Inhaltsverzeichnis

J1-K31-Fx


PRG
999
99:99:99
99/99/9999
PRESET
STOP
PEZZI FATTI: 99999999
X 99999999
Y 99999999
Z 99999999
Ux 99999999
Uy 99999999
Uz 99999999
Bloccaggi
Contrasto
I/O
esc
pg up
pgm
run
stop
err
ins
pg dn
F1
F2
F3
1
2
3
4
5
6
7
8
9
0
+/-
help
F4
F5
F6
Y=0
F7
F8
F9
F10
F11
F12
F13
F14
F15
F16
F17

1. Informations

1.1 Release

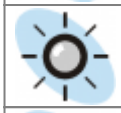
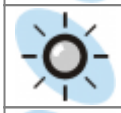
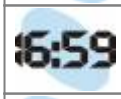
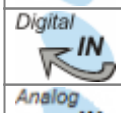
Document release	Description	Notes	Date
01	New manual	Valid per hardware releases from 02 and firmware major release from 5	14/09/2011
02	New system and backup/restore functions	Valid for firmware 1K31F-xx.5.5 and later	28/11/2011
03	On-line versio		09/01/2012

The controller has been designed for industral environments in conformity to EC directive 2004/108/CE.

- EN 61000-6-4: Electromagnetic compatibility - Generic standard on emission for industrial environments
  - EN55011 Class A: Limits and measurement methods
  - EN 61000-6-2: Electromagnetic compatibility - Generic standard on immunity for industrial environments
    - EN 61000-4-2: Electromagnetic compatibility - Electrostatic discharge immunity
    - EN 61000-4-3: Immunity to radiated, radio-frequency electromagnetic field
    - EN 61000-4-4: Electrical fast transients
    - EN 61000-4-5: Surge immunity
    - EN 61000-4-6: Conducted disturbance induced by radio-frequency
    - Moreover the product is conform to the following standards:
      - EN 60529: Housing protection rating IP64
      - EN 60068-2-1: Environmental testing: Cold
      - EN 60068-2-2: Environmental testing: Dry heat
      - EN 60068-2-14: Environmental testing: Change of temperature
      - EN 60068-2-30: Environmental testing: Cyclic damp heat
      - EN 60068-2-6: Environmental testing: Sinusoidal vibration
      - EN 60068-2-27: Environmental testing: Shock vibration
      - EN 60068-2-64: Environmental testing: Random vibration

2. Description

The **J1-K31-F** is a combo HMI-PAC controller of the Qmove+ range

Dotazione di serie	
	7„ graphic LCD display TFT-256 COLOUR-800x480px
	Resisitive Touch Screen
	PROG serial port for programming (For use with interface accessory IQ009)
	1 multistandard serial port (RS232/422/485) - USER PORT
	1 MMC/SD card slot
	CANopen communication protocol
	14 signal led's
	8 system led's
	Anti-vibration spring cage terminals
	Clock calender
	Interchangeable panel film
	Custom function keys
Optional hardware(Consult the Hardware versions table)	
	1 multistandard serial port (RS232/422/485) – AUX1 PORT
	1 RS485 serial port - AUX2 PORT
	2 CANbus port [1)]
	1 USB PORT[2)]
	1 ETHERNET port
	1 remote kepad connection port
	32 standard digital inputs (+16 inputs instead of 8 counts)
	4 analog inputs

Fast Digital IN	4 fast inputs
A/B/Z	8 two-way counts
Digital OUT	32 digital outputs
Analog OUT	8 analog outputs
Stepper OUT	4 step-direction outputs for stepper motors

[1] the second CANbus port has not been enabled
[2] not enabled

2.1 Product identification

The Ordering Code provides the exact product characteristics. Make sure that the product characteristics meet your requirements.

2.1.1 Product label

- **a - Ordering Code**
- **b - Week made**: indicates the week and year of manufacture
- **c - Part number**: unique code that identifies an ordering code
- **d - Serial number**: product serial number, different for individual product
- **e - Hardware release**: version of hardware release

2.1.2 Ordering Code

Modello				Caratteristiche				
J1	-	**K31**	-	**FA**	**10**	/	**TP01**	
							TP00 = Codice tastiera (TP00 = pannello con touch-screen resistivo, logo e tasti funzione personalizzabili); **TP01** = pannello con touch-screen resistivo, logo e tasti funzione standard QEM	
					10 = Versione firmware (00 = non installato)			
				F = Livello tecnologico **A** = Versione hardware				
		K = Tastiera estesa **1** = display lcd grafico 7" TFT-256 COLORI-800x480px; dimensione pannello anteriore (216x263mm); tastiera 41 tasti + 18 led; contenitore a norme DIN 43700; **1** = Corrispondenza firmware-hardware						
J1 = Famiglia Qmove „HMI+PLC"								

2.1.3 Hardware Versions

There are currently 14 hardware versions available:

		Hardware Versions																		
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	W	Y	Z
SLOT 2 (Scheda base)	USER PORT (RS232, RS422, RS485)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	AUX1 PORT (RS232, RS422, RS485)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	AUX2 PORT (RS485)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	CAN1 PORT	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	CAN2 PORT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ETHERNET PORT	-	-	-	-	-	-	1	1	-	1	1	-	1	-	1	1	1	1	1
	USB PORT[1)]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLOT 3 (Schede di specializzazione)	Standard digital inputs	-	16	24	16	24	24	16	16	32	32	32	32	32	32	32	32	-	24	24
	Fast digital inputs[2)]	-	2	3	2	3	3	2	2	4	4	4	4	4	4	4	4	-	3	3
	12bit analog inputs	-	2	2	2	4	2	2	2	4	4	4	4	4	4	4	4	-	2	4
	16bit analog inputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PT100 inputs [3)]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Thermocouple inputs[4)]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20kHz two-way count inputs, ABZ \\(24V-PP, 5V-LD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	200kHz two-way count inputs, ABZ (24V-PP, 5V-LD)	-	4	4	2	4	2	2	2	4[5)]	8	4	2	2	6	4	6	-	4	4
	Protected digital outputs	-	8	24	8	24	24	8	8	32	32	32	32	32	32	32	32	-	24	24
	Digital relay outputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	0-10V, 12bit analog outputs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	+/-10V, 16bit analog outputs	-	4	4	2	4	2	2	2	4	8	4	2	2	6	4	6	-	4	4
	Stepper outputs	-	-	-	-	-	-	-	2[6)]	-	-	-	-	-	-	2	-	-	-	4[7)]
	Qem remote keypad connector[8)]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Card software code declared in SLOT 3		-	1MG3F	1MG4F	1MG3F	1MG4F	1MG4F	1MG3F	1MG3F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	-	1MG4F	1MG4F

[1), 3), 4), 8)] option not currently enabled
[2)] the rapit inputs can be used as frequency meters in the „FREQ" device
[5)] i connettori utilizzati sono CN15, CN16, CN17 e CN18
[6)] 4 uscite solo Push-Pull
[7)] 4 uscite solo Push-Pull

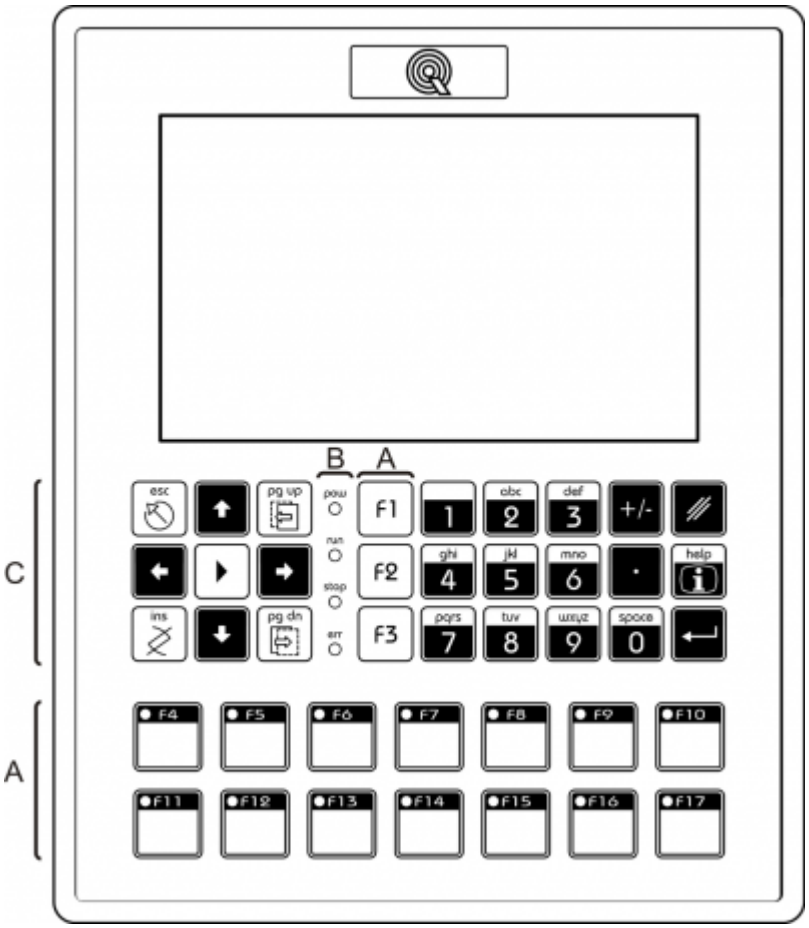
2.1.4 Firmware Versions

Version	Description
10	Fully programmable with PLC functions
20	Fully programmable with PLC and Motion control functions
30	Fully programmable with PLC, Motion control, Camming and Interpolation functions

For more details about the various characteristics of the firmware, consult the table Devices enabled in the controllers.

2.2 Product Configuration

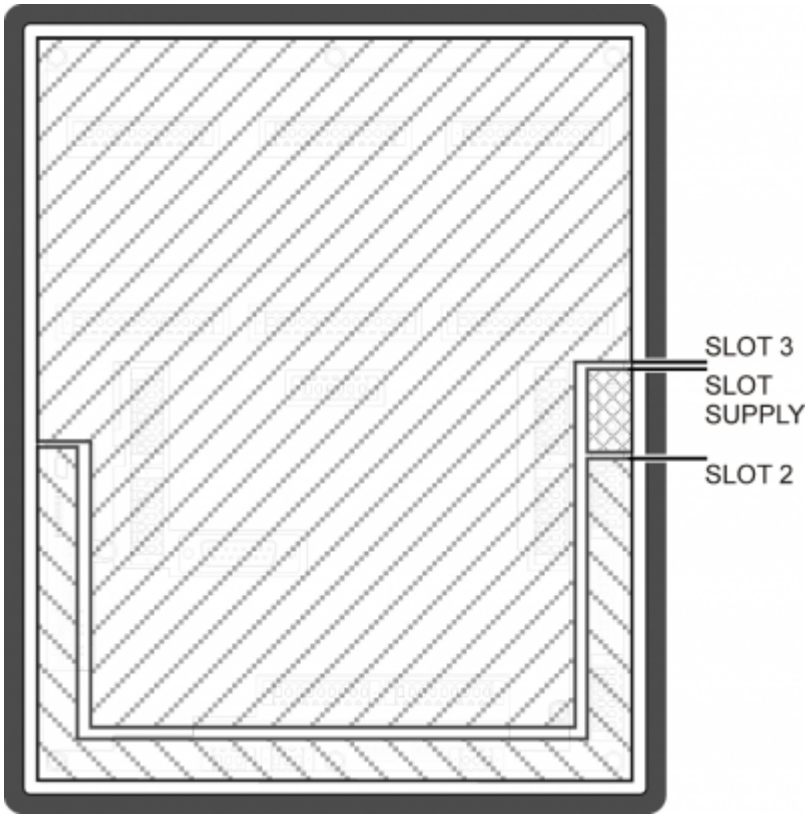
2.2.1 Front Panel



A) Function keys and led's
B) System led's
C) Tastiera

2.2.2 Rear terminal blocks

The J1-K31-F is configured with a specialization card inserted in the slot 3.



Slot	Description
Slot Supply	Power connector located on the base board
Slot 2	Base Card
Slot 3	Expansion cards

3. Technical features

3.1 General features

Weight (full hardware)	1,8Kg
Housing	Metal sheet
Front panel	Allumium
Outer Frame	Noryl Extinguishing
Display	LCD 7'' TFT 256 colors - 800 x 480px
Touch screen	Resistive 4 wires
Display dimensions	152,4 x 91,4mm / 7„
User led's	14
System led's	8
Function keys	17
System keys	24
Operating temperature	0 ÷ 50°C
Transport and storage temperature	-25 ÷ +70 °C
Relative humidity	90% without condensing
Altitude	0 - 2000m s.l.m.
Front protection rating	IP64

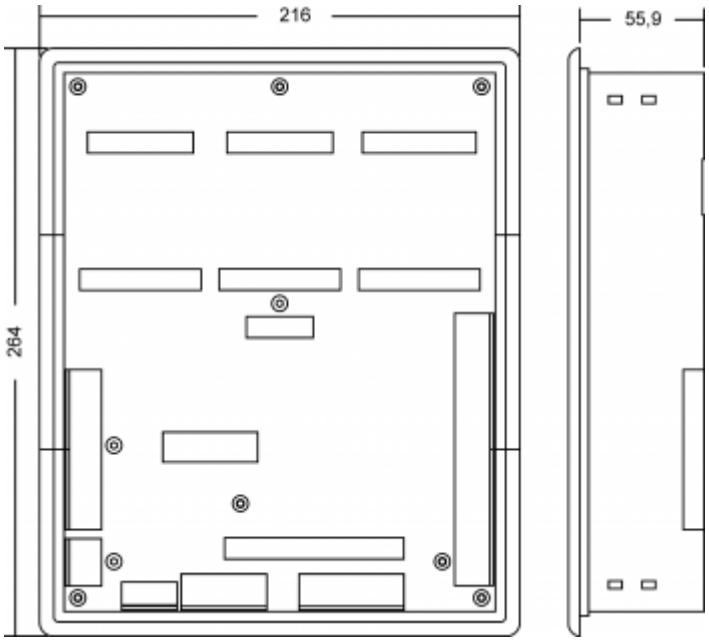
3.2 CPU (F level technology)

RISC microprocessor (32 bit)	
Work frequency	200MHz
RAM	16MB
Flash	8MB

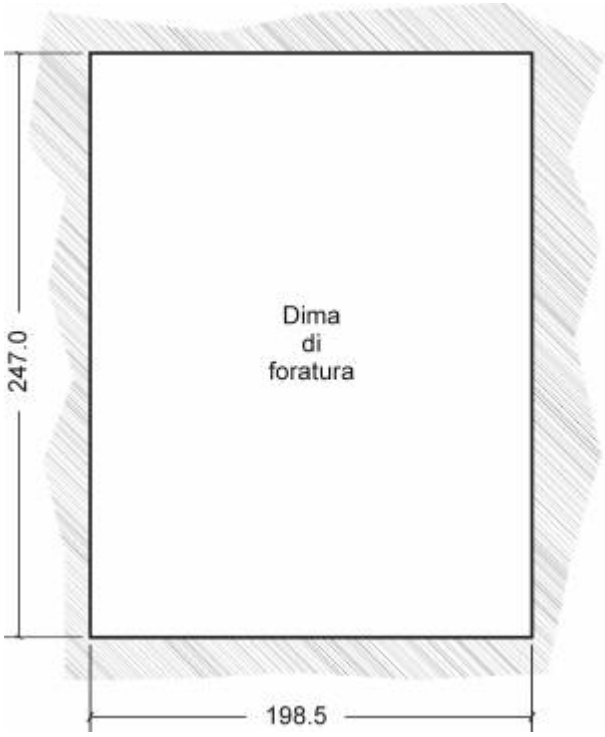
For more information on use of the memory consult Memories used

3.3 Dimensions

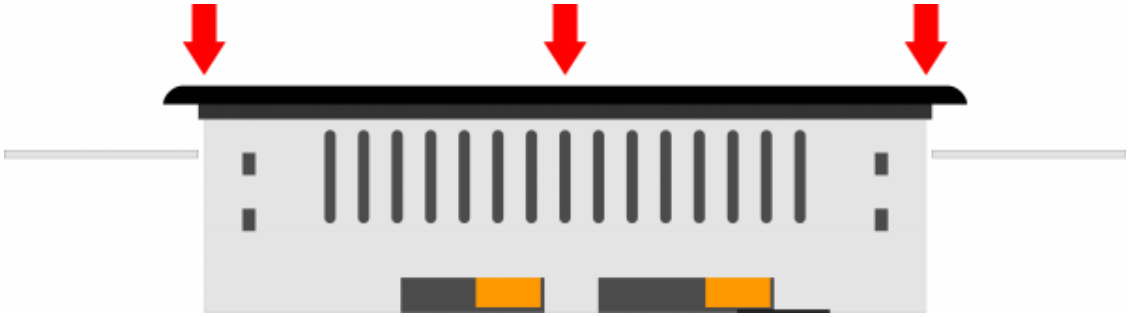
Lengths in mm.



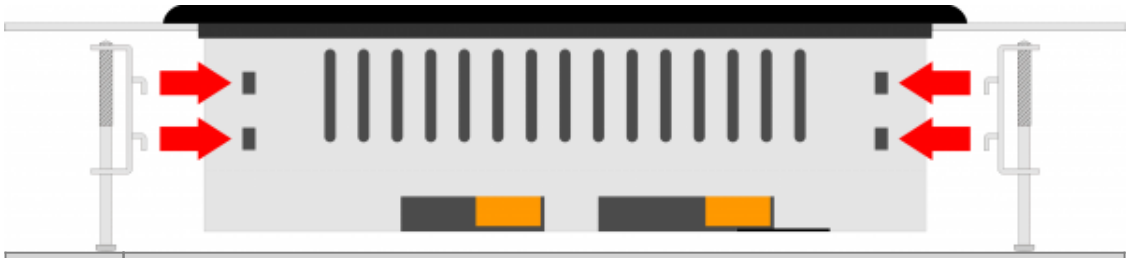
3.4 Hole template



Fit the controller in the hole.



Apply the brackets.

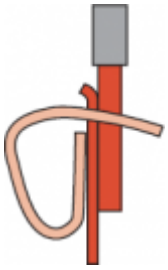
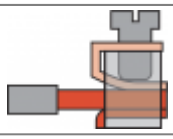


Before fixing the controller, check it is mounted firmly in the hole and the gasket under the frame makes a good seal. No liquids must enter and the frame must not deform.

Screw the controller in place.

	Warning: after putting the pin of fixing, do only half rotation to not tear the frame!
	• Please read carefully. • See technical notes on Weidmuller terminals BLZF, BLZ and B2L.

Types of Connectors

	Family	Wire Section no end caps	Wire section with end caps	Characteristics of contact	Tools
	BLZF 3.5	0.3-1.50 mm^2	0.3-1 mm^2		Open the self-locking, spring clip terminals with a flat blade screwdriver to DIN 5264-A as shown below See the table below for recommended cap ends To crimp the cap ends to the wire use the tool below
	B2L 3.5	0.3-1.00 mm^2	0,3-0.5 mm^2		
	BLZF 5.08	0.3-2.50 mm^2	0.3-2.00 mm^2		
	BLZ 5.00	0.2-2.50 mm^2	0.1-1 mm^2		The screw terminals can be tightened with a flat blade screwdriver to DIN 5264 as shown in fig.4.7 Tightening torque: 0.4 - 0.5 Nm.

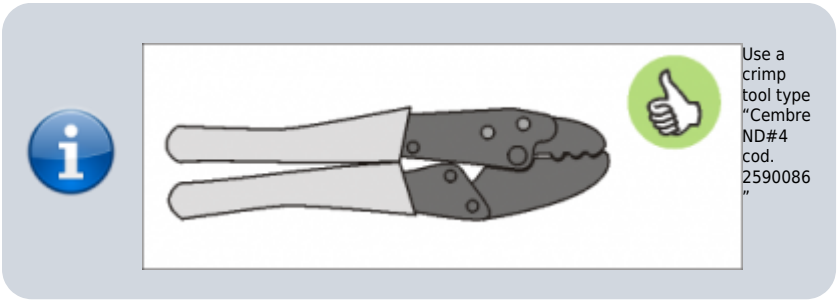
For a safer cabling, always use wire end caps

Tools

End caps

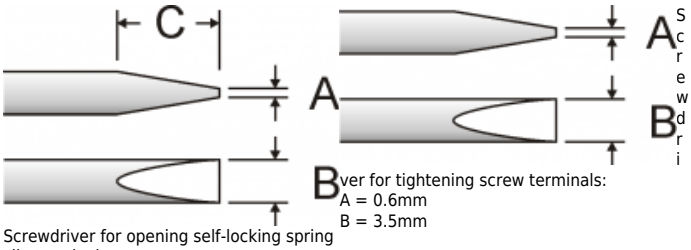
Wire section	End cap section	Make	Model
0.1-0.3 mm^2	0.95 mm^2	Cembre	PKE 308
0.3-0.5 mm^2	1.32 mm^2	Cembre	PKE 508
		BM	BM00601
1 mm^2	2.5mm^2	BM00603	PK 108
		BM	BM00603

End cap crimping tool



Use a crimp tool type "Cembre ND#4 cod. 2590086 "

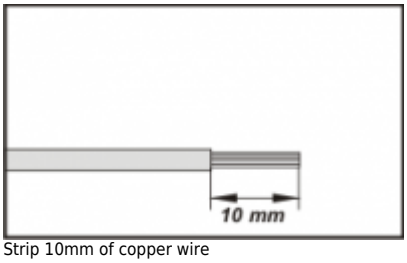
Screwdrivers



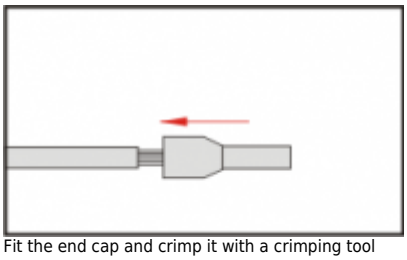
Screwdriver for opening self-locking spring clip terminals:
A = 0.6mm
B = 2.5mm max
C = 7 mm min

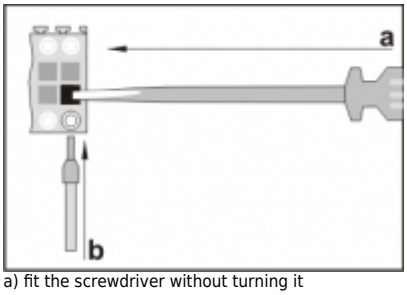
Screwdriver for tightening screw terminals:
A = 0.6mm
B = 3.5mm

Procedure

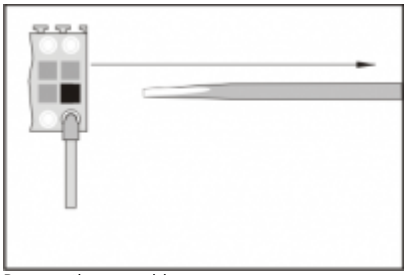


Strip 10mm of copper wire


Fit the end cap and crimp it with a crimping tool

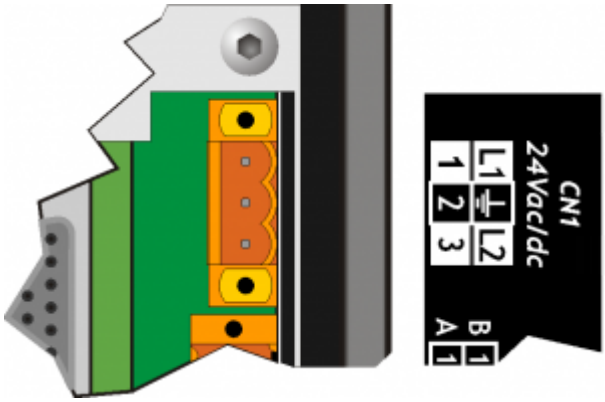


a) fit the screwdriver without turning it
b) fit the cable in the terminal


Remove the screwdriver

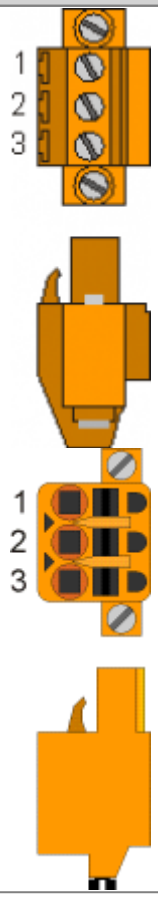
4. Electric Characteristics and wiring

4.1 Slot Supply

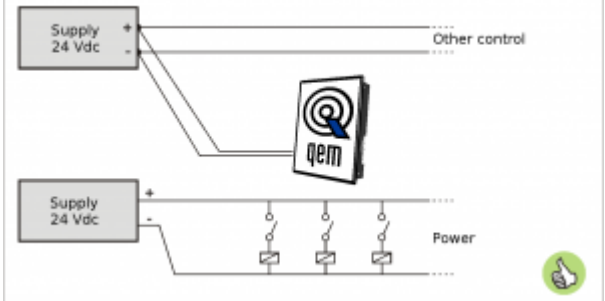
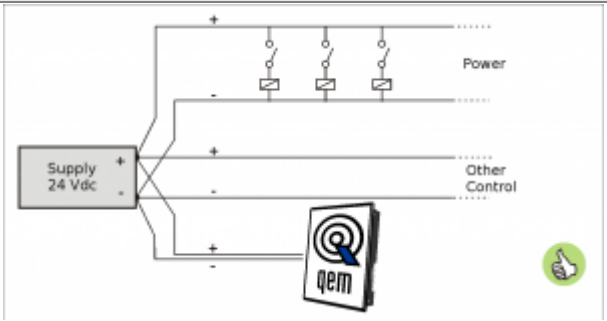


