Green led):

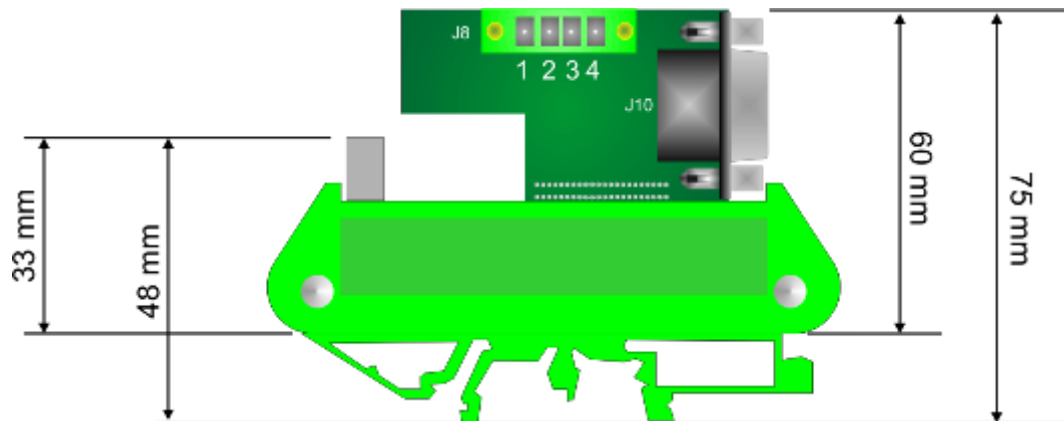
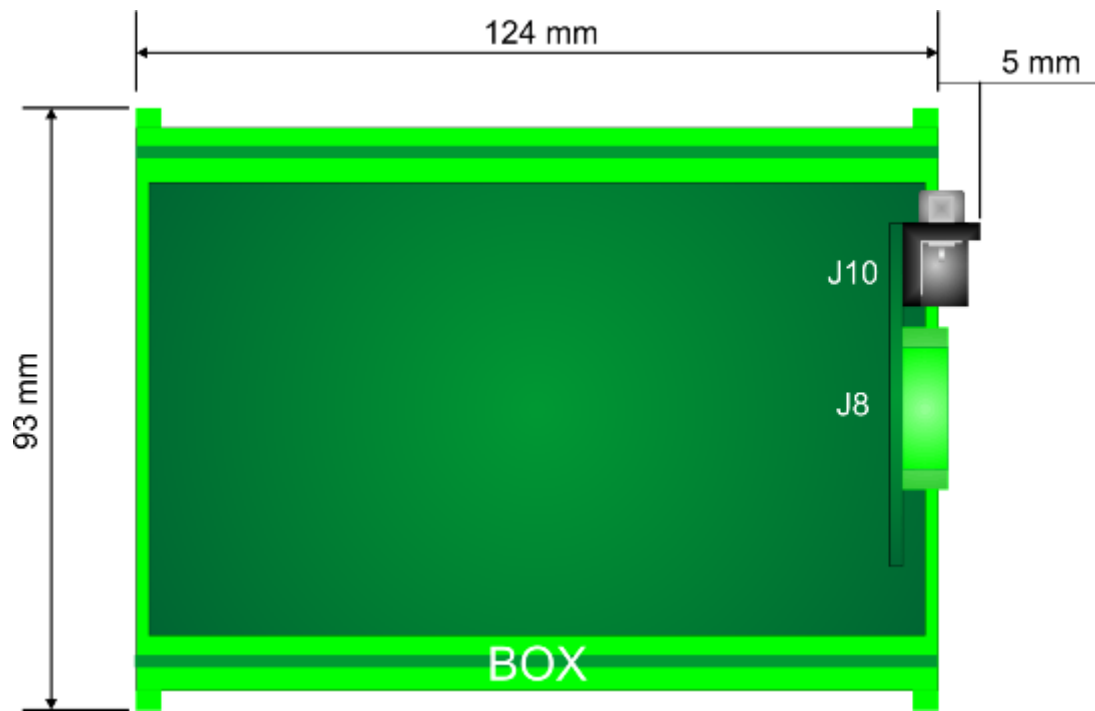
- Fast blink – board in BOOT MODE
- blink1 sec – application RUN

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

8 Dimensions



9 Notes on the CE legislation

We have two directives about electronic devices, regarding the **NG Quark**: 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 comply the Union harmonisation legislation (Low Voltage Directive), Directive 2006/95/EC (until April 19th, 2016) and Directive 2014/35/EU (from April 20th, 2016) but it can be applied on devices supplied at 50-1000Vac or 75-1500Vdc. **NG Quark** 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 Union harmonisation legislation Directive 2004/108/CE (until April 20th, 2016) and Directive 2014/30/EU (from April 20th, 2016), the device can be considered inherently benign in terms of electromagnetic compatibility because its inherent physical characteristics are such that:

a) it is incapable of generating or contributing to electromagnetic emissions which exceed a level allowing radio and

telecommunications equipment and other equipment to operate as intended;

b) it will operate without unacceptable degradation in the presence of the electromagnetic disturbance normally present in its intended environment

Moreover, this device cannot be classified as a "finished appliance with an independent functionality", due the

NG Quark haven't any use outside a complex electromechanics system, the machine electric board, made by a manufacturer in an industrial ambit and not by a final user.

Thus, it hasn'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)

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