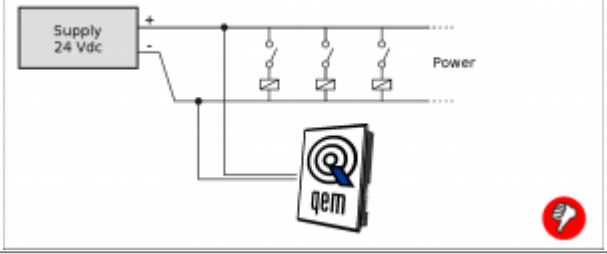
	The cabling must be carried out by specialist personnel and fitted with suitable anti-static precautions. **Before handling the controller, disconnect the power and all parts connected to it.** **To guarantee compliance with EC regulations, the power supply must have a galvanic isolation of at least 1500Vac.**

Power supply	**24 Vdc**
Voltage range	22 - 27 Vdc
Max. absorption	30W

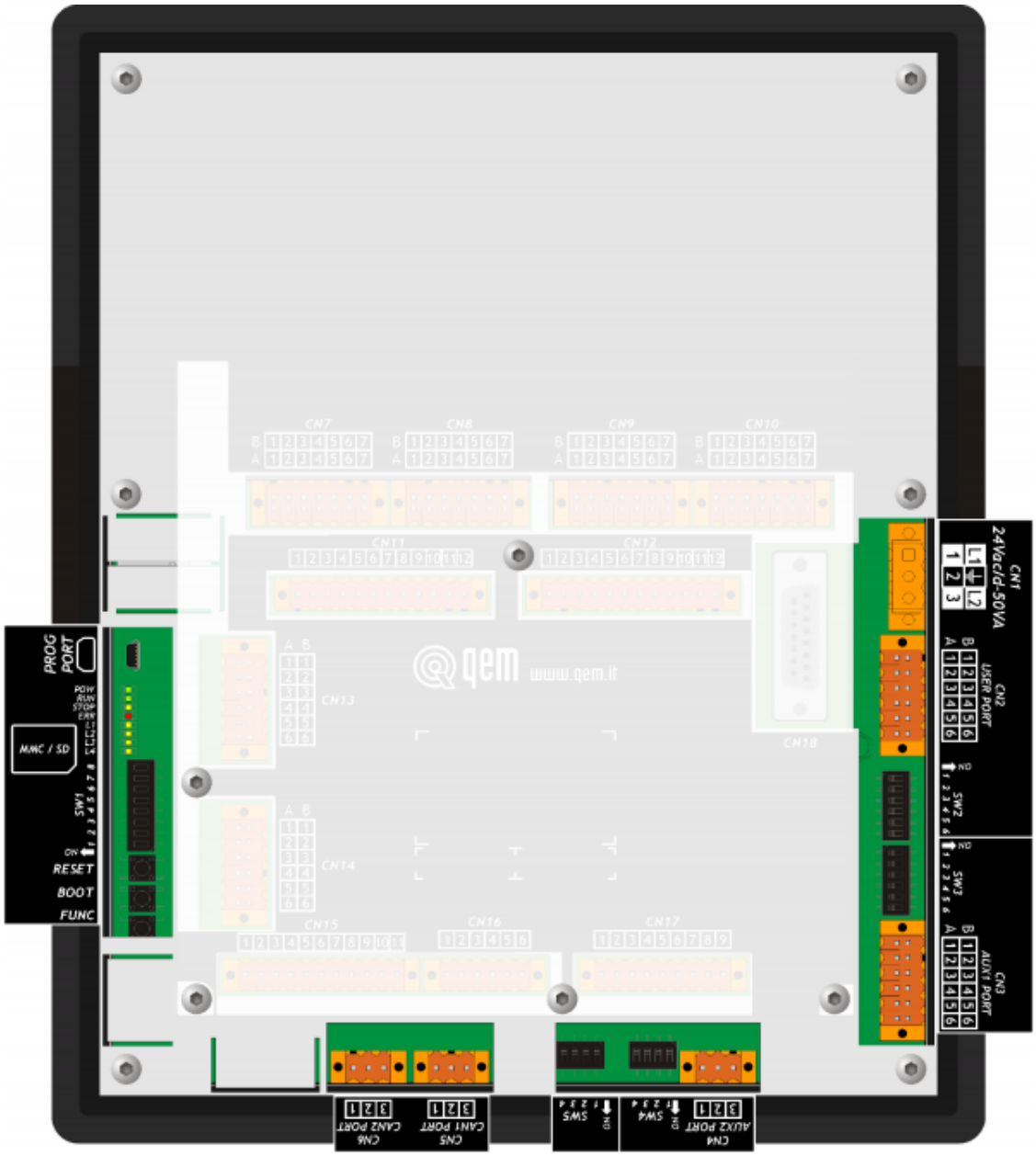
CN1	Terminal	Symbol	Description
	1	L1/+	DC power positive
	2	GROUND	Gnd-PE (signals)
	3	L2/-	DC power 0V

Connection examples for 24Vdc power supply

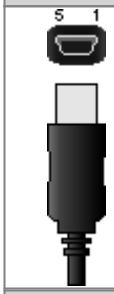
Use an isolated power unit with 24Vdc +/-5% output conform to EN60950-1.	
	Use two separate power units: one for the control circuit and one for the power circuit
	For a single power unit, use two separate lines: one for the control and one for the power

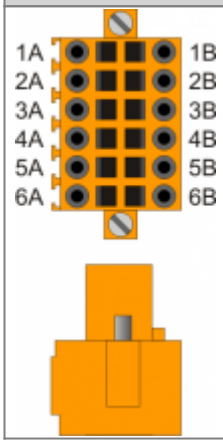
	DO NOT use the same lines for the power circuit and the controller

4.2 Slot 2

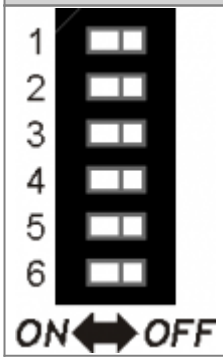

CN1
24Vac/d-50VA
L1
L2
CN2
USER PORT
SW2
SW3
CN3
AUX1 PORT
PROG PORT
MMC / SD
SW1
RESET
BOOT
FUNC
CN7
CN8
CN9
CN10
CN11
CN12
CN13
CN14
CN15
CN16
CN17
CN18
www.qem.it
CN5
CAN1 PORT
CN6
CAN2 PORT
SW5
SW4
CN4
AUX2 PORT

4.2.1 Serial Port Connections

PROG PORT	Description
	Serial port used for the transfer and debugging of the application program in the CPU. Use only with IQ009 or IQ013.

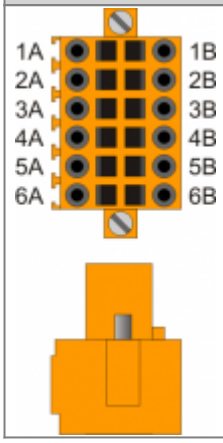
CN2	Terminal	RS232	RS422	RS485	Description
	1A	-	-	A	Terminal A - RS485
	2A	-	-	B	Terminal B - RS485
	3A	0V	0V	0V	USER PORT common
	4A	0V	0V	0V USER PORT common	
	5A	TX	-	-	Terminal TX - RS232
	6A	Terra			
	1B	-	RX	-	Terminal RX - RS422
	2B	-	RXN	-	Terminal RX N - RS422
	3B	-	TX	-	Terminal TX - RS422
	4B	-	TXN	-	Terminal TX N - RS422
	5B	RX	-	-	Terminal RX - RS232
	6B	Ground			

Setup of USER PORT electric standard

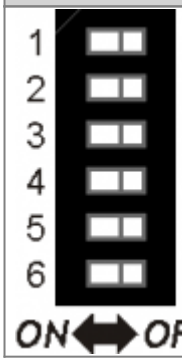
SW2	Num. Dip	Name DIP	Setting of DIP			Function
	1	JP2	ON	X[1]	X[2]	Termination RS485
	2	JP3	ON	X[3]	X[4]	Polarization RS485
	3	JP1	ON	X[5]	X[6]	
	4		OFF	ON	OFF	Selection of USER PORT electric standard
	5		ON	OFF	OFF	
	6		OFF	OFF	ON	
			RS485	**RS422**	**RS232**[7]	

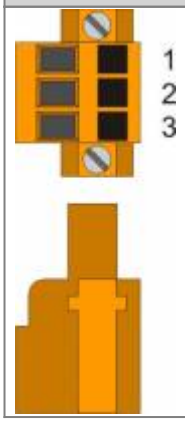
[1], [2], [3], [4], [5], [6] X = setting not significant

[7] the USER PORT can be used as PROG PORT with RS232 electric standard, setting ON in DIP-8 of SW1 and OFF in DIP-6 of SW2

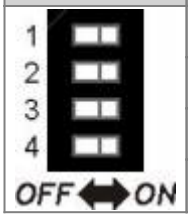
CN3	Terminal	RS232	RS422	RS485	Description
	1A	-	-	A	Terminal A - RS485
	2A	-	-	B	Terminal B - RS485
	3A	0V	0V	0V	USER PORT common
	4A	0V	0V	0V	USER PORT common
	5A	TX	-	-	Terminal TX - RS232
	6A	Ground			
	1B	-	RX	-	Terminal RX - RS422
	2B	-	RXN	-	Terminal RX N - RS422
	3B	-	TX	-	Terminal TX - RS422
	4B	-	TXN	-	Terminal TX N - RS422
	5B	RX	-	-	Terminal RX - RS232
	6B	Ground			

Setup of AUX1 PORT electric standard

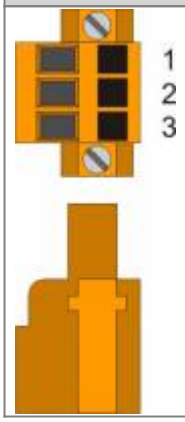
SW3	Num. Dip	Name DIP	Setting of DIP			Function
	1	JP2	ON	X[1]	X[2]	Termination RS485
	2	JP3	ON	X[3]	X[4]	Polarization RS485
	3	JP1	ON	X[5]	X[6]	
	4	-	OFF	ON	OFF	Standard USER PORT settings
	5	-	ON	OFF	OFF	
	6	-	OFF	OFF	ON	
	-	-	**RS485**	**RS422**	**RS232**	

CN4	Terminal	Symbol	Description
	1	0V	RS485 serial common
	2	B	Terminal RS485 B
	3	A	Terminal RS485 A

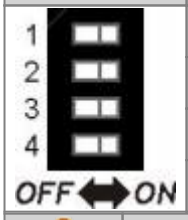
Setup of AUX2 PORT polarisation and termination resistances

SW4	Num. Dip	Name Dip	Setting of DIP	Function
	1	JP3	ON	Polarization RS485
	2	JP2	ON	Termination RS485
	3	JP1	ON	Polarization RS485
	4		X[7]	None

[1], [2], [3], [4], [5], [6] X = setting not significant
[7] X = setting not significant

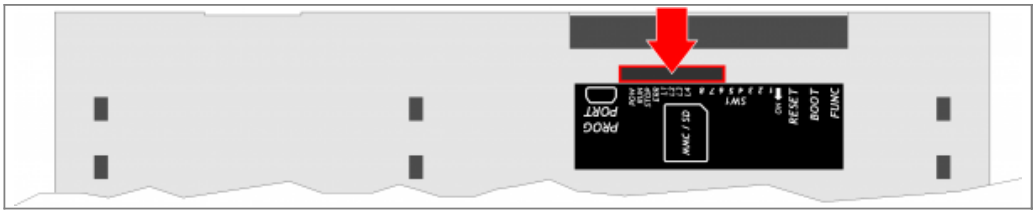
CAN1 PORT CAN2 PORT	Terminal	Symbol	Description
	1	0V	CAN common
	2	CAN L	Terminal CAN L
	3	CAN H	Terminal CAN H

Setup of CAN1 and CAN2 PORT Termination resistances

SW5	Num. Dip	Name Dip	Setting of DIP	Function
	1	JP1	ON	Termination CAN1
	2	JP2	ON	
	3	JP1	ON	Termination CAN2
	4	JP2	ON	

When activating the CAN1 port termination, set dip's JP1 and JP2 to ON.
When activating the CAN1 port termination, set dip's JP1 and JP2 to ON.

ETHERNET PORT	Description
	Connector RJ45. LED: * LINK: green led = cable connected (led on signals the cable is connected to both ends) * DATA: yellow led = data transmission (flashing led signals data transmission)



Memory card slot (marked by an arrow)

4.2.2 Characteristics of Serial Port Connection

Connector for IQ009 or IQ013

The USB mini-B connector does not support USB electrical standards, it can only be used with an interface IQ009 or IQ013.

It is used for the transfer and debugging of the application program in the CPU.

Electrical standard	TTL (Use serial interface IQ009 or IQ013)
Communication speed	Min. 9.6 Kbaud - max 115200 Kbaud settable by dip1 and 2 of the switch SW1
Insulation	None

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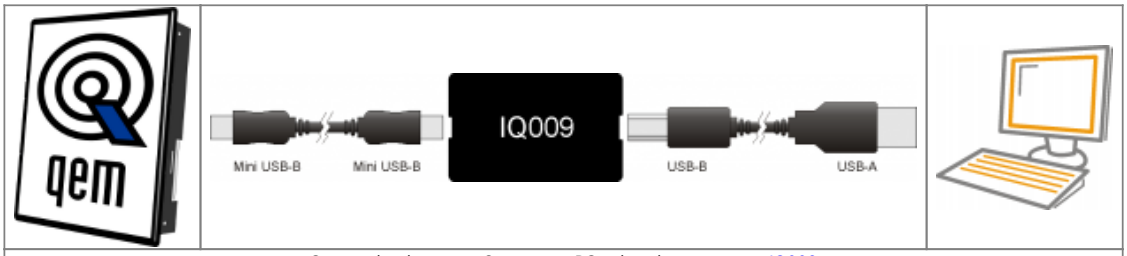
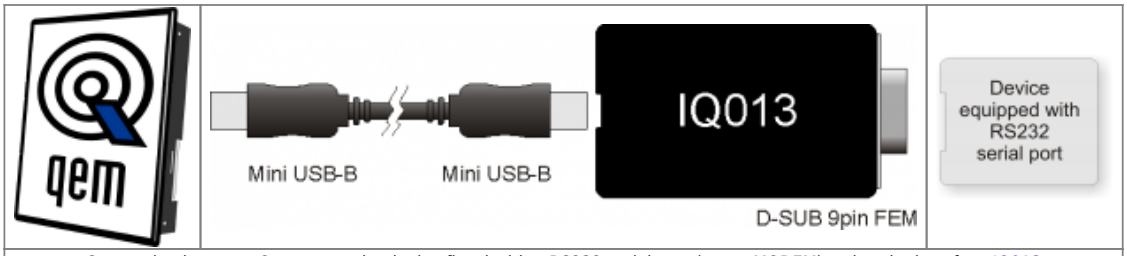


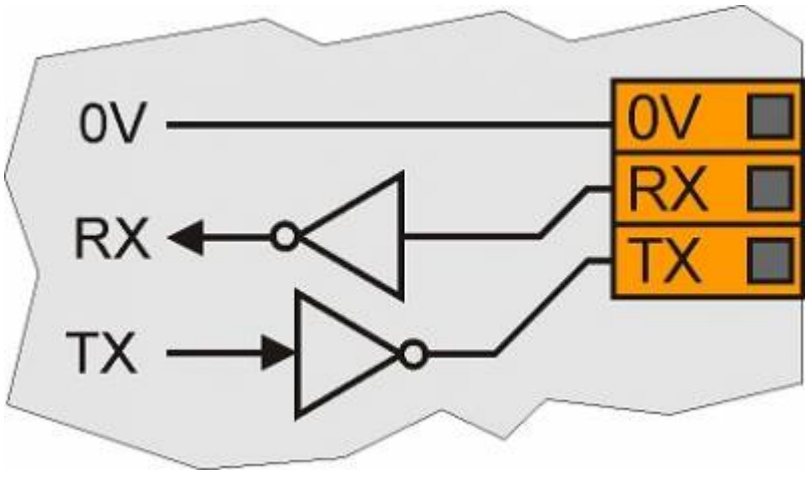
Connection between Qmove+ e PC using the accessory IQ009

.

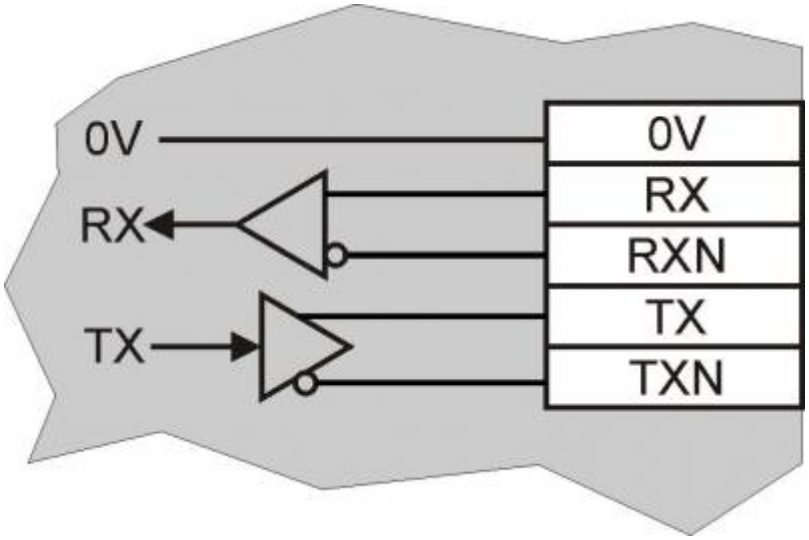


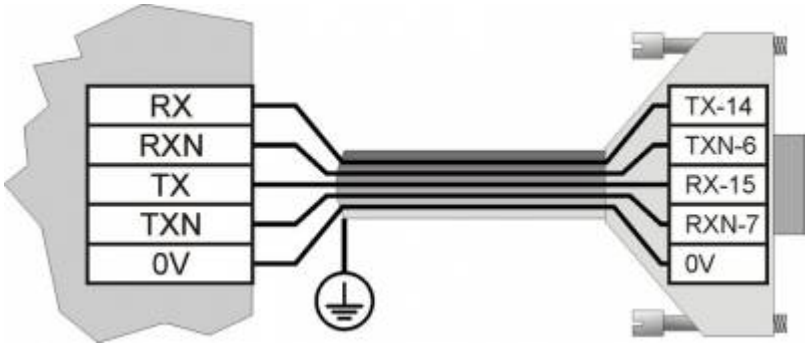
Connection between Qmove+ and a device fitted with a RS232 serial port (e.g. a MODEM), using the interface IQ013

Communication speed	4800, 9600, 19200, 38400, 57600, 115200 baud
Communication mode	Full duplex
Operating mode	Referred to 0V
Max. number of devices connected on the line	1
Max. cable length	15 m
Input impedence	≥ 3 Kohm
Short-circuit current limit	7 mA



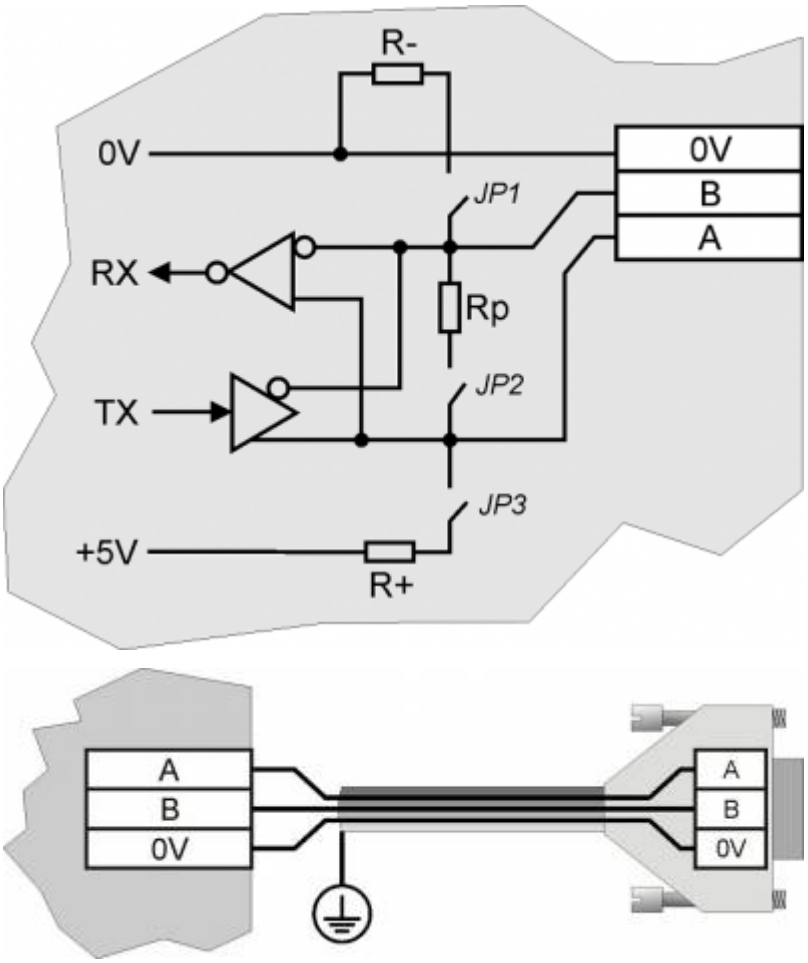
Communication speed	4800, 9600, 19200, 38400, 57600, 115200 baud
Communication mode	Full duplex
Operating mode	Differential
Max. number of devices connected on the line	1
Max. cable length	1200 m
Input impedence	≥ 12 Kohm
Short-circuit current limit	35 mA





To activate the internal termination resistance see paragraph Setup of USER PORT electric standard, Setup of AUX1 PORT electric standard or Setup of AUX2 PORT polarization and termination resistances

Communication speed	4800 baud (only if used with SERCOM and/or MODBUS device), 9600 baud, 19200 baud, 38400 baud, 57600 baud
Communication mode	Half duplex
Operating mode	Differential
Max. number of devices connected on the line	32
Max. cable length	1200 m
Input impedence	≥ 12 Kohm
Short-circuit current limit	35 mA



To activate the internal termination resistance see paragraph Setup Termination resistances

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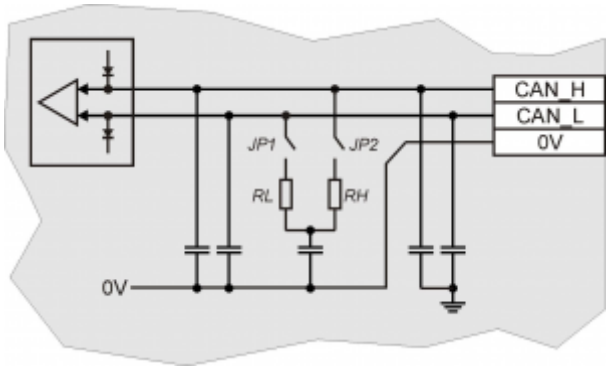
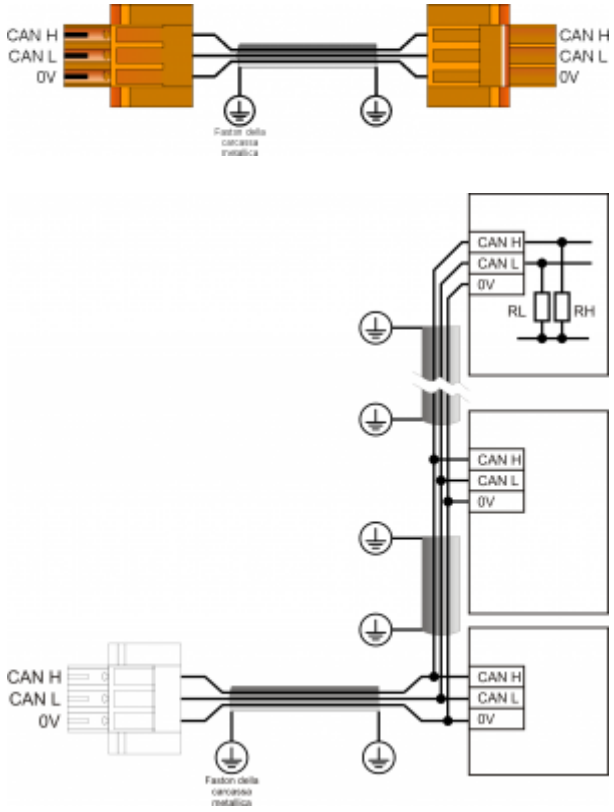
Communication speed	125, 250, 500, 1000 Kbit/s
Max. number of Drivers/Receivers on the line	100
Max. cable lengths	500m @ 125Kbit/s, 250m @ 250Kbit/s, 100m @ 500Kbit/s, 25m @ 1000Kbit/s
Input impedence	>15Kohm
Short-circuit current limit	45mA



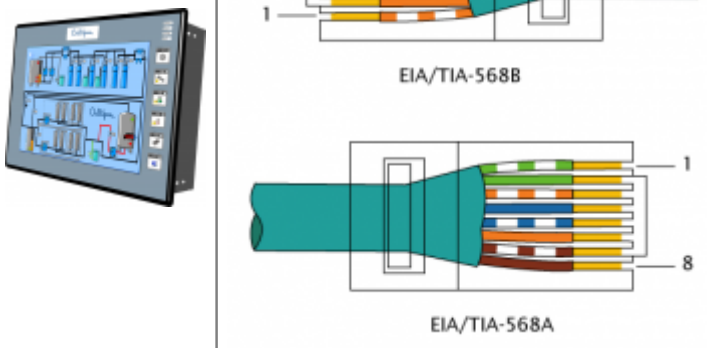


CAN BUS connection examples.

Caution:
Close DIP's JP1 and JP2 and insert the termination resistances (RL, RH) on the last device of the chain.

Ethernet Interface 10/100 Base T (IEEE 802.3) on RJ45 connector.

Connection between Qmove + and PC:



Qmove+	Cross-over cable EIA/TIA-568A/B	PC
Type of Memory Card to use	MMC, SD and SDHC up to 8GB For proper operation it is necessary that the device conforms to the standards set by „SD Association“ (www.sdcard.org) or „Multi Media Card Association“ (www.mmca.org).	

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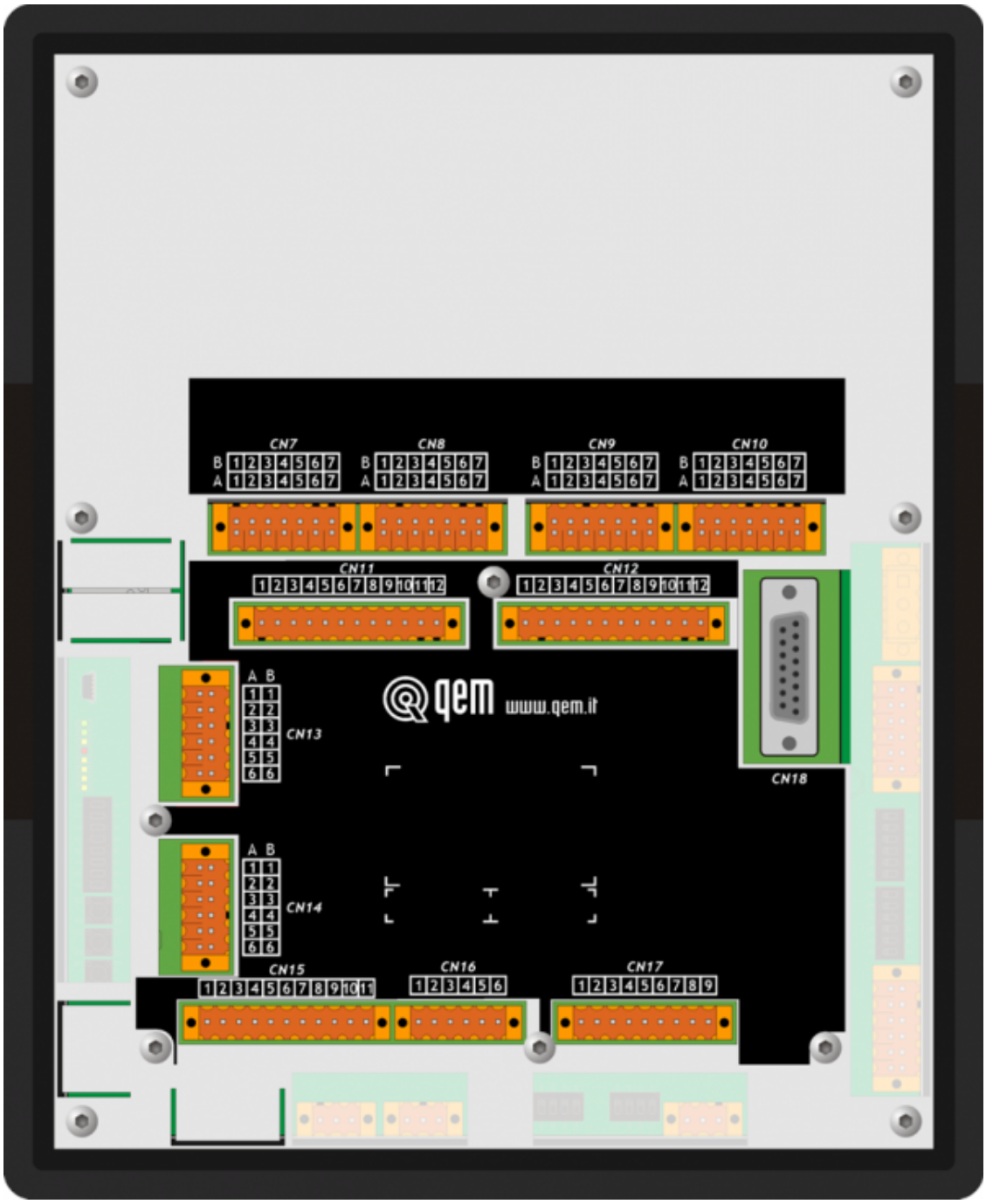
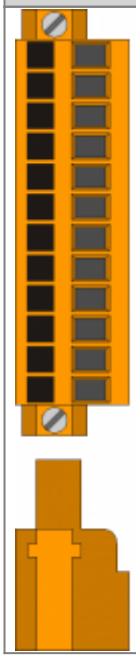
To use the Memory Cards they must first be formatted with FAT16 or FAT32 file system.

4.3 Slot 3 – 1MG3F Card Connectors

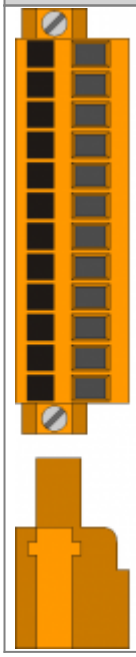


4.3.1 Digital Inputs

	**The electriccal features are given in paragraph Electrical features. The wiring examples are given in paragraph Connection examples**

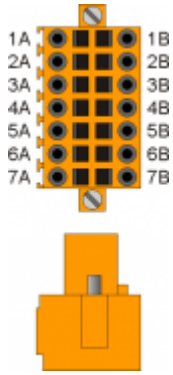
CN11	Terminal	Symbol	Description		Address
	1	I01(PNP)	PNP type rapid input I01	Externally configurable terminals[1)]	1.INT05 FREQ1[2)]
	2	I01(NPN)	Rapid input I01 type NPN		
	3	0V	Common digital inputs		
	4	I1	Input I1		3.INP01
	5	I2	Input I2		3.INP02
	6	I3	Input I3		3.INP03
	7	I4	Input I4		3.INP04
	8	I5	Input I5		3.INP05
	9	I6	Input I6		3.INP06
	10	I7	Input I7		3.INP07
	11	I8	Input I8		3.INP08
	12	0V	Common for digital inputs		

[1)] **NPN rapid input configuration**:
Terminal 1: connect to 12÷24Vdc of the power supply
Terminal 2: input
PNP rapid input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2)] Can be used as a frequency input to FREQ device, indicating 1 in the device declaration

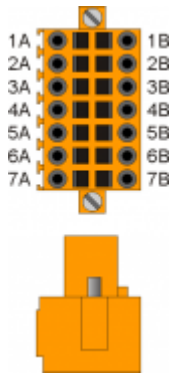
CN12	Terminal	Symbol	Description		Address
	1	I02(PNP)	PNP type rapid input I02	Externally configurable terminals[1)]	1.INT06 FREQ2[2)]
	2	I02(NPN)	NPN type rapid input I02		
	3	0V	Common for digital inputs		
	4	I9	Input I9		3.INP09
	5	I10	Input I10		3.INP10
	6	I11	Input I11		3.INP11
	7	I12	Input I12		3.INP12
	8	I13	Input I13		3.INP13
	9	I14	Input I14		3.INP14
	10	I15	Input I15		3.INP15
	11	I16	Input I16		3.INP16
	12	0V	Common for digital inputs		

[1)] **NPN rapid input configuration**:
Terminal 1: connect to 12÷24Vdc of the power supply
Terminal 2: input
PNP rapid input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2)] Can be used as a frequency input to FREQ device, indicating 2 in the device declaration

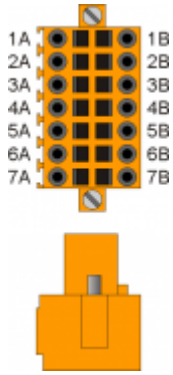
The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN7	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA1	Phase A count 1	PNP Push-Pull[1)]	3.INP17	3.CNT01
	3A	PHB1 Phase B count 1		3.INP18		
	4A	Z1	Z count 1		1.INT01	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA1+	+ PHA count 1	Line Driver	3.INP17	3.CNT01
	3B	PHB1+	+ PHB count 1		3.INP18	
	4B	Z1+	+ Z count 1		1.INT01	
	5B	PHA1-	- PHA count 1			
	6B	PHB1-	- PHB count 1			
	7B	Z1-	- Z count 1			

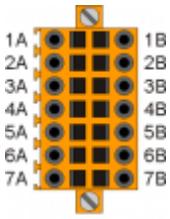
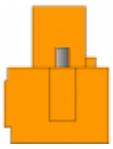
[1)] **PNP/Push-Pull type count configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN8	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA2	Phase A count 2	PNP Push-Pull[1)]	3.INP19	3.CNT02
	3A	PHB2	Phase B count 2		3.INP20	
	4A	Z2	Z count 2		1.INT02	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA2+	+ PHA count 2	Line Driver	3.INP19	3.CNT02
	3B	PHB2+	+ PHB count 2		3.INP20	
	4B	Z2+	+ Z count 2		1.INT02	
	5B	PHA2-	- PHA count 2			
	6B	PHB2-	- PHB count 2			
	7B	Z2-	- Z count 2			

[1)] **PNP/Push-Pull type count configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN9	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA3	Phase A count 3	PNP Push-Pull[1)]	3.INP21	3.CNT03
	3A	PHB3	Phase B count 3		3.INP22	
	4A	Z3	Z count 3		1.INT03	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA3+	+ PHA count 3	Line Driver	3.INP21	3.CNT03
	3B	PHB3+	+ PHB count 3		3.INP22	
	4B	Z3+	+ Z count 3		1.INT03	
	5B	PHA3-	- PHA count 3			
	6B	PHB3-	- PHB count 3			
	7B	Z3-	- Z count 3			

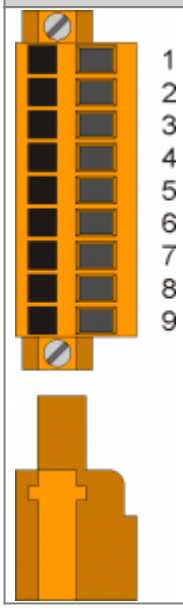
[1)] **PNP/Push-Pull type count configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN10	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA4	Phase A count 4	PNP Push-Pull[1)]	3.INP23	3.CNT04
	3A	PHB4	Phase B count 4		3.INP24	
	4A	Z4	Z count 4		1.INT04	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA4+	+ PHA count 4	Line Driver	3.INP23	3.CNT04
	3B	PHB4+	+ PHB count 4		3.INP24	
	4B	Z4+	+ Z count 4		1.INT04	
	5B	PHA4-	- PHA count 4			
	6B	PHB4-	- PHB count 4			
	7B	Z4-	- Z count 4			

[1)] **PNP/Push-Pull type count configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

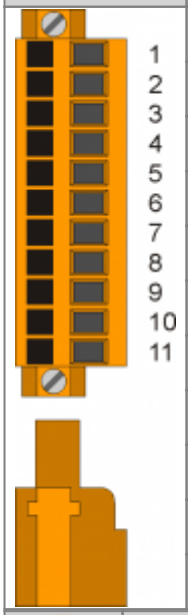
4.3.2 Analog Inputs

The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

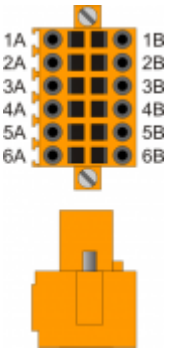
CN17	Terminal	Symbol	Description	Address
	1	GAI	Common for analog inputs	
	2	IA1	Analog input 1	3.AI01
	3	SEL1V	Analog input 1 selector, voltmetric 0-10V [1)]	
	4	SEL1C	Analog input 1 selector, amperometric 0-20mA [2)]	
	5	GAI	Common for analog inputs	
	6	IA2	Analog input 2	3.AI02
	7	SEL2V	Analog input 2 selector, 0-10V voltmetrico [3)]	
	8	SEL2C	Analog input 2 selector, 0-20mA amperometric [4)]	
	9	VREF	Reference voltage	

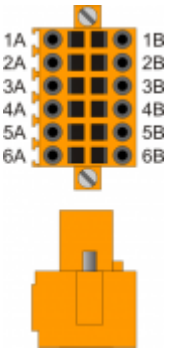
[1), 3)] Wiring this terminal to GAI, the input functions as 0-10V voltmetric
[2), 4)] Wiring this terminal to GAI, the input functions as 0-20mA amperometric

4.3.3 Digital Outputs

CN15	Terminal	Symbol	Description	Address
	1	V+	Outputs power in (12-28Vdc)	
	2	O1	Digital output 1	3.OUT01
	3	O2	Digital output 2	3.OUT02
	4		N.C.	
	5	O3	Digital output 3	3.OUT03
	6	O4	Digital output 4	3.OUT04
	7	V-	Outputs power in (12-28Vdc)	
	8	O5	Digital output 5	3.OUT05
	9	O6	Digital output 6	3.OUT06
	10	O7	Digital output 7	3.OUT07
	11	O8	Digital output 8	3.OUT08

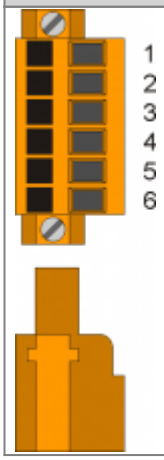
The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN13	Terminal	Symbol	Description		Address
	1A	VD1	n.c.		
	2A	DIR1+	DIRECTION output 1	**Push-Pull Line Driver**	3.PULSE01
	3A	STEP1+	STEP output 1		
	4A	DIR2+	DIRECTION output 2		3.PULSE02
	5A	STEP2+	STEP output 2		
	6A	0V	Common for stepper outputs		
	1B	VD1	n.c.		
	2B	DIR1-	Complementary DIRECTION output 1	Complementary outputs for use in drives with **Line-Driver** inputs	
	3B	STEP1-	Complementary output STEP 1		
	4B	DIR2-	Complementary output DIRECTION 2		
	5B	STEP2-	Complementary output STEP 2		
	6B	0V	Common for stepper outputs		

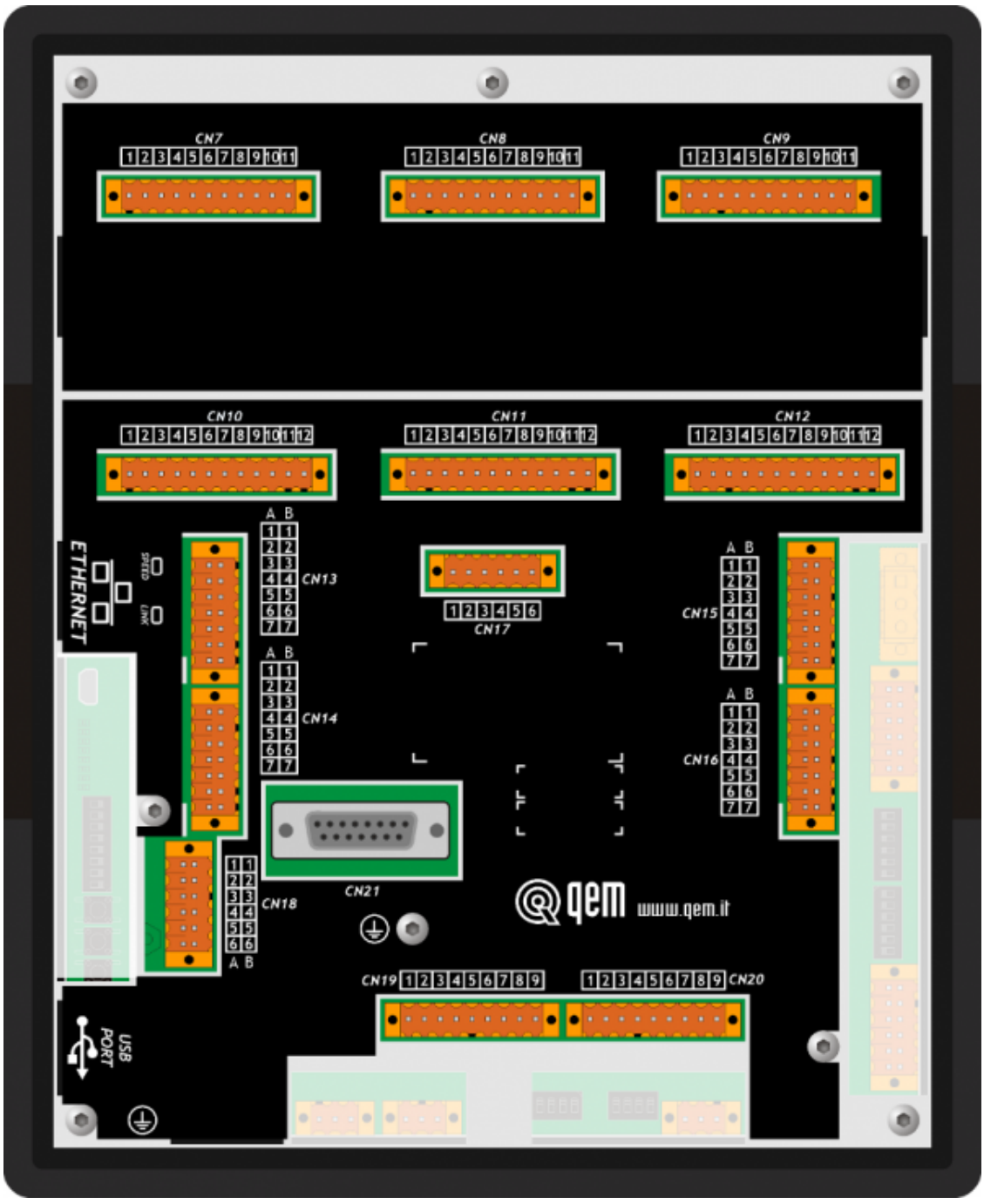
CN14	Terminal	Symbol	Description		Address
	1A	VD1	n.c.		
	2A	DIR1+	DIRECTION output 3	**Push-Pull Line Driver**	3.PULSE03
	3A	STEP1+	STEP output 3		
	4A	DIR2+	DIRECTION output 4		3.PULSE04
	5A	STEP2+	STEP output 4		
	6A	0V	Common for stepper outputs		
	1B	VD1	n.c.		
	2B	DIR1-	Complementary output DIRECTION 3	Complementary outputs for use in drives with **Line-Driver** inputs	
	3B	STEP1-	Uscita complementare STEP 3		
	4B	DIR2-	Complementary output DIRECTION 4		
	5B	STEP2-	Complementary output STEP 4		
	6B	0V	Common for stepper outputs		

4.3.4 Analog Outputs

The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

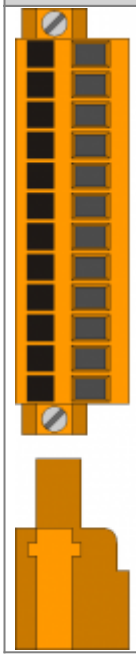
CN16	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	AO1	Analog output 1	3.AN01
	3	AO2	Analog output 2	3.AN02
	4	GAO	Common for analog outputs	
	5	AO3	Analog output 3	3.AN03
	6	AO4	Analog output 4	3.AN04

4.4 Slot 3 – 1MG4F Card Connectors

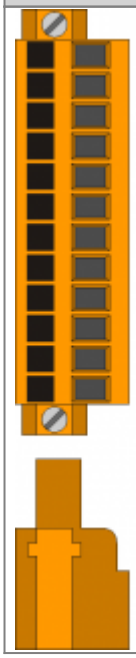


4.4.1 Digital Inputs

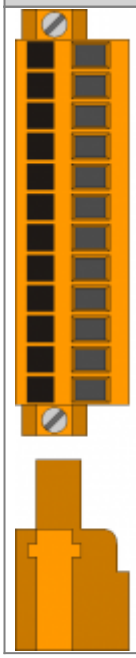
The electrical characteristics are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN10	Terminal	Symbol	Description	Address	
	1	I01(PNP)	PNP type rapid input I01	External terminal configuration [1]	1.INT05 FREQ1[2]
	2	I01(NPN)	NPN type rapid input I01		
	3	0V	Common for digital inputs		
	4	I1	Input I1		3.INP01
	5	I2	Input I2		3.INP02
	6	I3	Input I3		3.INP03
	7	I4	Input I4		3.INP04
	8	I5	Input I5		3.INP05
	9	I6	Input I6		3.INP06
	10	I7	Input I7		3.INP07
	11	I8	Input I8		3.INP08
	12	0V	Common for digital inputs		

[1] **NPN type rapid input configuration**:
Terminal 1: connect to 12-24Vdc of power unit
Terminal 2: input
PNP type rapid input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2] can be used as frequency input for a FREQ device, indicating 1 in the device declaration

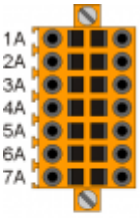
CN11	Terminal	Symbol	Description	Address	
	1	I02(PNP)	PNP type rapid input I02 di tipo PNP	External terminal configuration[1]	1.INT06 FREQ2[2]
	2	I02(NPN)	Rapid input I02 di tipo NPN		
	3	0V	Common for digital inputs		
	4	I9	Input I9		3.INP09
	5	I10	Input I10		3.INP10
	6	I11	Input I11		3.INP11
	7	I12	Input I12		3.INP12
	8	I13	Input I13		3.INP13
	9	I14	Input I14		3.INP14
	10	I15	Input I15		3.INP15
	11	I16	Input I16		3.INP16
	12	0V	Common for digital inputs		

[1] **NPN type rapid input configuration**:
Terminal 1: connect to 12-24Vdc of power unit
Terminal 2: input
PNP type rapid input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2] can be used as frequency input for a FREQ device, indicating 2 in the device declaration

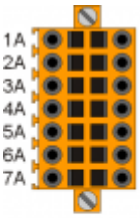
CN12	Terminal	Symbol	Description	Address	
	1	I03(PNP)	PNP type rapid input I03	External terminal configuration[1)]	1.INT07
	2	I03(NPN)	Rapid input I03 di tipo NPN		
	3	0V	Common for digital inputs		
	4	I17	Input I17		3.INP17
	5	I18	Input I18		3.INP18
	6	I19	Input I19		3.INP19
	7	I20	Input I20		3.INP20
	8	I21	Input I21		3.INP21
	9	I22	Input I22		3.INP22
	10	I23	Input I23		3.INP23
	11	I24	Input I24		3.INP24
	12	0V	Common for digital inputs		

[1)] **NPN type rapid input configuration**:
Terminal 1: connect to 12-24Vdc of power unit
Terminal 2: input
*PNP type rapid input configuration**:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)

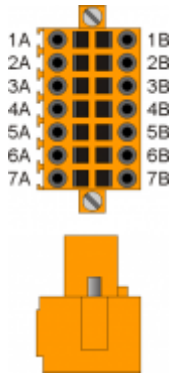
The electrical features are given in section Electrical features.
The connection examples are provided in section Connection examples

CN13	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA1	Phase A counter 1	PNP Push-Pull[1)]	3.INP25	3.CNT01
	3A	PHB1	Phase B counter 1		3.INP26	
	4A	Z1	Z counter 1		1.INT01	
	5A	0V	Common of the counter inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA1+	+ PHA counter 1	Line Driver	3.INP25	3.CNT01
	3B	PHB1+	+ PHB counter 1		3.INP26	
	4B	Z1+	+ Z counter 1		1.INT01	
	5B	PHA1-	- PHA counter 1			
	6B	PHB1-	- PHB counter 1			
	7B	Z1-	- Z counter 1			

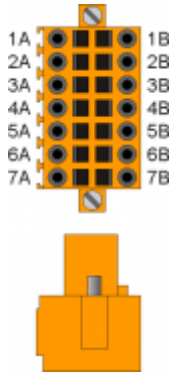
[1)] **PNP/Push-Pull counter type**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN13	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA2	Phase A counter 2	PNP Push-Pull[1)]	3.INP27	3.CNT02
	3A	PHB2	Phase B counter 2		3.INP28	
	4A	Z2	Z counter 2		1.INT02	
	5A	0V	Common of the counter inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA2+	+ PHA counter 2	Line Driver	3.INP27	3.CNT02
	3B	PHB2+	+ PHB counter 2		3.INP28	
	4B	Z2+	+ Z counter 2		1.INT02	
	5B	PHA2-	- PHA counter 2			
	6B	PHB2-	- PHB counter 2			
	7B	Z2-	- Z counter 2			

[1)] **PNP/Push-Pull counter type**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN13	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA3	Phase A counter 3	PNP Push-Pull[1)]	3.INP29	3.CNT03
	3A	PHB3	Phase B counter 3		3.INP30	
	4A	Z3	Z counter 3		1.INT03	
	5A	0V	Common of the counter inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA3+	+ PHA counter 3	Line Driver	3.INP29	3.CNT03
	3B	PHB3+	+ PHB counter 3		3.INP30	
	4B	Z3+	+ Z counter 3		1.INT03	
	5B	PHA3-	- PHA counter 3			
	6B	PHB3-	- PHB counter 3			
	7B	Z3-	- Z counter 3			

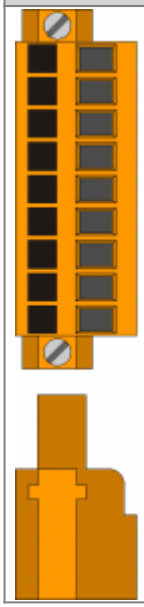
[1)] **PNP/Push-Pull counter type**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN13	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B			
	2A	PHA4	Phase A counter 4	PNP Push-Pull[1)]	3.INP31	3.CNT04
	3A	PHB4	Phase B counter 4		3.INP32	
	4A	Z4	Z conteggio 4		1.INT04	
	5A	0V	Common of the counter inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B			
	2B	PHA4+	+ PHA counter 4	Line Driver	3.INP31	3.CNT04
	3B	PHB4+	+ PHB counter 4		3.INP32	
	4B	Z4+	+ Z counter 4		1.INT04	
	5B	PHA4-	- PHA counter 4			
	6B	PHB4-	- PHB counter 4			
	7B	Z4-	- Z counter 4			

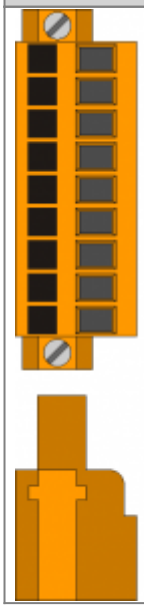
[1)] **PNP/Push-Pull counter type**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

4.4.2 Analog Inputs

The electrical features are given in section Electrical features.
The connection examples are provided in section Connection examples

CN19	Terminal	Simbol	Description	Address
	1	GAI	Common of the analog inputs	
	2	IA1	Analog input 1	3.AI01
	3	SEL1V	Analog input selector 1 voltmetric 0÷10V[1)]	
	4	SEL1C	Analog input selector 1 amperometric 0÷20mA[2)]	
	5	GAI	Common of the analog inputs	
	6	IA2	Analog input 2	3.AI02
	7	SEL2V	Analog input selector 2 voltmetric 0÷10V[3)]	
	8	SEL2C	Analog input selector 2 amperometric [4)]	
	9	VREF	Voltage reference	

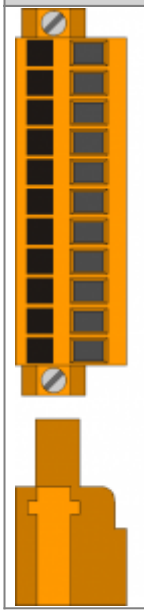
[1), 3)] Connection this terminal to GAI, the input works as voltmetric 0÷10V
[2), 4)] Connection this terminal to GAI, the input works as amperometric 0÷20mA

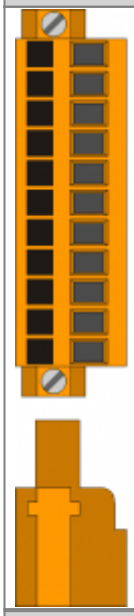
CN20	Terminal	Simbol	Description	Address
	3	GAI	Common of the analog inputs	
	2	IA3	Analog input 3	3.AI03
	3	SEL3V	Analog input selector 3 voltmetric 0÷10V[1)]	
	4	SEL3C	Analog input selector 3 amperometric 0÷20mA[2)]	
	5	GAI	Common of the analog inputs	
	6	IA4	Analog input 4	3.AI04
	7	SEL4V	Analog input selector 4 voltmetric 0÷10V[3)]	
	8	SEL4C	Analog input selector 4 amperometric 0÷20mA[4)]	
	9	VREF	Voltage reference	

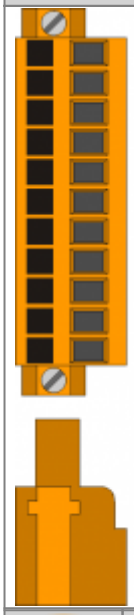
[1), 3)] Connection this terminal to GAI, the input works as voltmetric 0÷10V
[2), 4)] Connection this terminal to GAI, the input works as amperometric 0÷20mA

4.4.3 Digital Outputs

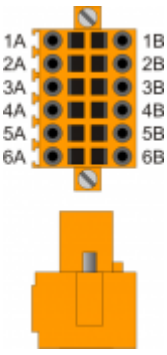
The electrical characteristics are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN7	Terminal	Symbol	Description	Address
	1	V+	Outputs power in (12-28Vdc)	
	2	O1	Digital output 1	3.OUT01
	3	O2	Digital output 2	3.OUT02
	4		N.C.	
	5	O3	Digital output 3	3.OUT03
	6	O4	Digital output 4	3.OUT04
	7	V-	Outputs power in (12-28Vdc)	
	8	O5	Digital output 5	3.OUT05
	9	O6	Digital output 6	3.OUT06
	10	O7	Digital output 7	3.OUT07
	11	O8	Digital output 8	3.OUT08

CN8	Terminal	Symbol	Description	Address
	1	V+	Outputs power in (12-28Vdc)	
	2	O9	Digital output 9	3.OUT09
	3	O10	Digital output 10	3.OUT10
	4		N.C.	
	5	O11	Digital output 11	3.OUT11
	6	O12	Digital output 12	3.OUT12
	7	V-	Outputs power in (12-28Vdc)	
	8	O13	Digital output 13	3.OUT13
	9	O14	Digital output 14	3.OUT14
	10	O15	Digital output 15	3.OUT15
	11	O16	Digital output 16	3.OUT16

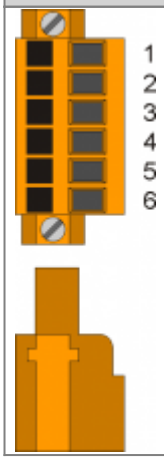
CN9	Terminal	Symbol	Description	Address
	1	V+	Outputs power in (12-28Vdc)	
	2	O17	Digital output 17	3.OUT17
	3	O18	Digital output 18	3.OUT18
	4		N.C.	
	5	O19	Digital output 19	3.OUT19
	6	O20	Digital output 20	3.OUT20
	7	V-	Outputs power in (12-28Vdc)	
	8	O21	Digital output 21	3.OUT21
	9	O22	Digital output 22	3.OUT22
	10	O23	Digital output 23	3.OUT23
	11	O24	Digital output 24	3.OUT24

The electrical features are given in section Electrical features.
The connection examples are provided in section Connection examples

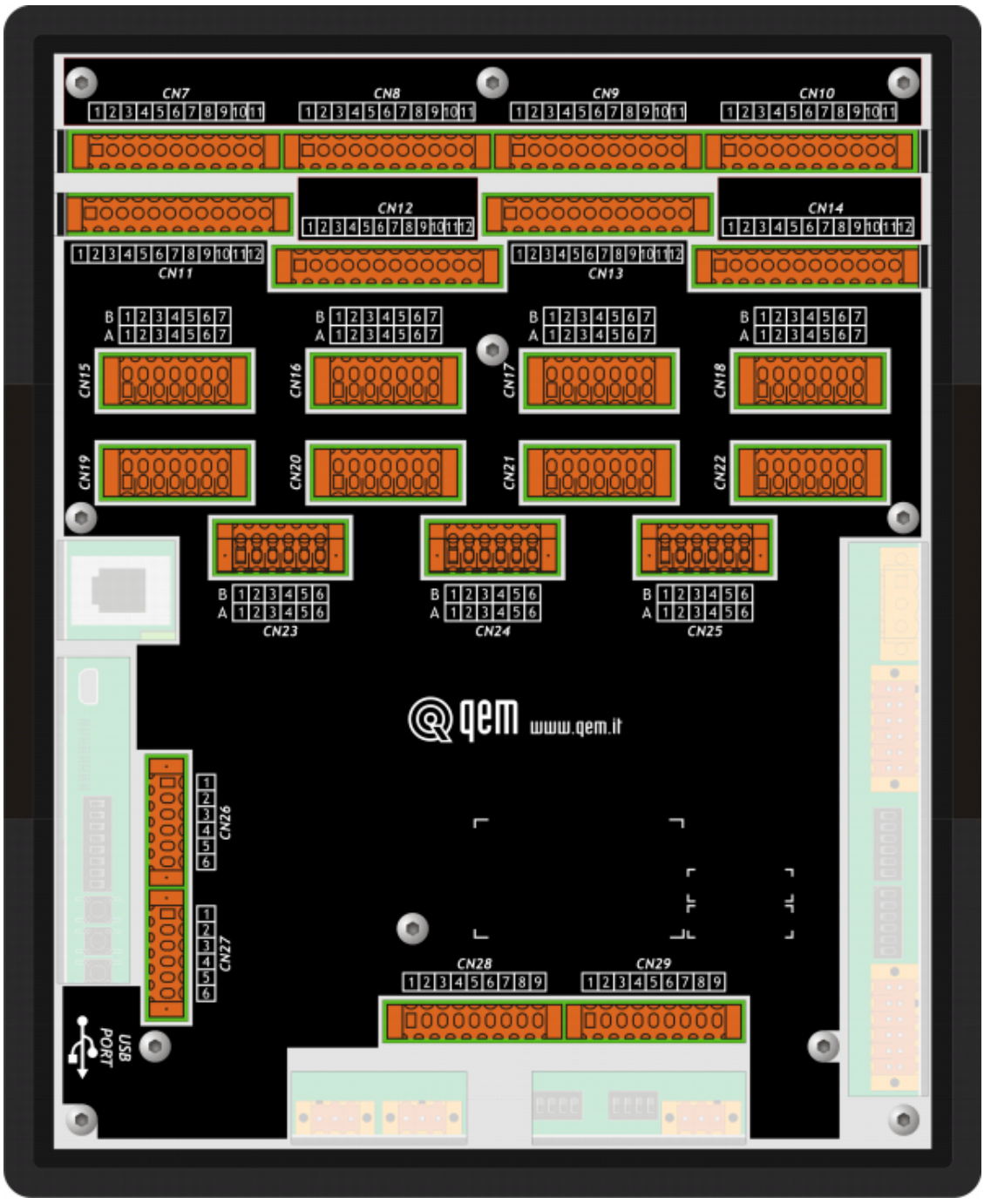
CN18	Terminal	Symbol	Description	Address
	1A	-	n.c.	
	2A	DIR1	Output DIRECTION 1	3.PULSE01
	3A	STEP1	Output STEP 1	
	4A	DIR2	Output DIRECTION 2	3.PULSE02
	5A	STEP2	Output STEP 2	
	6A	0V	Common of the stepper outputs	
	1B	-	n.c.	
	2B	DIR3	Output DIRECTION 3	3.PULSE03
	3B	STEP3	Output STEP 3	
	4B	DIR4	Output DIRECTION 4	3.PULSE04
	5B	STEP4	Output STEP 4	
	6B	0V	Common of the stepper outputs	

4.4.4 Analog Outputs

The electrical features are given in section Electrical features.
The connection examples are provided in section Connection examples

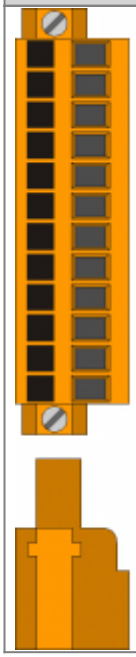
CN17	Terminal	Symbol	Description	Address
	1	GAO	Common of the analog outputs	
	2	AO1	Analog outputs 1	3.AN01
	3	AO2	Analog outputs 2	3.AN02
	4	GAO	Common of the analog outputs	
	5	AO3	Analog outputs 3	3.AN03
	6	AO4	Analog outputs 4	3.AN04

Slot 3 – 1MG8F Card Connectors

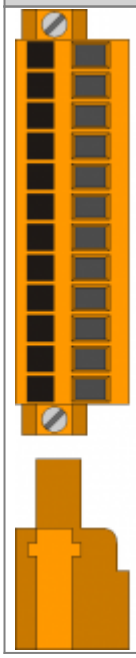


4.4.5 Digital Inputs

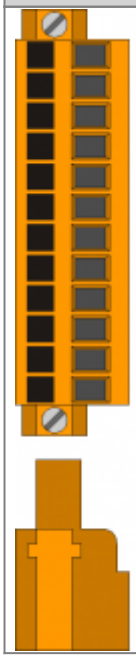
The electrical features are given in paragraph Electrical Features.
The wiring examples are given in paragraph Connection examples

CN11	Terminal	Symbol	Description		Address
	1	I01(PNP)	PNP type fast input I01	External terminal configuration[1]	FREQ1[2]
	2	I01(NPN)	PNP type fast input I01		
	3	0V	Common for digital inputs		
	4	I1	Input I1		3.INP01
	5	I2	Input I2		3.INP02
	6	I3	Input I3		3.INP03
	7	I4	Input I4		3.INP04
	8	I5	Input I5		3.INP05
	9	I6	Input I6		3.INP06
	10	I7	Input I7		3.INP07
	11	I8	Input I8		3.INP08
	12	0V	Common for digital inputs		

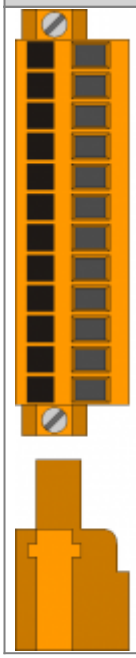
[1] **NPN type fast input configuration**:
Terminal 1: connect to 12-24Vdc of the power unit
Terminal 2: input
PNP type fast input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2] can be used as frequency input for a FREQ device, indicating 1 in the device declaration

CN12	Terminal	Symbol	Description		Address
	1	I02(PNP)	PNP type fast input I02	External terminal configuration[1]	FREQ2[2]
	2	I02(NPN)	NPN type fast input I02		
	3	0V	Common for digital inputs		
	4	I9	Input I9		3.INP09
	5	I10	Input I10		3.INP10
	6	I11	Input I11		3.INP11
	7	I12	Input I12		3.INP12
	8	I13	Input I13		3.INP13
	9	I14	Input I14		3.INP14
	10	I15	Input I15		3.INP15
	11	I16	Input I16		3.INP16
	12	0V	Common for digital inputs		

[1] **NPN type fast input configuration**:
Terminal 1: connect to 12-24Vdc of the power unit
Terminal 2: input
PNP type fast input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)
[2] can be used as frequency input for a FREQ device, indicating 2 in the device declaration

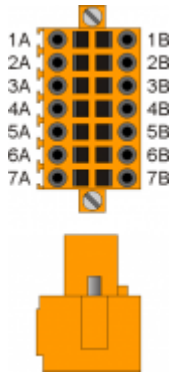
CN13	Terminal	Symbol	Description		Address
	1	I03(PNP)	PNP type fast input I03	External terminal configuration[1)]	1.INT09
	2	I03(NPN)	NPN type fast input I03		
	3	0V	Common for digital inputs		
	4	I17	Input I17		3.INP17
	5	I18	Input I18		3.INP18
	6	I19	Input I19		3.INP19
	7	I20	Input I20		3.INP20
	8	I21	Input I21		3.INP21
	9	I22	Input I22		3.INP22
	10	I23	Input I23		3.INP23
	11	I24	Input I24		3.INP24
	12	0V	Common for digital inputs		

[1)] **NPN type fast input configuration**:
Terminal 1: connect to 12-24Vdc of the power unit
Terminal 2: input
PNP type fast input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)

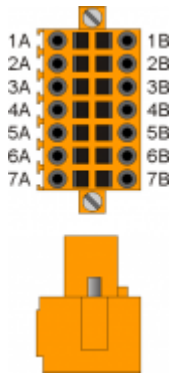
CN14	Terminal	Symbol	Description		Address
	1	I04(PNP)	PNP type fast input I04	External terminal configuration[1)]	1.INT10
	2	I04(NPN)	NPN type fast input I04		
	3	0V	Common for digital inputs		
	4	I25	Input I25		3.INP25
	5	I26	Input I26		3.INP26
	6	I27	Input I27		3.INP27
	7	I28	Input I28		3.INP28
	8	I29	Input I29		3.INP29
	9	I30	Input I30		3.INP30
	10	I31	Input I31		3.INP31
	11	I32	Input I32		3.INP32
	12	0V	Common for digital inputs		

[1)] **NPN type fast input configuration**:
Terminal 1: connect to 12-24Vdc of the power unit
Terminal 2: input
PNP type fast input configuration:
Terminal 1: input
Terminal 2: connect to 0V (terminal 3)

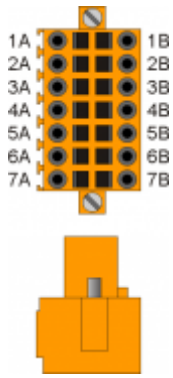
The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN15	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA1	Phase A	Count 1 PNP Push-Pull[2]	3.INP33	3.CNT01
	3A	PHB1	Phase B		3.INP34	
	4A	Z1	Z		1.INT01	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA1+	+ PHA	Count 1 Line Driver	3.INP33	3.CNT01
	3B	PHB1+	+ PHB		3.INP34	
	4B	Z1+	+ Z		1.INT01	
	5B	PHA1-	- PHA			
	6B	PHB1-	- PHB			
	7B	Z1-	- Z			

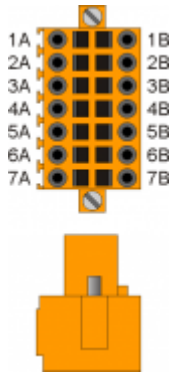
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN16	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA2	Phase A	Count 2 PNP Push-Pull[2]	3.INP35	3.CNT02
	3A	PHB2	Phase B		3.INP36	
	4A	Z2	Z		1.INT02	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA2+	+ PHA	Count 2 Line Driver	3.INP35	3.CNT02
	3B	PHB2+	+ PHB		3.INP36	
	4B	Z2+	+ Z		1.INT02	
	5B	PHA2-	- PHA			
	6B	PHB2-	- PHB			
	7B	Z2-	- Z			

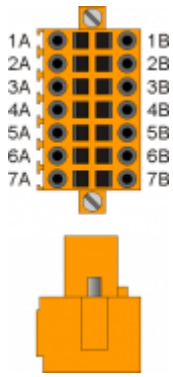
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN17	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA3	Phase A	Count 3 PNP Push-Pull[2]	3.INP37	3.CNT03
	3A	PHB3	Phase B		3.INP38	
	4A	Z3	Z		1.INT03	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA3+	+ PHA	Count 3 Line Driver	3.INP37	3.CNT03
	3B	PHB3+	+ PHB		3.INP38	
	4B	Z3+	+ Z		1.INT03	
	5B	PHA3-	- PHA			
	6B	PHB3-	- PHB			
	7B	Z3-	- Z			

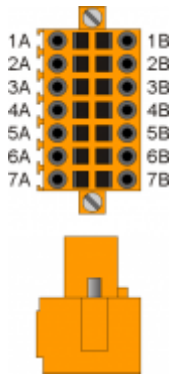
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN18	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA4	Phase A	Count 4 PNP Push-Pull[2]	3.INP39	3.CNT04
	3A	PHB4	Phase B		3.INP40	
	4A	Z4	Z		1.INT04	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA4+	+ PHA	Count 4 Line Driver	3.INP39	3.CNT04
	3B	PHB4+	+ PHB		3.INP40	
	4B	Z4+	+ Z		1.INT04	
	5B	PHA4-	- PHA			
	6B	PHB4-	- PHB			
	7B	Z4-	- Z			

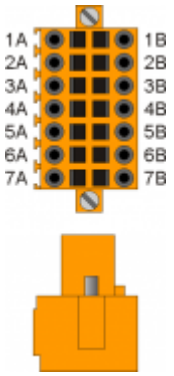
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN19	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA5	Phase A	Count 5 PNP Push-Pull[2]	3.INP41	3.CNT05
	3A	PHB5	Phase B		3.INP42	
	4A	Z5	Z		1.INT05	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA5+	+ PHA	Count 5 Line Driver	3.INP41	3.CNT05
	3B	PHB5+	+ PHB		3.INP42	
	4B	Z5+	+ Z		1.INT05	
	5B	PHA5-	- PHA			
	6B	PHB5-	- PHB			
	7B	Z5-	- Z			

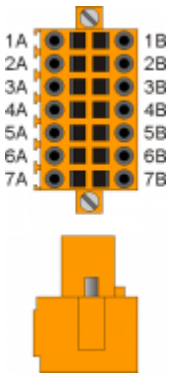
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN20	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA6	Phase A	Count 6 PNP Push-Pull[2]	3.INP43	3.CNT06
	3A	PHB6	Phase B		3.INP44	
	4A	Z6	Z		1.INT06	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA6+	+ PHA	Count 6 Line Driver	3.INP43	3.CNT06
	3B	PHB6+	+ PHB		3.INP44	
	4B	Z6+	+ Z		1.INT06	
	5B	PHA6-	- PHA			
	6B	PHB6-	- PHB			
	7B	Z6-	- Z			

[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN21	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA7	Phase A	Count 7 PNP Push-Pull[2]	3.INP45	3.CNT07
	3A	PHB7	Phase B		3.INP46	
	4A	Z7	Z		1.INT07	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA7+	+ PHA	Count 7 Line Driver	3.INP45	3.CNT07
	3B	PHB7+	+ PHB		3.INP46	
	4B	Z7+	+ Z		1.INT07	
	5B	PHA7-	- PHA			
	6B	PHB7-	- PHB			
	7B	Z7-	- Z			

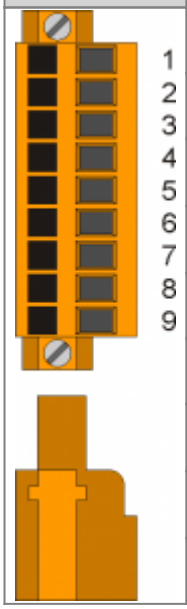
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN22	Terminal	Symbol	Description		Address	
	1A		Internal bridge 1A -1B [1]			
	2A	PHA8	Phase A	Count 8 PNP Push-Pull[2]	3.INP47	3.CNT08
	3A	PHB8	Phase B		3.INP48	
	4A	Z8	Z		1.INT08	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Internal bridge 1A -1B[3]			
	2B	PHA8+	+ PHA	Count 8 Line Driver	3.INP47	3.CNT08
	3B	PHB8+	+ PHB		3.INP48	
	4B	Z8+	+ Z		1.INT08	
	5B	PHA8-	- PHA			
	6B	PHB8-	- PHB			
	7B	Z8-	- Z			

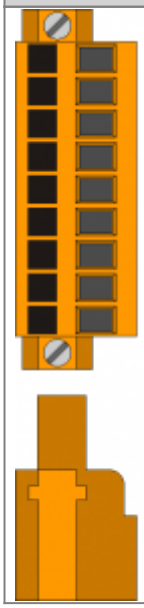
[1, 3] Used to power the encoder. See Connection examples.
[2] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

4.4.6 Analog Inputs

The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN28	Terminal	Symbol	Description	Address
	1	GAI	Common for analog inputs	
	2	IA1	analog input 1	3.AI01
	3	SEL1V	Analog input selector 1 voltmetric 0-10V[1]	
	4	SEL1C	Analog input selector 1 amperometric 0-20mA[2]	
	5	GAI	Common for analog inputs	
	6	IA2	analog input 2	3.AI02
	7	SEL2V	Analog input selector 2 voltmetric 0-10V[3]	
	8	SEL2C	Analog input selector 2 amperometric 0-20mA[4]	
	9	VREF	Reference voltage	

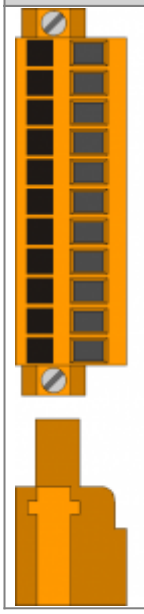
[1, 3] Connecting this terminal to GAI, the input functions as voltmetric 0-10V
[2, 4] Connecting this terminal to GAI, the input functions as amperometric 0-20mA

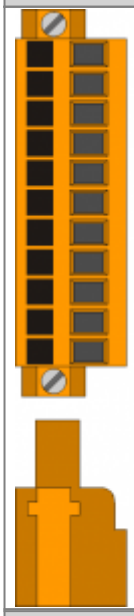
CN29	Terminal	Symbol	Description	Address
	3	GAI	Common for analog inputs	
	2	IA3	analog input 3	3.AI03
	3	SEL3V	Analog input selector 3 voltmetric 0-10V[1)]	
	4	SEL3C	Analog input selector 3 amperometric 0-20mA[2)]	
	5	GAI	Common for analog inputs	
	6	IA4	analog input 4	3.AI04
	7	SEL4V	Analog input selector 4 voltmetric 0-10V[3)]	
	8	SEL4C	Analog input selector 4 amperometric 0-20mA[4)]	
	9	VREF	Reference voltage	

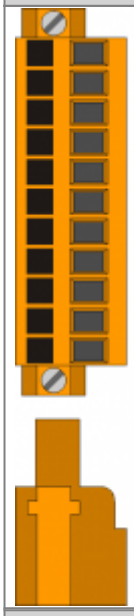
[1), 3)] Connecting this terminal to GAI, the input functions as voltmetric 0-10V
[2), 4)] Connecting this terminal to GAI, the input functions as amperometric 0-20mA

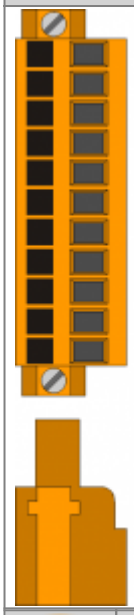
4.4.7 Digital Outputs

The electrical features are given in paragraph Electrical features.
The connection examples are given in paragraph Connection examples

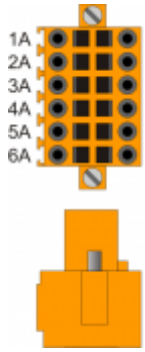
CN7	Terminal	Symbol	Description	Address
	1	V+	Output supply in (12÷28Vdc)	
	2	O1	Digital output 1	3.OUT01
	3	O2	Digital output 2	3.OUT02
	4	V-	Common for output supply	
	5	O3	Digital output 3	3.OUT03
	6	O4	Digital output 4	3.OUT04
	7	V-	Common for output supply	
	8	O5	Digital output 5	3.OUT05
	9	O6	Digital output 6	3.OUT06
	10	O7	Digital output 7	3.OUT07
	11	O8	Digital output 8	3.OUT08

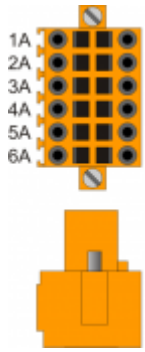
CN8	Terminal	Symbol	Description	Address
	1	V+	Output supply in (12-28Vdc)	
	2	O9	Digital output 9	3.OUT09
	3	O10	Digital output 10	3.OUT10
	4	V-	Common for output supply	
	5	O11	Digital output 11	3.OUT11
	6	O12	Digital output 12	3.OUT12
	7	V-	Common for output supply	
	8	O13	Digital output 13	3.OUT13
	9	O14	Digital output 14	3.OUT14
	10	O15	Digital output 15	3.OUT15
	11	O16	Digital output 16	3.OUT16

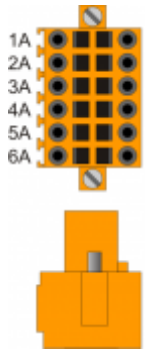
CN9	Terminal	Symbol	Description	Address
	1	V+	Output supply in (12-28Vdc)	
	2	O17	Digital output 17	3.OUT17
	3	O18	Digital output 18	3.OUT18
	4	V-	Common for output supply	
	5	O19	Digital output 19	3.OUT19
	6	O20	Digital output 20	3.OUT20
	7	V-	Common for output supply	
	8	O21	Digital output 21	3.OUT21
	9	O22	Digital output 22	3.OUT22
	10	O23	Digital output 23	3.OUT23
	11	O24	Digital output 24	3.OUT24

CN10	Terminal	Symbol	Description	Address
	1	V+	Output supply in (12-28Vdc)	
	2	O25	Digital output 25	3.OUT25
	3	O26	Digital output 26	3.OUT26
	4	V-	Common for output supply	
	5	O27	Digital output 27	3.OUT27
	6	O28	Digital output 28	3.OUT28
	7	V-	Common for output supply	
	8	O29	Digital output 29	3.OUT29
	9	O30	Digital output 30	3.OUT30
	10	O31	Digital output 31	3.OUT31
	11	O32	Digital output 32	3.OUT32

The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

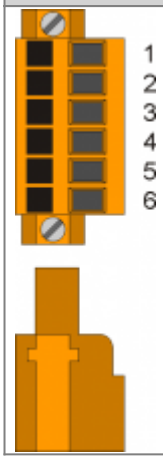
CN23	Terminal	Symbol	Description		Address
	1A	-	n.c.		
	2A	DIR1+	DIRECTION output 1	**Push-Pull Line Driver**	3.PULSE01
	3A	STEP1+	STEP output 1		
	4A	DIR2+	DIRECTION output 2		3.PULSE02
	5A	STEP2+	STEP output 2		
	6A	0V	Common for stepper outputs		
	1B	-	n.c.		
	2B	DIR1-	Complementary output DIRECTION 1	Complementary outputs for use in drivers with **Line-Driver** inputs	
	3B	STEP1-	Complementary output STEP 1		
	4B	DIR2-	Complementary output DIRECTION 2		
	5B	STEP2-	Complementary output STEP 2		
	6B	0V	Common for stepper outputs		

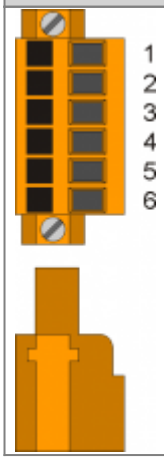
CN24	Terminal	Symbol	Description		Address
	1A	-	n.c.		
	2A	DIR1+	DIRECTION output 3	**Push-Pull Line Driver**	3.PULSE03
	3A	STEP1+	STEP output 3		
	4A	DIR2+	DIRECTION output 4		3.PULSE04
	5A	STEP2+	STEP output 4		
	6A	0V	Common for stepper outputs		
	1B	-	n.c.		
	2B	DIR1-	Complementary output DIRECTION 3	Complementary outputs for use in drivers with **Line-Driver** inputs	
	3B	STEP1-	Complementary output STEP 3		
	4B	DIR2-	Complementary output DIRECTION 4		
	5B	STEP2-	Complementary output STEP 4		
	6B	0V	Common for stepper outputs		

CN25	Terminal	Symbol	Description		Address
	1A	-	n.c.		
	2A	DIR5+	DIRECTION output 5	**Push-Pull Line Driver**	3.PULSE05
	3A	STEP5+	STEP output 5		
	4A	-	n.c.		
	5A	-	n.c.		
	6A	0V	Common for stepper outputs		
	1B	-	n.c.		
	2B	DIR5-	Complementary output DIRECTION 5	Complementary outputs for use in drivers with **Line-Driver** inputs	
	3B	STEP5-	Complementary output STEP 5		
	4B	-	n.c.		
	5B	-	n.c.		
	6B	0V	Common for stepper outputs		

4.4.8 Analog Outputs

The electrical features are given in paragraph Electrical features.
The wiring examples are given in paragraph Connection examples

CN26	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	AO1	Analog output 1	3.AN01
	3	AO2	Analog output 2	3.AN02
	4	GAO	Common for analog outputs	
	5	AO3	Analog output 3	3.AN03
	6	AO4	Analog output 4	3.AN04

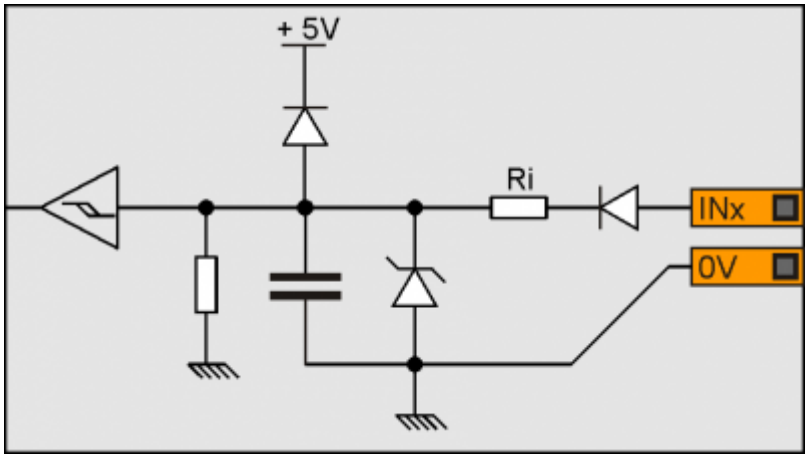
CN27	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	AO5	Analog output 5	3.AN05
	3	AO6	Analog output 6	3.AN06
	4	GAO	Common for analog outputs	
	5	AO7	Analog output 7	3.AN07
	6	AO8	Analog output 8	3.AN08

4.5 Electrical Characteristics

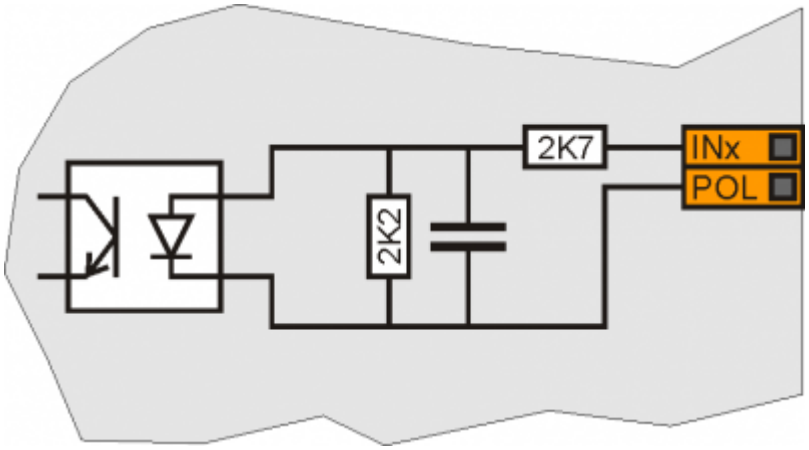
The electrical characteristics of the hardware are given below.
The maximum and minimum frequencies, and real acquisition times, may depend on eventual additional software filters, for example see the system variable „QMOVE:sys004“ at paragraph System Variables.

Type of polarisation	PNP
Min. acquisition time (hardware)	3ms
Isolation	1000Vrms
Rated operating voltage	24Vdc
Voltage of logic state 0	0-2 V
Voltage of logic state 1	10.5 - 26.5 V
Internal voltage drop	5V
Input resistance (Ri)	2700Ω
Sink current	2mA ÷ 8mA[1)]

[1)] **CAUTION: If the device connected to the inputs needs a higher minimum current, inputs may not work properly.**



Tipo di polarizzazione	NPN / PNP
Frequenza massima	200KHz
Tempo min. di acquisizione (hardware)	5µs
Isolamento	1000Vrms
Tensione di funzionamento nominale	24Vdc
Tensione stato logico 0	0÷2 V
Tensione stato logico 1	10,5 ÷ 26,5 V
Caduta di tensione interna	1,2 V
Resistenza di ingresso	2700Ω

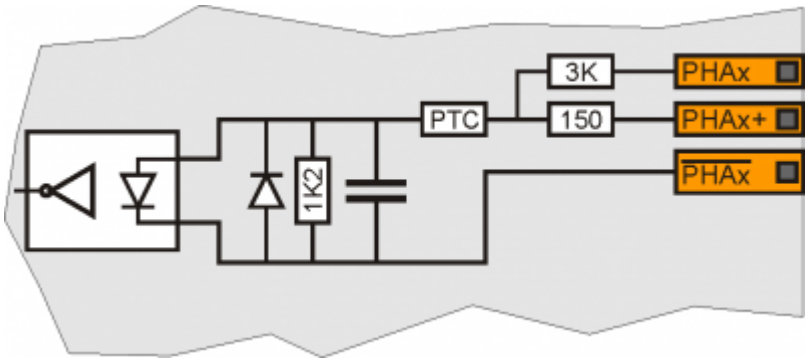


The values given in the table refer to input signals A, B and Z.
The max. frequency given in the table refers to A and B phase signals with a DutyCycle = 50%
With count frequencies over 50KHz the use of Line-Driver type encoders is recommended.

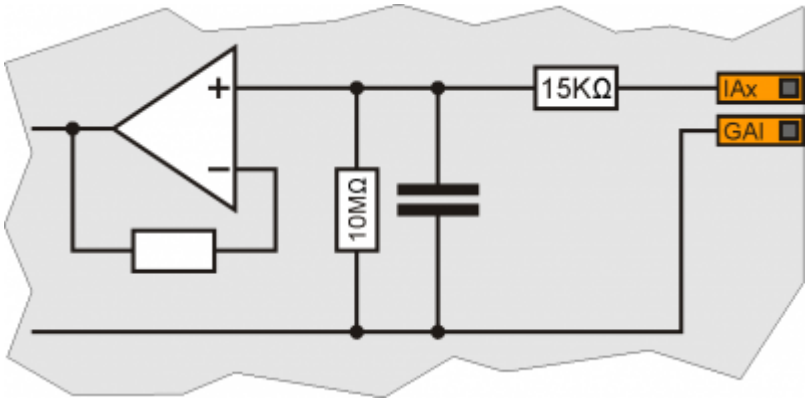
Type of polarisation	PNP/PP
Max frequency	200KHz
Min. acquisition time	5µs
Insulation	1000Vrms
Rated operating voltage	24Vdc
Voltage of logic status 0	0 - 2 V
Voltage of logic status 1	10.5 - 26.5 V
Internal voltage drop	1.2V
Input resistance	3100Ω

Line-Driver

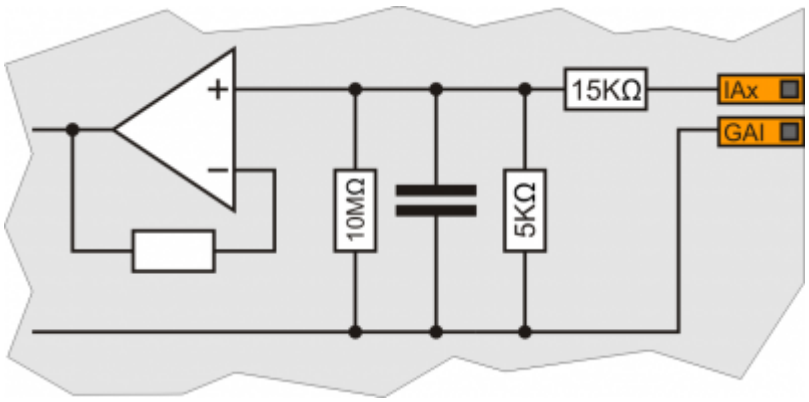
Type of polarisation	Line-Driver
Max. frequency	200KHz
Min. acquisition time	5µs
Insulation	1000Vrms
Rated operating voltage (PHx+ ? PHx-)	5Vdc
Voltage of logic status 0 (PHx+ ? PHx-)	0-1.5 V
Voltage of logic status 1 (PHx+ ? PHx-)	2-5 V
Internal voltage drop	1.2V
Input restistance	150Ω



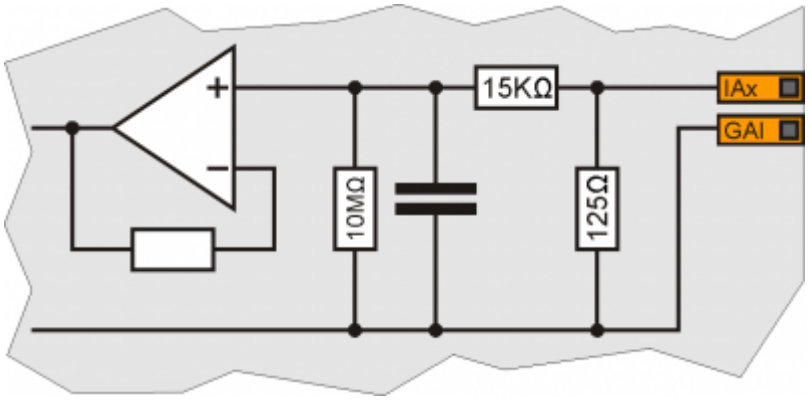
Type of connection	Potentiometric 1KΩ-20KΩ
Resolution	12bit/16bit
Reference voltage output	2.5Vdc
Max output current from reference	10mA
Input resistance	10MΩ
Max. linearity error	± 0,1% Vfs
Max. offset error	± 0,1% Vfs
S.n.	71 dB
Update speed	1ms
Insulation	1000 Vrms



Type of connection	Voltmetric 0-10V
Resolution	12bit/16bit
Input resistance (Rin)	20KΩ
Damage value	20V
Max. linearity error	± 0.1% Vfs
Max. offset error	± 0.1% Vfs
S.n.	71 dB
Update speed	1ms
Insulation	1000 Vrms

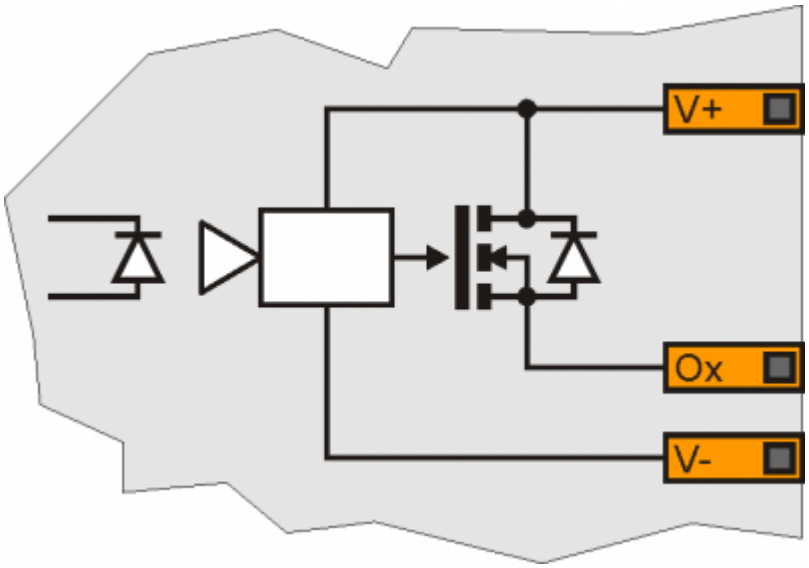


Type of connection	Amperometric (0-20 mA)
Resolution	12bit/16bit
Input resistance	125Ω
Damage value	25 mA
Max. linearity error	± 0,1% Vfs
Max. offset error	± 0,1% Vfs
S.n.	71 dB
Update speed	1ms
Insulation	1000 Vrms

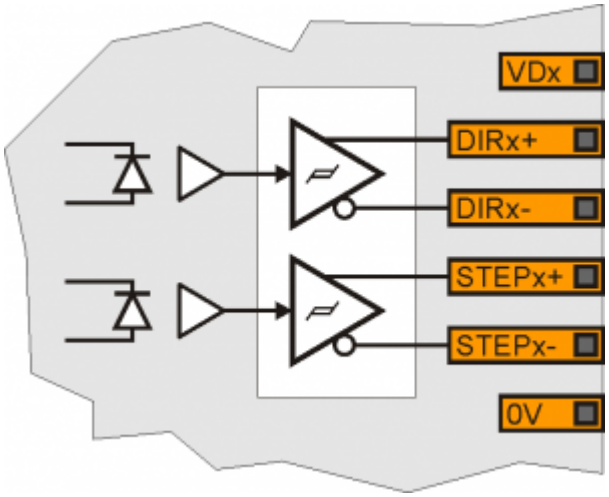


Switchable load	Dc (PNP)
Max. operating voltage	28V
Insulation	1000Vpp
Max. internal voltage drop	600mV

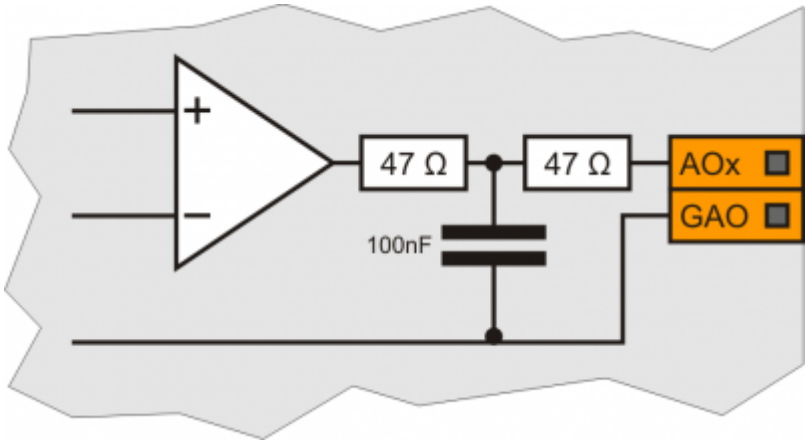
Max internal resistance @ON	90mΩ
Max. protection current	12A
Max. operating current	2A
Max. current @OFF	5µA
Max switching time from ON to OFF	270µs
Max switching time from OFF to ON	250µs



Type of polarisation	Push-Pull / Line-Driver
Max output frequency	50KHz
Insulation	1000Vpp
Max. operating current	20mA

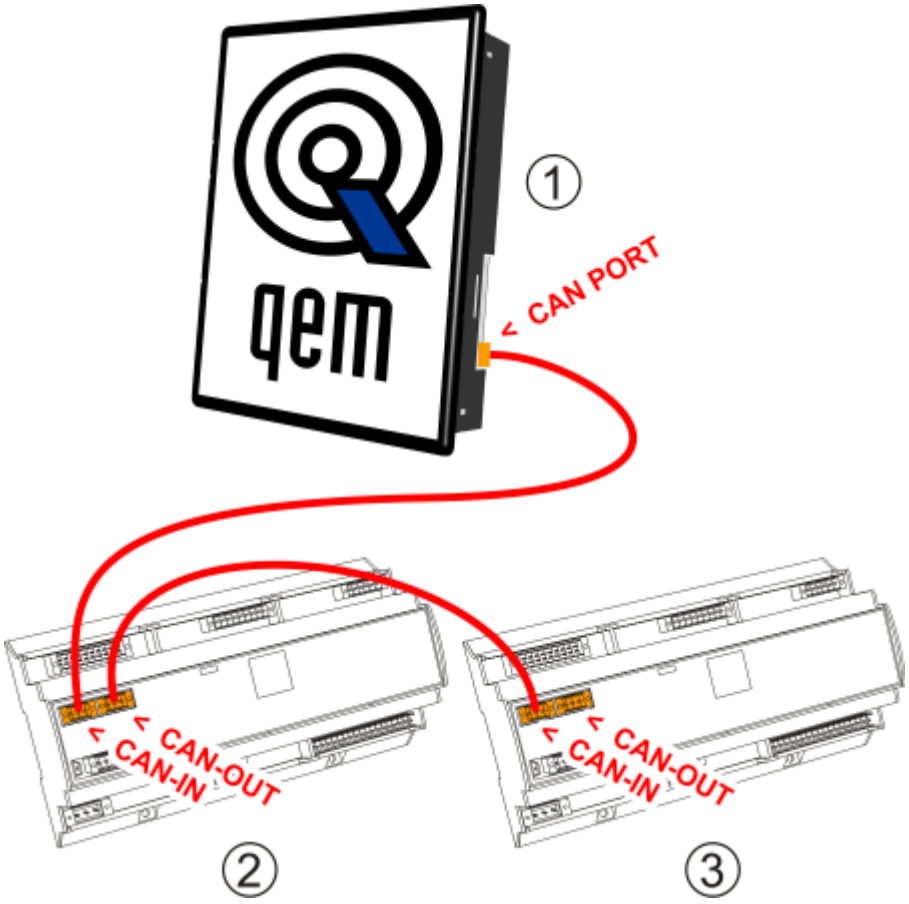


Type of connection	Common mode
Insulation	1000Vrms
Voltage range (minimum no load)	-9.8V - +9.8V
Max. offset variation depending on temperature*	+/- 5mV
Resolution	16bit
Max. current	1mA
Output variation depending on load	100 µV/mA
Output resistence	249Ω


+
−
47 Ω
47 Ω
AOx
GAO
100nF

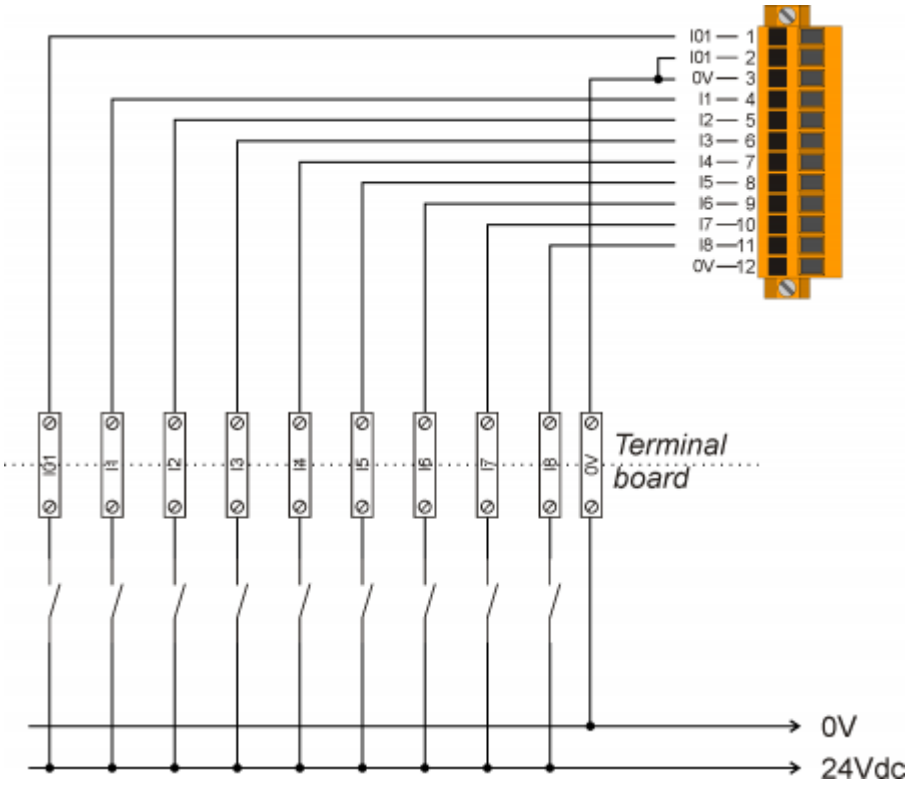
5. Connection examples

CANbus

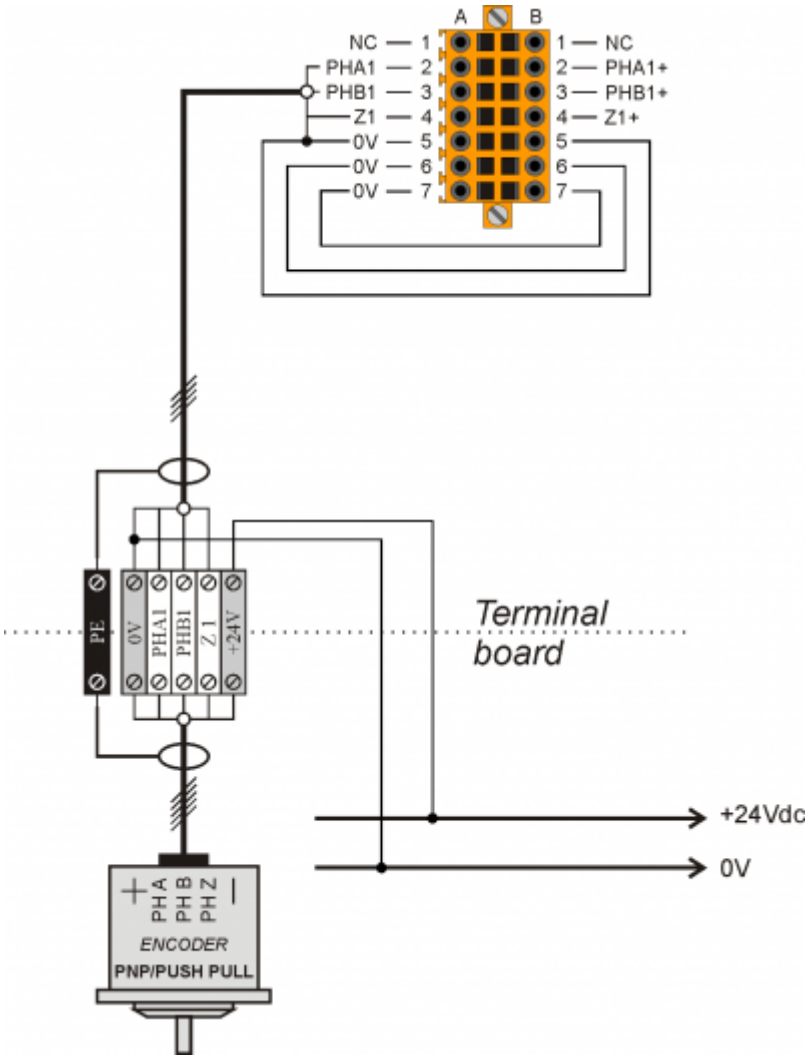


	• On the first (1) and on the last (3) device of the chain, the termination resistances must be inserted. • The cable shoes must be connected to ground by the fastons provided on the metal body.
	• To activate the internal termination resistance see paragraph Setup of CAN1 and CAN2 PORT Termination resistances

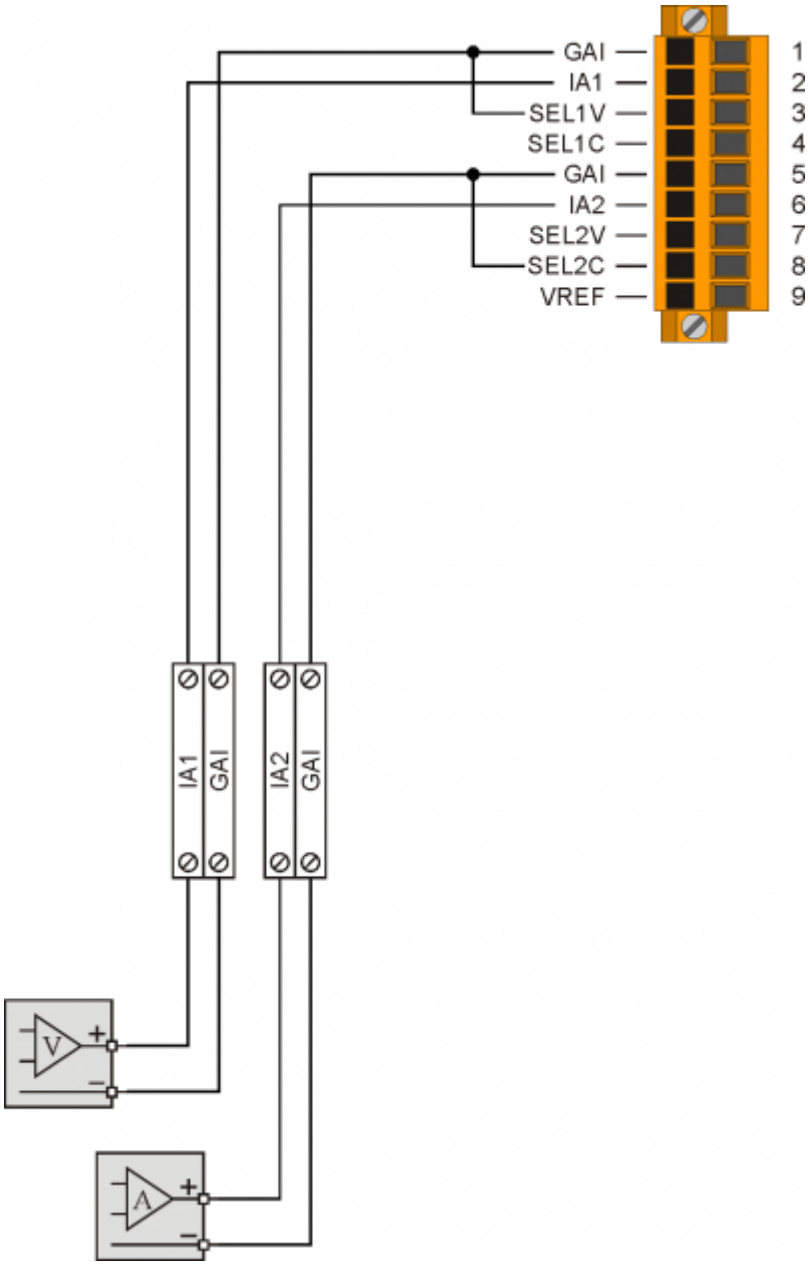
Digital inputs



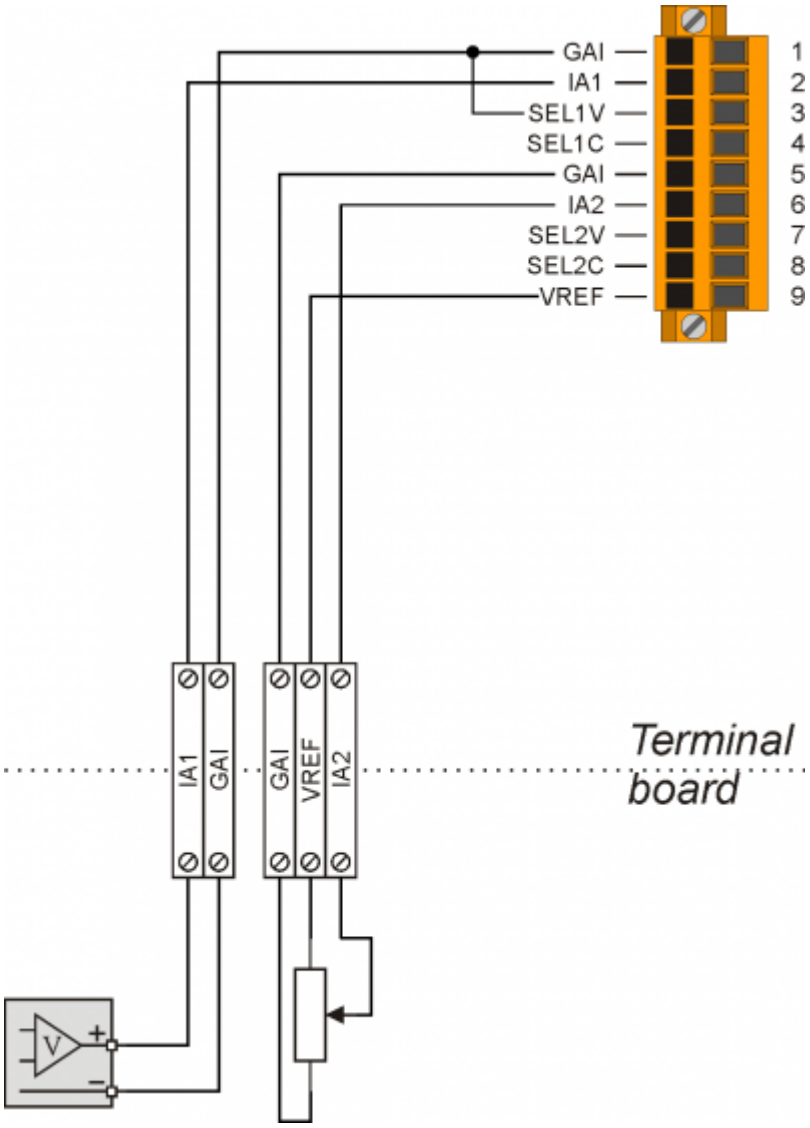
PNP / Push Pull count inputs



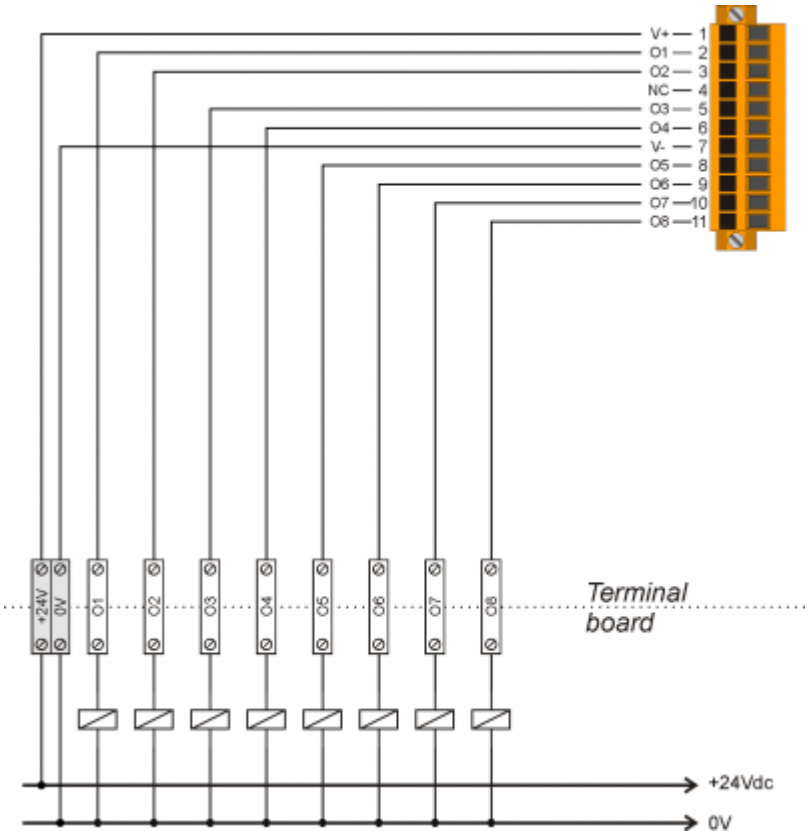
Voltmetric and amperometric analog inputs



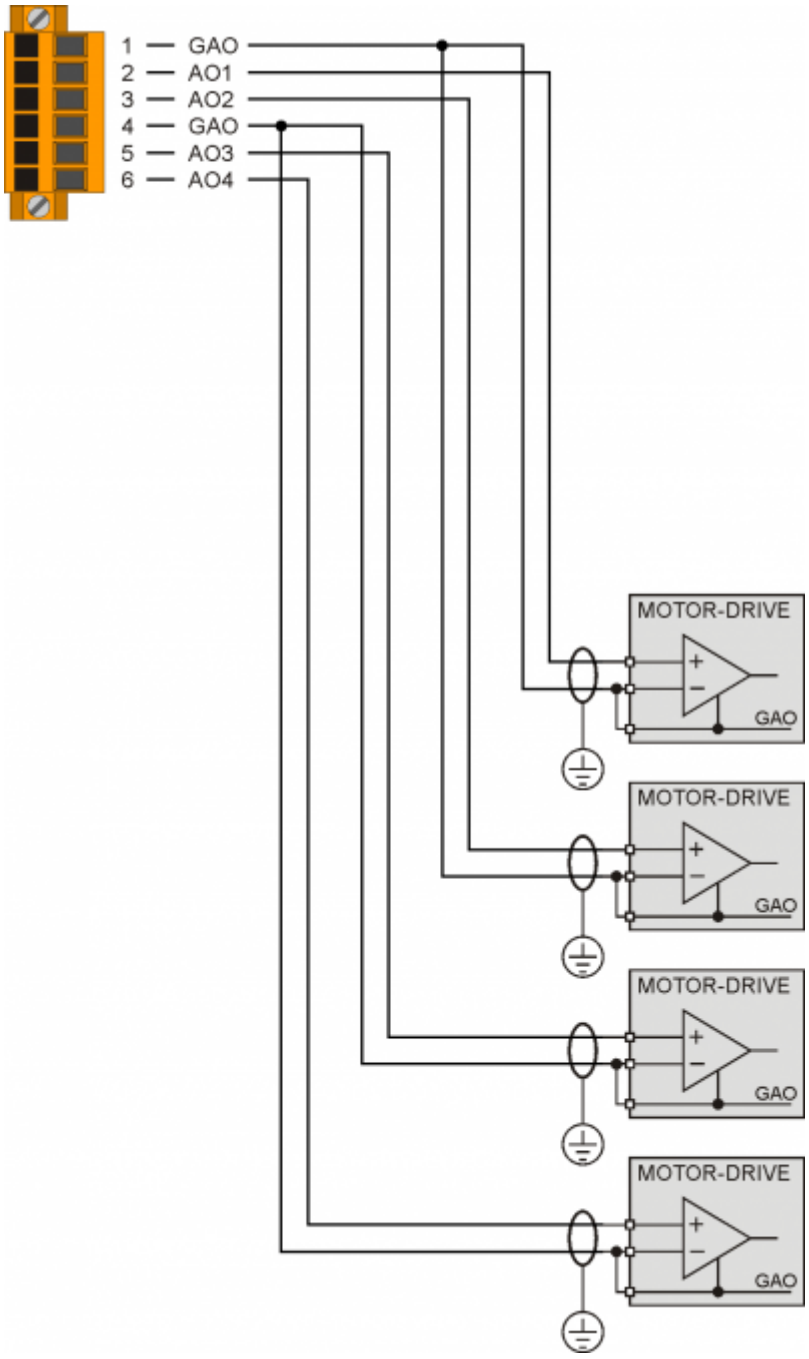
Voltmetric and potentiometric analog inputs



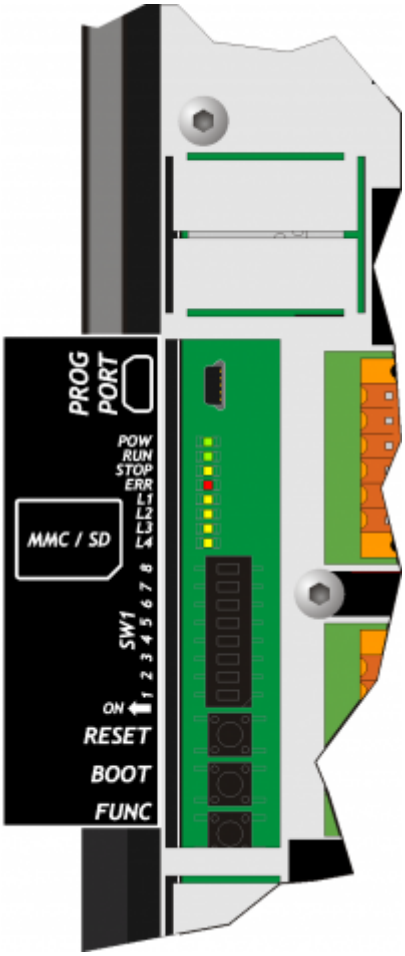
Protected digital outputs

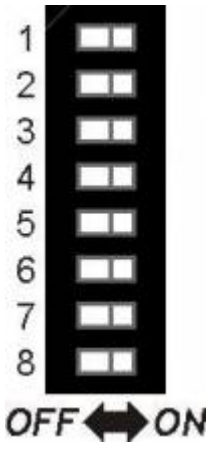


Analog outputs

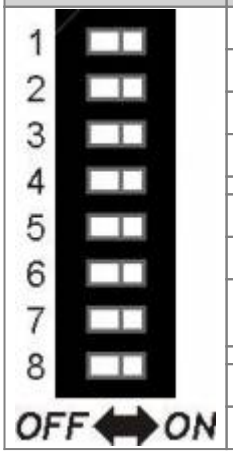


6. Settings, procedures and signals



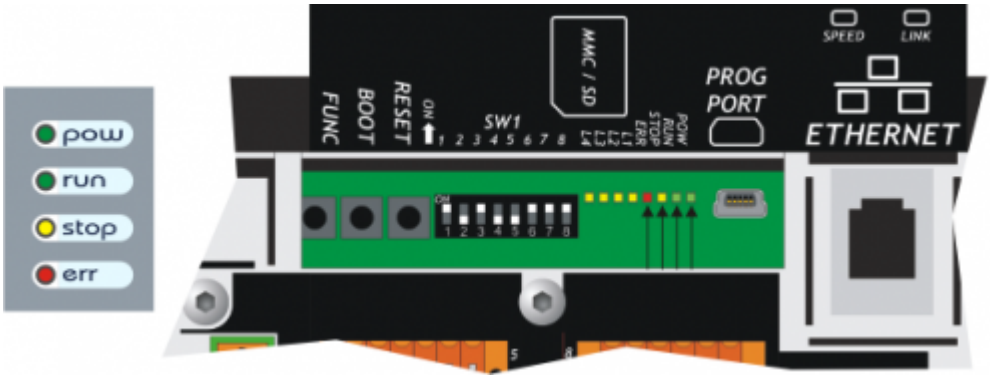
SW1	Dip	DIP settings				Function
	1	OFF	OFF	ON	ON	Select PROG PORT transmission speed
	2	OFF	ON	OFF	ON	
		Baud-rate 38400	Baud-rate 115200	Baud-rate 19200	Baud-rate 57600	
	3	OFF	OFF	ON	ON	Select USER PORT transmission speed
	4	OFF	ON	OFF	ON	
		Baud-rate 38400	Baud-rate 115200	Baud-rate 19200	Baud-rate 57600	
	5	CANbus baud-rate selector. See paragraph CANbus baud-rate selector				
	6	OFF		ON		Select PROG PORT functioning mode
		PROG PORT can also be used by SERCOM and MODBUS devices		PROG PORT cannot be used by SERCOM and MODBUS devices		
	7	CANbus baud-rate selector. See paragraph CANbus baud-rate selector				
	8	OFF		ON		Select the USER PORT as PROG PORT[1)]
		PROG PORT normal		PROG PORT on USER PORT connector		

[1)] It is possible to use the USER PORT connector as PROG PORT with RS232 electric standard, doing this the mini-USB connector of the PROG PORT is disconnected (Setting USER PORT electric standard). **For this function mode also set dip 6 of SW2 to OFF.**

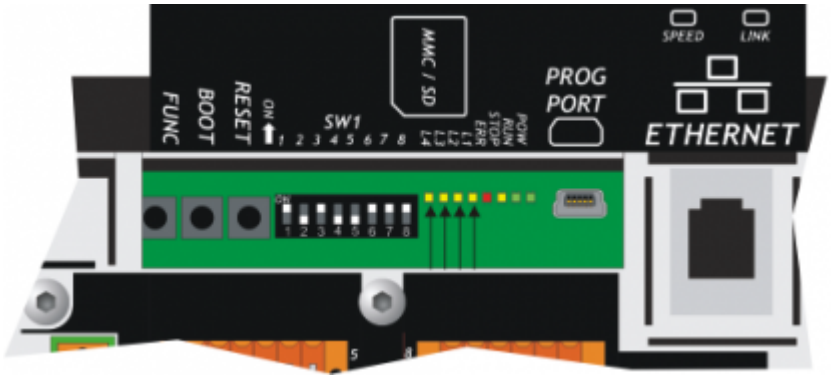
SW1	Dip	DIP settings				Function
	1	-				-
	2	-				-
	3	-				-
	4	-				-
	5	OFF	ON	OFF	ON	Select speed of CANbus transmission
	7	OFF	OFF	ON	ON	
		Baud-rate 125KB/S	Baud-rate 250KB/S	Baud-rate 500KB/S	Baud-rate 1MB/S	
	6	-				-
	8	-				-

6.1 Led

The system led's **„pow, run, stop, err“** are found on the front panel and on the rear of controllers with display and only on the top of controllers without display.



The user led's **„L1, L2, L3** e **L4“** are found on the rear:



6.1.1 “System Led” Signals

6.1.1.1 Legend:

 Led ON

 Led OFF

 Led Flashing

Led	Colour	Status	Description
pow	Green		Power on
			When it is the only led on, it signals the CPU reset status
run	Green		CPU in RUN status
			CPU in READY status

Led	Colour	Status	Description
stop	Yellow		When the **pow** is on, it signals the STOP status of the CPU If the **pow** led is off, it signals the BOOT status of the CPU
err	Red		When the **pow** led is off, it signals a hardware error. See paragraph Hardware Error codes If the **pow** led is flashes, the flash rate indicates the type of error. See paragraph **err** led signals

6.1.1.2 err led signals

N. flashes	Error	Description	Recommended action
1	**Bus error**	Bus is not configured as described in the application software.	Check the correspondence between the QMOVE application (BUS section of configuration unit) and the product configurations (cards mounted in BUS).
2	**CheckSum Error**	The integrity control on retentive variables ha dato esito negative. (see chapter Reset Error Checksum)	The machine data must be restored from a backup (.DAT file) or cancel the error with the specific system function and enter the values manually.
3	**Index Out of Bound**	An array index is pointing on an inexistent element	With the Qview development environment open the editor of a unit and use the „Edit→Go to PC“ command to highlight the program line that has caused the error. In general the value used as index has a value lower than 1 or over the array dimension.
4	**Program Over Range**	The program selection index in the DATAGROUP has attempted to access an inexistent program.	With the Qview development environment open the editor of a unit and user the „Edit→Go to PC“ command to highlight the program line that has caused the error. In general the value used as index is lower than 1 or over the array dimension.
5	**Step Over Range**	The step selection index in the DATAGROUP has attempted to access an inexistent step.	With the Qview development environment open the editor of a unit and user the „Edit→Go to PC“ command to highlight the program line that has caused the error. In general the value used as index is lower than 1 or over the array dimension.
6	**Division By Zero**	The denominator of a division operation of the application program has a zero value.	With the Qview development environment open the editor of a unit and user the „Edit→Go to PC“ command to highlight the program line that has caused the error.
7	**Syntax Error**	The application program has an invalid instruction	This error may appear because the program counter has met the QCL END instruction.
8	**Watch Dog Error**	A CAN module does not function correctly, or a specialist card has a hardware problem	With the Qview development environment open the „Monitor→Bus“ panel and the righthand column called „Watchdog Bus“ indicates the card that caused the problem.
9	**Stack Error**	The applciation program has used all permitted levels of calls to subroutines	With the Qview software environment open the editor of a unit and use the „Edit→Go to PC“ command to highlight the program line that caused the error. Analyse the unit execution flow, the call to subroutines nestings have a limit, over which this error is generated.

6.1.1.3 Hardware error codes

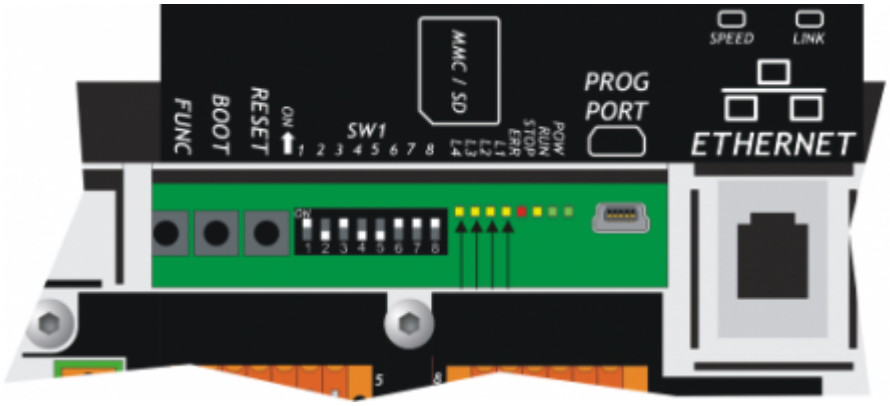
During the startup sequence, if a malfunction of any peripheral is detected, the system blocks and the error is signaled by the flashing led  err while the other system led's remain off.

The number of flashes indicates the type of error according to the following table :

Number of flashes	Error
1	Display
2	FPGA
3	Media
4	Bootloader
5	FW
6	Bus
7	*Signal not active*
8	*Signal not active*
9	Exception

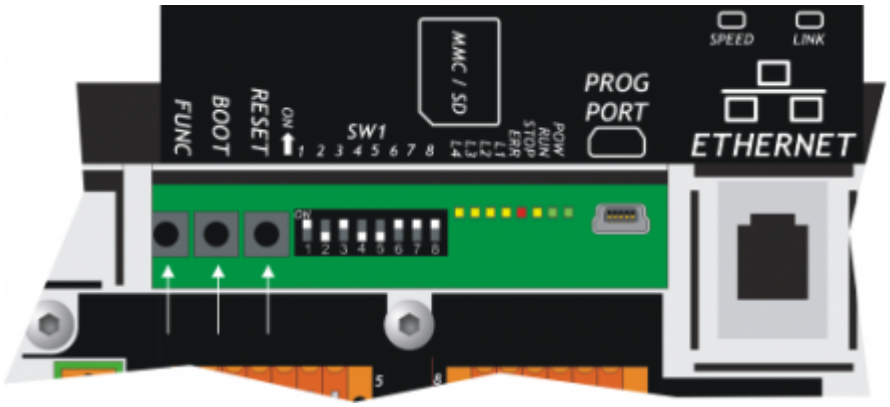
Each of these signals indicates a serious error situation. The product must be sent to the QEM aftersales service.

6.1.2 “User Led” signal



Led	Colour	Description
L1 L2 L3 L4	Yellow	Programmable in the application program by the QMOVE system variable:sys003 and used by the system functions

6.2 Keys



Name	Description
FUNC	Press on startup of the controller to access the System functions
BOOT	Press on startup of the controller to set the CPU in Boot status and then access the firmware update functions
RESET	Reset CPU. the system is restarted restoring the initial conditions (after a startup)

7. Operating Overview

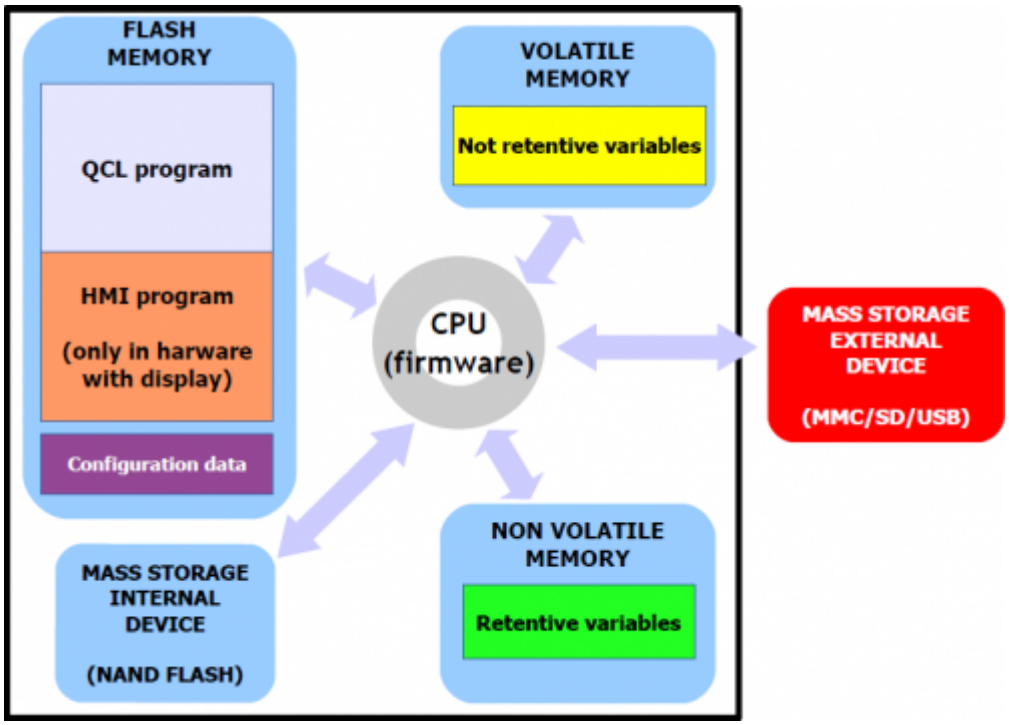
7.1 Foreword

This chapter covers aspects and descriptions of the product functionalities that are often related to the firmware, which enable the functionalities that enable its operation as a QEM Qmove+ programmable system.

7.2 Organisation of data and memories

To best understand the terms used in this chapter, it is important to know the organisation of data and memory in a QMOVE application. QMOVE applications are programs written in QCL language that, translated in binary code, are transferred onto QMOVE hardware and saved there. In the hardware, the microprocessor runs has a program called firmware that interprets the above binary code instructions and performs the operations associated to them.

A QCL application, in addition to the instructions, is also composed of variables that the QCL instructions act on.. Some of these variables are retentive, i.e. their values remain unaltered from shut-off to start up. The flow chart below illustrates the organisation of data in a QCL application transferred to the memory of any QMOVE hardware:



It can be noted that, the QMOVE hardware has several mass storage devices with different technology (e.g. the non volatile data memory may be a §ram tamponata rather than an eeprom or a magneto-resistiva ram, ...), they have been divided in the following categories:

„Nonvolatile memory“, where the following is saved:

- **QCL Program:** the series of QCL instructions translated into binary by the compiler.
- **HMI program:** the series of HMI screens translated into binary by the compiler. This program only exists when the QMOVE hardware has a display.
- **Configuration data:** the calibration and configuration data, e.g. the touch-screen calibration settings, the ethernet communication configuration data (IP address, etc). This data can be entered by both system functions and specigic PC software utilities.

„Non volatile data memory“, which stores:

- **Retentive variables:** the group of variables that remains unaltered on a shut-off and startup (e.g. SYSTEM, ARRAYS, DATAGROUP, etc).

„Volatile data memory“, which stores:

- **Non retentive variables:** the group of variables that is set to 0 at each startup (e.g. GLOBAL, ARRGBL, etc).

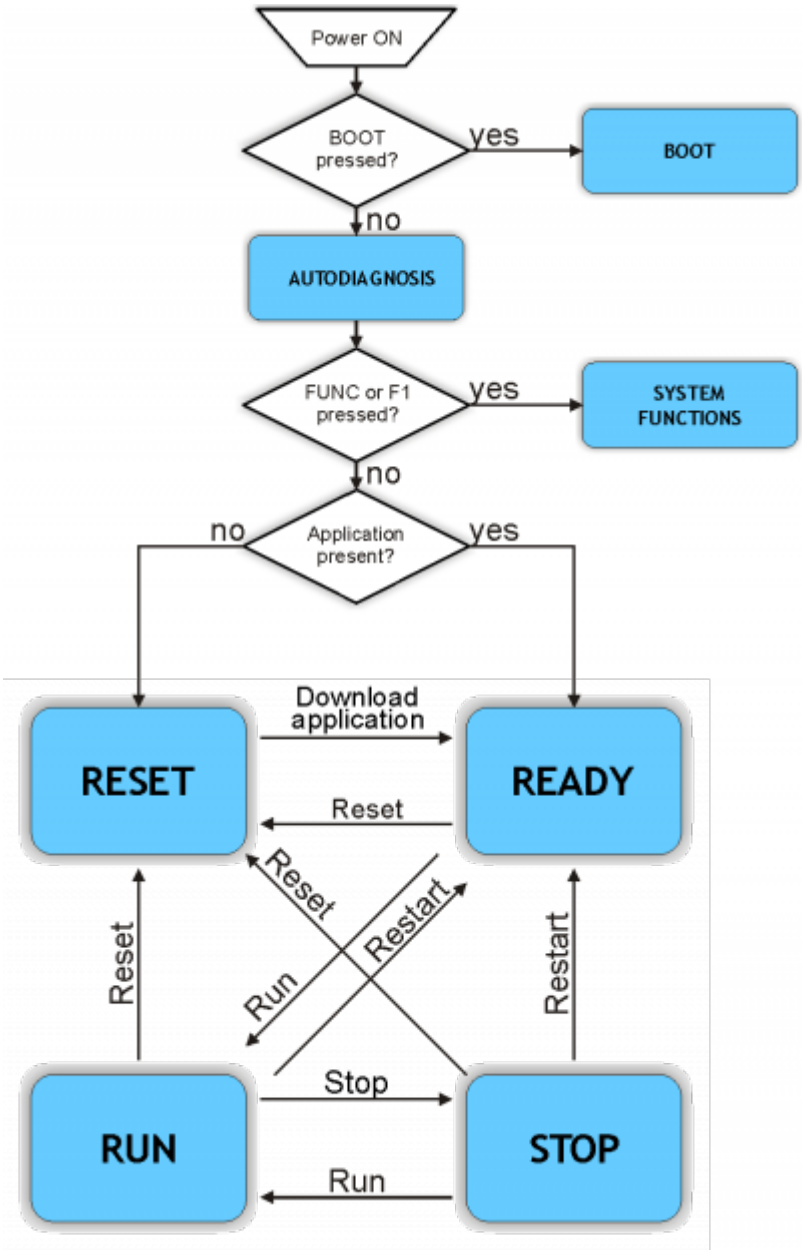
The volatile data memory is also used as dynamic memory. i.e. the memory used by the firmwarefor internal operations and active HMI screen management.

„Internal mass memory“ is managed by a standard filesystem and is useful to save information by the DATASTORE device (read - write binary or csv files with recipes, logs, variuous setups, etc).
E' inoltre utilizzato per memorizzare il backup dell'applicativo QMOVE.

„External mass storage“ is managed by a standard filesystem and is useful for loading the QMOVE application, data loading/saving, firmware update or to save information by the DATASTORE device.

7.3 CPU Status

The CPU has several operating statuses. The figure below shows the main status changes from the controller startup.
The main operatiing statuses are RESET, READY, RUN and STOP.
The CPU events that determine a transition from one status to another are mainly linked to commands being sent by the development environment: **Run, Reset, Stop** and **Restart.**
Application download is the development environment procedure that allows to transfer a QMOVE application to the CPU.



Application download is the development environment procedure that allows to transfer a QMOVE application to the CPU.

The BOOT state can be used to access the firmware updating functions.

SELF-DIAGNOSIS

During the startup, after scanning the system led's, the controller performs a series of self-diagnostic operations. When any faults are detected or the operator has to be informed of any given situation, the self-doagnosis procedure is temporarily interrupted, signalling the event.
The fault signal is made by led's L1, L2 and a message is given on display (if present).

System Messages

n.	Led ON	System Message (if display present)	Description	Type
1	L1	`System Data WRITE ERROR`	Indicates that a write error has occurred during the configuration data saving.	B
2	L2	`System Data IS RESTORED FROM DEFAULT`	Indicates that the configuration data has been restores to the default settings.	C
3	L1 L2	`System Data is updated` `Please verify new data`	Indicates that the configuration data has been converted into a new format. Check that the previous settings have been maintained.	C

4	L3	`Firmware is updated`
		`old: 1K31F10 1.001`
		`new: 1K31F10 1.002`
			Indicates that a firmware update has been made.	C

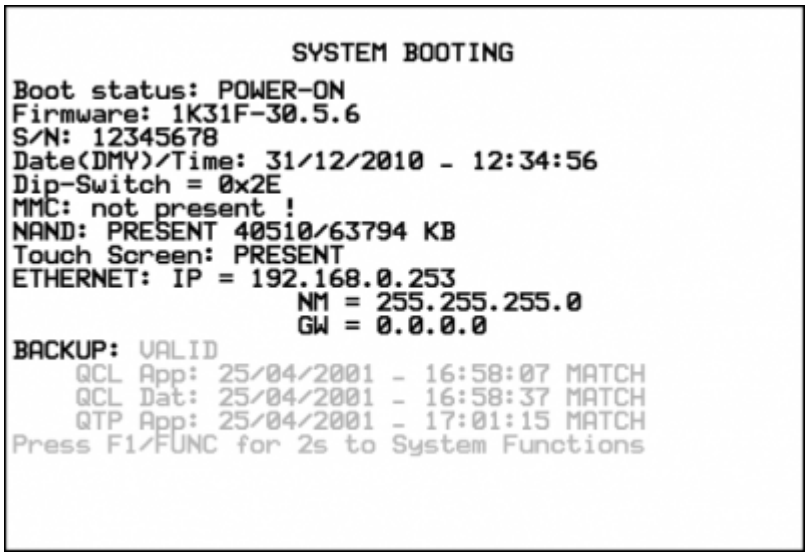
When the condition detected allows to continue to the start stage (type **C**) and waits for the **FUNC** button  to be pressed to continue the boot procedure.

The controller waits **5 seconds** before continuing with the startup stage, without waiting for a button to be pressed.

When the situation does not allow to continue the startup stage (tipo **B**), the led  **err** flashes continuously.

SYSTEM BOOTING

During the condition SELF-DIAGNOSTICS and SYSTEM BOOTING on the instrument with the display, you see some important information about the system as shown in the following picture:

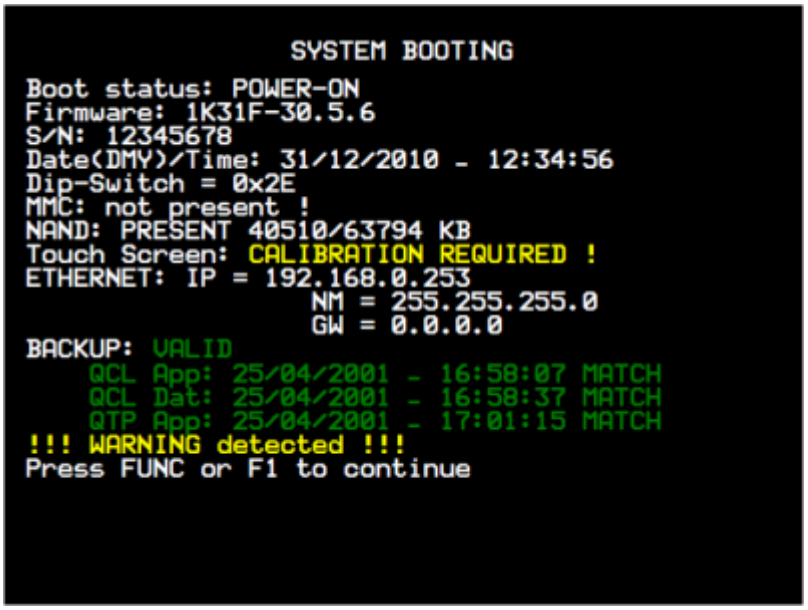


WARNING: The values shown in the diagram are examples and may change depending on the instrument in question.

List of informations

Nr.	Message	Description
1	`Boot status: POWER-ON`	Displays the boot status: POWER-ON Sterting the instrument INIT Initializing application downloads RESTART Restart the instrument software BACKUP Backup operation RESTORE Restore operation
2	`Firmware: 1K31F-30.5.6`	Displays the name, version, major release and minor release of the firmware. Example: 1K31F Firmware name 30 Version 5 Major release 6 Minor release (build)
3	`S/N: 12345678`	Serial number of the instrument.
4	`Date(DMY)/Time: 31/12/2010 - 12:34:56`	Clock and calendar: GG/MM/YYYY - HH:MM:SS
5	`Dip-Switch = 0x2E`	You receive a „hexadecimal value representing the status of the switch SW1. Is equivalent to the value of the system variable SYS002.
6	`MMC: PRESENT 510/31250 KB`	If you inserted the MMC/SD, at this stage appear the device data as used KB (510) and total KB (31250). In case the device does not exist message appears: „not present !“
7	`NAND: PRESENT 40510/63794 KB`	It checks the internal device NAND and and then displays the used KB and the total KB. In the event that the device is not found, an error is reported and appears „NAND: NOT PRESENT !“
8	`Touch Screen: PRESENT`	In the instruments with touch screen, it is detected and then checks the calibration data. In the event that should still be performed calibration, you receive the message „CALIBRATION REQUIRED !“. The touch calibration is possible with the system function „Touch Calibration“.

Nr.	Message	Description
9	ETHERNET: IP = 192.168.0.253 NM = 255.255.255.0 GW = 0.0.0.0	In the instruments with ethernet interface, are visualized the parameters for the address (IP), net mask (NM) and gateway (GW). Set this parameters with the function „Set Ethernet communic. parameter“
10	BACKUP: VALID QCL App: 25/04/2001 - 16:58:07 MATCH QCL Dat: 25/04/2001 - 16:58:37 MATCH QTP App: 25/04/2001 - 17:01:15 MATCH	Checked in NAND of a good backup and displays the creation data and time of application (QCL App), the data (QCL Dat) and the QTP data (QTP App). If after the „BACKUP“ message appears the „VALID“ message means that the backup can be restored properly by using the system function „Restore from NAND“. If after the „BACKUP“ message appears the „NOT PRESENT“ message means that the backup is not present. If after the „BACKUP“ message appears the „NOT VALID“ message means that the backup cannot be restored properly because the checksum between the file aren't the same. After any file (QCL App, QCL Dat e QTP App), in addition to the date and time of creation, also displays additional informations: „MATCH“ indicates that the file is the same with the RUN application. „NO MATCH“ indicates that the file isn't the same with the RUN application. „SIZE ERROR“ indicates that the file size is invalid. „NOT PRESENT“ indicates that the file does not exist.
11	Press F1/FUNC for 2s to System Functions	This message indicates that the pressure of F1 or FUNC buttons for 2 seconds, provides access to system functions as described in the procedure. The message is visible for 4 seconds.
12	!!! WARNING detected !!! Press FUNC or F1 to continue	If during the previous stages, warning messages are displayed, wait for about 20 seconds. If you not wait, press the F1 or FUNC keys.
13	!!! ERROR detected !!! Press FUNC or F1 to continue	Message displayed if in previous phases, you receive error messages. To continue you are press F1 or FUNC keys.



WARNING: The values shown in the diagram are examples and may change depending on the instrument in question.
For the instrument without the display, during this phase you don't see the informations.

The SYSTEM FUNCTIONS status can be used to access the SYSTEM FUNCTIONS, which are special procedures that allow the user to perform various operations. For more details see the System Functions chapter.

Led status	**pow** **run**
Status cause	No application in memory.
The condition that can put the CPU in this status	RESET command.

This condition can only pass onto a READY status by downloading the applicaiton, using the Qview6 development environment.

Led status	**pow** **run**
Status cause	Application valid and waiting for execution.

Conditions that can put the CPU in this status	Application download.

This condition can pass onto to the RUN or RESET statuses.

Led status	**pow** **run**
Status cause	Application in execution.
Condition that can put the CPU in this status	RUN command.

This condition can pass onto all other CPU statuses.

Led status	**pow** **stop** » **run**
Status cause	Stop on application in execution.
Condition that can put the CPU in this status	A breakpoint has been encountered in the application code interpretation.

This condition can pass onto all other CPU statuses.

7.4 System Functions

IMPORTANT: The use of these procedures could represent a risk (e.g. see deletion of application), therefore it is highly recommended that they are performed by qualified experts.

The system functions are spefici procedures that allow the user to perform various operations, e.g. the configuration/calibration of peripherals, data and application save/restore on/from removable mass memory, deletion of the application and management of the mass memories. Controllers with display have some system functions that are only accessible by password and if access attempts are made the **„Function is locked“** message is given.

All the system functions are listed below.
If the „**PWD**“ column shows '**Y**', this means that the function requires a system password *(default: „123“)*.

System Functions

n.	Led ON	System Function	PWD	Description
1	L1	01 - Reset Error Checksum	**-**	Reset error checksum. N.B.: if the checksum error is present, the led L1 flashes.
2	L2	02 - Copy all files MMC/SD → NAND	**-**	Copy all files from MMC/SD to NAND Flash memory.
3	L1 L2	03 - Copy all files NAND → MMC/SD	**-**	Copy all files from NAND Flash memory to MMC/SD.
4	L3	04 - Application delete	**Y**	Delete the application.
5	L1 L3	05 - Application upload from MMC/SD	**Y**	Upload the application from MMC/SD.
6	L2 L3	06 - Set Date & Time	**-**	Adjust the system clock
7	L1 L2 L3	07 - Downl. retentive data to MMC/SD	**-**	Save the retentive data on MMC/SD.
8	L4	08 - Set NEW Password	**Y**	Set a new password to access the „locked“ system functions
9	L1 L4	09 - Remove all files from NAND Flash	**Y**	Cancel all files stored on the NAND Flash memory.
10	L2 L4	10 - Show NAND Flash files	**-**	List the files stored on the NAND Flash memory

n.	Led ON	System Function	PWD	Description
11	L1 L2 L4	11 - Touch Calibration	**-**	Run the calibration procedure of the Touch Screen, if present.
12	L3 L4	12 - Set Ethernet communic. parameter	**-**	Run the setup procedure for the Ethernet communication parameters (IP address,..., etc.)
13	L1 L3 L4	13 - Backup to NAND	**-**	Run the backup of the QCL application, data and HMI application on NAND memory.
14	L2 L3 L4	14 - Restore from NAND	**Y**	Run the restore of the QCL application, data and HMI application from NAND memory.

*NB: To exit system functions press the keep the **F1** key or **FUNC** button for at least two seconds.*

To access the **System Functions**, start up the controller with **FUNC button** pressed.  **FUNC**

The QMOVE application, if present, it not executed and the led  L1 lights up.

Use the **FUNC button**  to scroll through the functions.
The selected function is indicated by the combination of **L1-L2-L3-L4** leds lighted up.

The „System Functions“ table gives the list of system functions and related led combinations.

Press the **BOOT button** for 2 seconds to execute the selected function.  **BOOT**

The **POW** led starts flashing to indicate taht the selected function is being executed.  **POW**

When the function ends the **POW** led stops flashing.  **POW**

Press the **FUNC button** to restart the controller.  **FUNC**

If the function does not complete properly the **POW** stops and the **ERR** starts flashing	 POW **ERR**

The number of flashes indicates the type of error as shown in the table System Function Error Messages.

When a system function ends with an error, the number of led flashes  **err** indicates the type of error.
If there is a display, a message is given to describe the cause of the error.

System Function Error Messages

Error/Number of ERR led flashes	Message
1	Generic error
2	Open/Exist/Create file error
3	Read file error
4	Write file error
5	Out of Memory error
6	QMos Version error
7	Checksum Error
8	Symbols checksum No Match
9	Configuration / Symbols error
10	File format error
11	Format error
12	Device not present or unformatted
13	Application not present error
14	Touch calibration failure
15	File compression type not support
16	Target don't match project !
17	Fw version don't match project !
18	File copy error
19	File size error
20	Crypt operation error
21	Invalid Product Serial Number
22	Function is locked
23	Function not enabled

7.4.1 Description

The system runs an integrity control of retentive variables by the applicaiton of a CRC to the nonvolatile data memory. This detects any corruption and prevents the application from starting up, signalling the situation by flashing the led  **err** as shown in Err led signals.
For the application to function again, a new download of the application must be performed with the development environment, or the „Reset Error Checksum“ system function. These operations delete the error status and **zero-setsall retentive variables**.

The procedure:

- Check the error status and end the funciton if no error is present.
  In microQMove products, the presence of the QCL application is also checked.
- Vengono azzerati i dati ritentivi e viene visualizzato il messaggio **“Clear power down data…”** fino al termine della procedura.
- Resets the retentive data and the message **“Clear power down data…”** until the end of the procedure.
- End of operation

This procedure copies all files in the root and „DS“ directory of the external MMC/SD or USB card to the NAND internal mass storage.

The following table gives the sequence of operations and any possible errors:

Message	Description	Possible errors
Check *DEVICE* presence	Checking for the presence of the external mass storage card On *DEVICE* appears MMC or USB, depending on what is selected	Device not present or unformatted
Mounting device…	Mounting the external mass storage card	Device not present or unformatted
Searching files…	Searching for compatible files	No Files Found
Copy <filename>….	Making a copy of the files indicating the name currently in copy	

This procedure copies all files contained in the root and „DS“ directory of the NAND internal mass storage to the external MMC/SD or USB card memory.

The following table gives the sequence of operations and any possible errors:

Message	Description	Possible errors
Check *DEVICE* presence	Checking for the presence of the external mass storage card On *DEVICE* appears MMC or USB, depending on what is selected	Device not present or unformatted
Mounting device…	Mounting external mass storage device	Device not present or unformatted
Searching files…	Searching for compatible files	No Files Found
Copy <filename>….	Copying the files indicating the name of the one currently in copy	

This deletes the application and empties the nonvolatible data memory, deleting the QCL program and, if present, deleting the HMI program.

The following table gives the sequence of operations performed and any possible errors:

Message	Description	Possible errors
`Reset retentive data`	Empty nonvolatible data memory	`Write file error`
`Delete QCL application`	Deletion of the QCL program	`Write file error`
`Delete HMI application`	Delection of the HMI program (if display installed)	`Write file error`

This loads an application from the external MMC/SD or USB mass memory card to the non volatile memory.

This allows to load all or one of the QCL program, HMI program and retentive data.

The external MMC/SD or USB mass memory card must contain at least one of the following files:

- **applic.bin** for the compiled QCL program generated by the Qview development environment
- **applic.dat** for the data file generated by the „Save Data…“ procedure of the Qview development environment or by the Downl system function. for retentive data to DEVICE;
- **appqtp.bin** for the compiled HMI program generated by the Qpaint development environment; it is generated by the special function „Download the project to File…“.

Message	Description	Possible errors
`Check` *`DEVICE`* `presence`	Checking for the presence of the external mass storage card On *DEVICE* appears MMC or USB, depending on what is selected	`Device not present or unformatted`
`Mounting device…`	Mounting external mass storage card	`Device not present or unformatted`

If the applic.bin is present:

Message	Description	Possible errors

`Upload QCL application`	Uploading the QCL program	`Open/Exist/Create file error`
		`Write file error`
		`Read file error`
		`Out of Memory Error`
		`QMos Version Error`
		`Checksum Error`
		`Symbols checksum No Match`
		`Configuration / Symbols Error`

If the applic.bin file is not present, an application must already be loaded in the nonvolatile memory otherwise the „Application not present“ message is given.

If the applic.dat file is present:

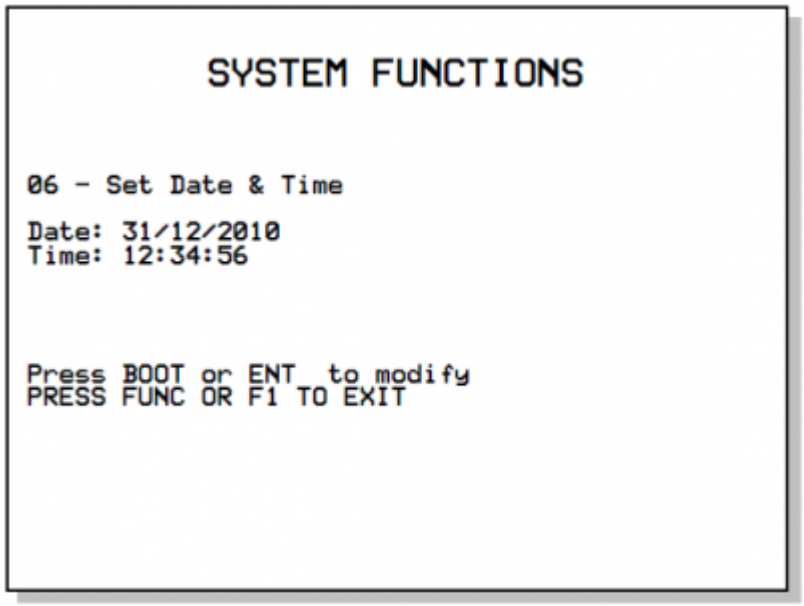
Message	Description	Possible errors

`Upload retentive data`	Uploading retentive data to the nonvolatile data memory	`Open/Exist/Create file error`
		`Write file error`
		`Read file error`
		`Out of Memory Error`
		`QMos Version Error`
		`Checksum Error`
		`Symbols checksum No Match`
		`Configuration / Symbols Error`
		`QTP File format error`

The procedure performs the following steps:

- Check the presence of the MMC/SD or USB card.
  The **„**`Check` *`DEVICE`* `presence`**“** message is given.
  On DEVICE appears MMC or USB, depending on what is selected.
- Mounting MMC/SD or USB card.\\The „Mounting device…“ message is given.
- Uploading the QCL program (applic.bin), if contained in the removable mass storage device
  The **„**`Upload QCL application`**“** message is given.
- Uploading retentive data of the QCL program (applic.dat), if contained in the removable mass storage device
  The **„**`Upload retentive data`**“** message is given.
  NOTE: if the applic.dat file is not found, the data in the system is maintained so long as the Symbol and Configuration checksums have not been varied. If they are varied all data will be set to zero.
- Uploading the HMI program (appqtp.bin), if contained in the removable mass storage device
  The **„**`Upload HMI application`**“** message is given.
- The file is closed and the operation ends.

This procedure sets the system clock/calendar.



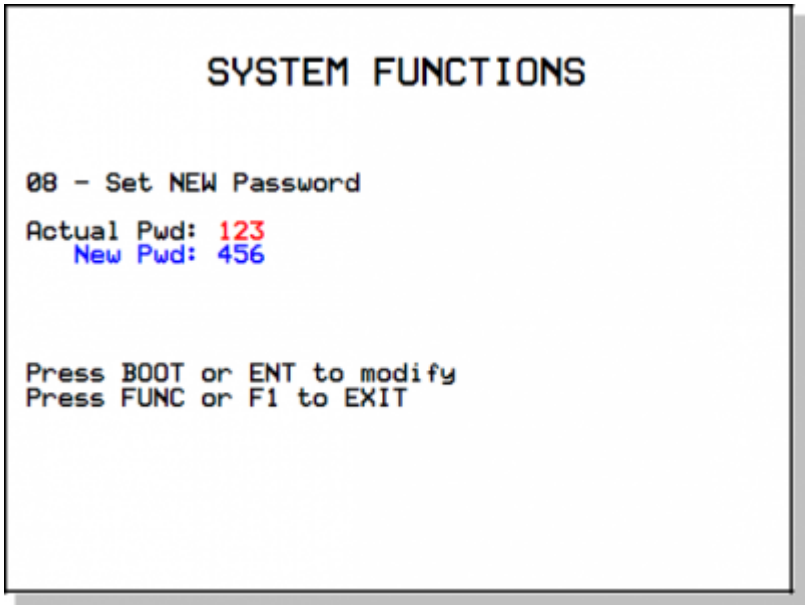
Press ENTER or the BOOT button to enter a new setting in the boxes. Each time a setting is confirmed the next box is accessed for modification. At the last box the new settings are saved.

This function creates a file on external mass storage (MMD/SD or USB) containing the retentive data values.
The file created is named „**applic.dat**“ and is the same as the file obtained by the „Save Data…“ procedure in the QView development environment. The function can only be performed if there is a valid QCL application in the controller.

The procedure performs the following steps:

- Check the presence of the MMC/SD or USB card.
  The „`Check` *`DEVICE`* `presence`“ message is given.
  On *DEVICE* appears MMC or USB, depending on what is selected.
- Mounting the MMC/SD or USB card.
  The „`Mounting device…`“ message is given.
- Check the presence of the QCL program
  The „`Checking application presence…`“ message is given.
- Check the validity of the retentive data
  The „`Checking retentive data…`“ message is given.
- Open the applic.dat destination file on the external MMC/SD or USB card
  The „`Open destination file…`“ message is given.
- Write the headers in the destination file
  The „`Write headers to destination file`“ message is given.
- Write the retentive data in the destination file
  The „`Write data to destination file`“.
  NOTE: the percentage progress of the operation is given during this step
- Close the file and end the operation

This modifies the password to access the system functions. The password is a number of max 3 digits. The default password is: **123** The procedura first asks for the current password (Actual Pwd) and, if correct, then allows a new password to be entered (New Pwd).



When the new password has been entered the „`saving data…`“ message is given to indicate that the new data is being saved.

NB: if 0 (zero) is entered as a new password, the password request is disabled.

Delete all files contained on the internal NAND flash mass storage.
Unlike the „Format NAND Flash“ function, this acts at a filesystem level aqnd can therefore be performed as many times as necessary.

The procedure performs the following steps:

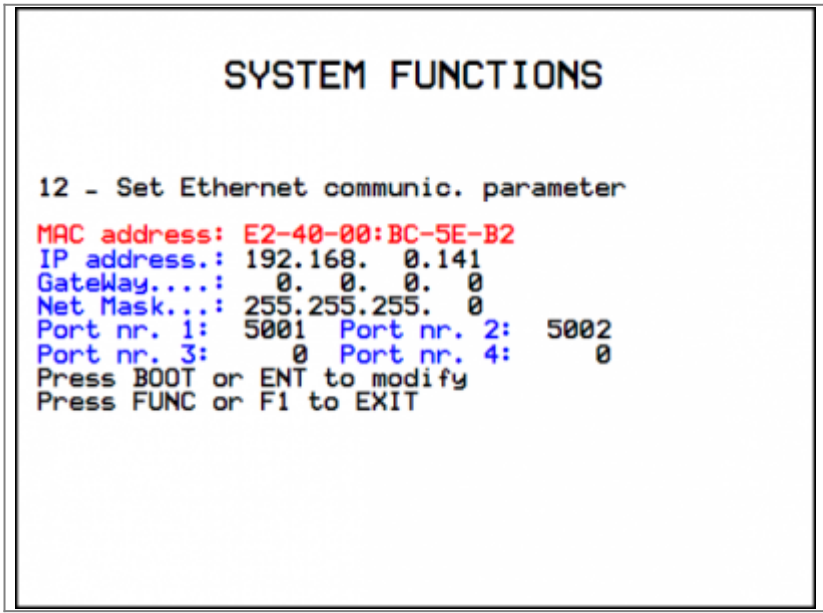
- Calculation of the number of files contained in the internal mass storage.
- The „`Searching files…`“ message is given.
- If zero files are found, the „`No Files Found`“ message is given and the function ends, otherwise the „`Delete <filename>`“ is given indicating the delection of every file found.
- Close the internal storage and end procedure

This views the name and size of all files found in the internal NAND flash mass storage.

The procedure performs the following steps:

- Calculate the number of files in the internal mass storage.
- The „`Searching files…`“ message is given.
- If zero files are found the „`No Files Found`“ message is given and the procedure ends.
- The file name and size in bytes „`<filename> - <size>B`“ of each file found is shown.
- Press the BOOT key or the ENTER button again to continue and the next file when the „`Press BOOT or ENT to show next filename`“ message is given
- Close the internal storage device and end procedure

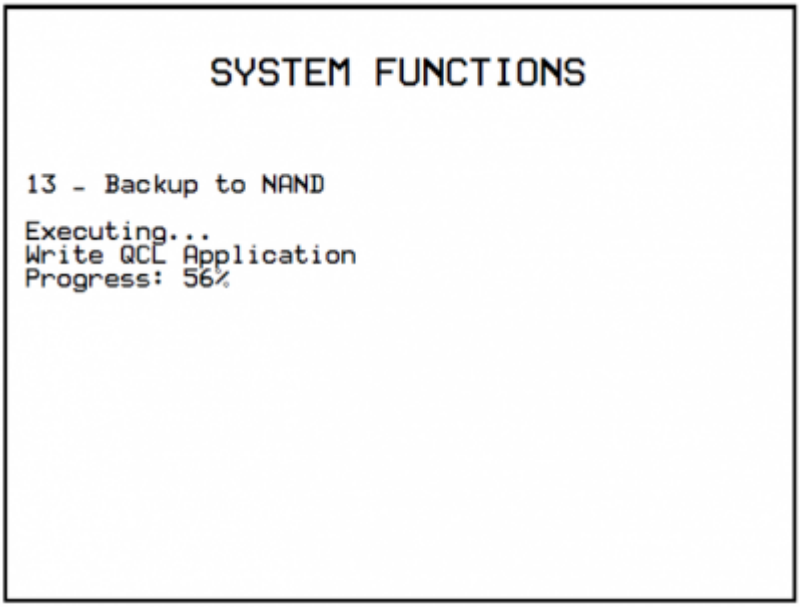
This views and modifies the communication parameters of the ETHERNET port.
When the function is accessed all data saved on the controller is shown.



To change a parameter press ENTER and introduce the new setting.
Press ENTER to go to and change the next box.
When the last box is confirmed, the data is saved and the **„`saving data…`“** message is given

The backup procedure creates a copy of the QCL and HMI applications in execution and a dump of the retentive data, as files saved in the NAND mass storage. The files created have the following names:

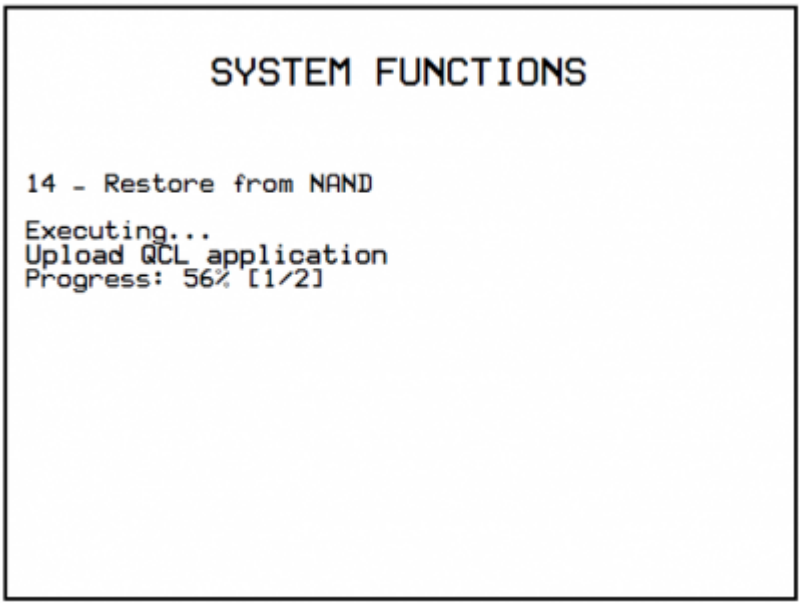
- applic.qcy identifies the file containing the QCL application (CPU)
- appdat.qcy identifies the file containing the retentive data of the QCL application
- appqtp.qcy identifies the file containing the HMI application



The procedure performs the following steps:

- Check the presence of the QCL application
  The „Checking application presence…“ message is given.
- Create and write in NAND the QCL application backup file: **applic.qcy**
  The „Write QCL application“ message is given with the percentage progress of the operation.
- Check the presence and validity of retentive data of the QCL application
  The „Checking retentive data…“ message is given.
- Create and write in NAND the retentive data backup file of the QCL application: **appdat.qcy**
  The „Write QCL data“ message is given with the percentage progress of the operation.
- If the controller has a display, a check is made for the presence of the HMI application:
  If the HMI application is correct the backup file **appqtp.qcy** is created in NAND and the „Write QTP application“ message is given with the percentage progress of the operation.
  If the application contains errors, the „QTP application error“ message is given.
  If the HMI application is not found, the „HMI application not present“ message is given.
- Procedure end and system reboot.

The restore procedure allows to recover from the NAND mass storage, the saved backup files of the QCL and HMI applications and an dump of the retentive data.



The procedure :

- The message „Restore NAND backup“ is given.
- The NAND backup file of the QCL Application is read: **applic.qcy**
  The message „Upload QCL application“ is given, the percentage progress of the operation and the procedure step number.
- The NAND backup file of the QCL Application retentive data is read : **appdat.qcy**
  The message „Upload retentive data“ is given, the percentage progress of the operation.
- If the controller has a display, the presence of the HMI application is checked and read from the NAND back up file: **appqtp.qcy.**
  The message „Upload HMI application“ is given, the percentage progress of the operation and the procedure step

number
- Procedure end and system reboot.

The use of system functions Backup to NAND and Restore from NAND allows to save in backup and restore a QMOVE application.

The backup and restore operations use the NAND internal memory device. The backup procedure creates a file copy of the QCL program, the HMI program (if the controller has a Qem display) and an image of the ritentive data.

The files created:

- **applic.qcy** containing the QCL program (QCL App)
- **appdat.qcy** containing the ritentive data image (QCL Dat)
- **appqtp.qcy** containing the HMI program (QTP App)

The files are encrypted and only the controller that generated them can run the Restore procedure so as to safeguard unauthorised data copies. The backup file copied to external memory such as MMC/SD or USB card can be carried out with the system function Copy all NAND files -> DEVICE. A directory named „**QBK**“ is created in the MMC/SD or USB that contains the above files. In the same way backup files can be transferred to the controller using the system function Copy all files DEVICE -> NAND. In this case, the files in the MMC/SD or USB must always be contained in the directory „**QBK**“.

Backup/restore is an important function that can be used in the following cases:

1. to restore the QMOVE application to a known situation (the situation at the time of the backup), if data has been changed by an operator or if the machine data has been altered for any reason.
2. when testing a new application, a backup can be made of the original, stable version. If the new application being tested is not satisfactory, the restore command will recover the original version.

7.5 Information of programming

This chapter outlines all product information that is necessary for programming, in other words during the development of a QCL application.

7.5.1 Development Environments

The product programming requires the Qview-5 environments to program the QCL code and if the product has a graphic display, also the Q paint-5 environment to design the screen graphics. Noth these softwares are available in the Qworkbench software package that can be downloaded as freeware from the Qem website.

The contoller has 3 slots, as indicated in chapter Back terminal blocks. The slots 4 to 12 can be declared and must be used to address recources installed in the Canopen modules.

A typical BUS declaration to use in the BUS section of the configuration unit:

```
BUS
1 iK31F    10
2 .
3 iMG8F    .
4     C401A   .
```

The firmware version must naturally correspond and the specialist card name at slot 3 must be correct. This name can be obtained from the far raight column of the table: Hardware Versions.

To program with the QPaint-5 development environment it is important to select the correct target. To do so, in the environment select *Project* ? *Target Configuration* then select the right controller according to the ordering code.

This paragraph looks at how to measure an estimate of use of the product's memories. The **nonvolatile memory** is available to memorise the **QCL** program and has a capacity of 512KB.
The memory space occupied is equal to the size of the .BIN file generated by Qview. The percentage memory occupied can be viewed in the CPU panel of Qview under „Used CODE memory“, or this information can be obtained from the value of parameter „sizeapp“ of the QMOS device.

The nonvolatile memory available to memorise the **HMI** program has a capacity of 5.5MB.
The memory space occupied is equal to the size of the .BIN file generated by Qpaint, whose value (in bytes) is viewed in parameter „memqtp“ of the MMIQ2 device.

The **nonvolatile data memory** used to memorise **retentive variables**, has a capacity of 819KB.
The percentage memory occupied can be viewed in the CPU panel of Qview, under „Used RETENTIVE“, or this information can be obtained from the value of parameter „sizeret“ of the QMOS device.

The **volatile data memory** used to memorise **non ritentive variables** has a capacity that depends on various factors (e.g. the HMI and QCL program sizes, the HMI screen being viewed, etc)
The general memory of the free system, available as volatile data memory, is indicated by parameter „memfree“ in the MMIQ2 device.

The PROG and USER serial ports implement the QEM proprietary communication protocol called BIN1.

The SERCOM and MODBUS devices can be used with all communication serial ports including PROG PORT. Use the following number settings during the device declaration to select the communication channel:

<QCL code>

```
0       PROG PORT
1       USER PORT
2       AUX1 PORT
3       AUX2 PORT
```

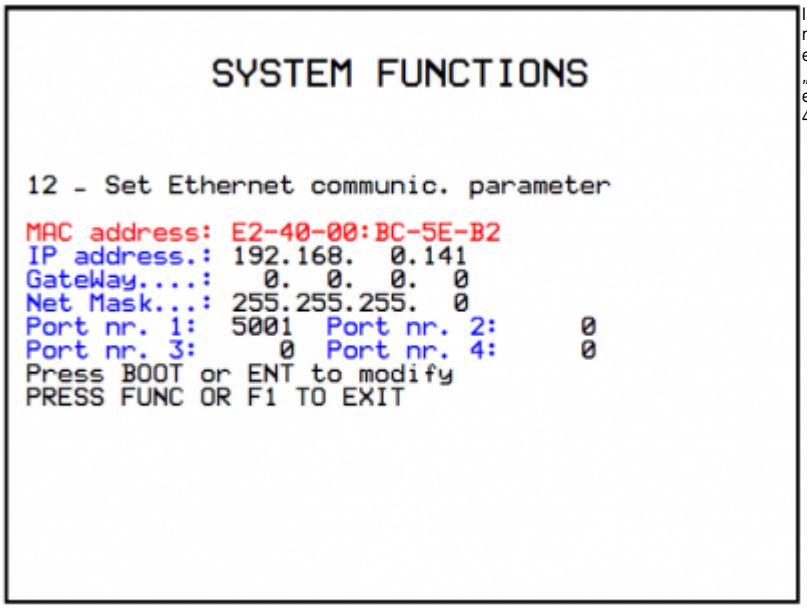
</code>

When the SERCOM and MODBUS devices use the PROG PORT or USER PORT, they address the channel only if the communication status of the device is open (st_opencom = 1). When the channel of the device is closed (st_opencom = 0) in the serial, the BIN1 protocol returns active. To force the BIN1 protocol on the PROG port (thereby preventing the SERCOM device from occupying the channel) active the SW1 dip 6.

When using the MODBUS RTU protocol with RS485 electric configuration, remember that take when the serial port is transmitting, the controller maintains the the channel (DE) active for a longer time than the „MODBUS RTU“ specification. For Per questo bisogna consider a minimum time of 5 milliseconds after which it is possible to receive a new message. Anche il device SERCOM device quando, it ends a transmission, has the same time the channel is active (DE).

The Ethernet communication port uses the TCP/IP transport protocol, where the BIN1 protocol packages travel inside TCP/IP data packages. Two

connections are active, identified by two communication ports freely set in the communication parameters of the Ethernet port.



In detail: The port set in „Port nr.1:“ represents a communication channel equivalent to PROG PORT. The port set in „Port nr.2:“ represents a channel equivalente to USER PORT. The ports 3 e 4 are not used.

A detailed list of limitations in the QCL language:

Description	Notes
FSTEP,FPROG	This instruction cannot be used. So there is not a direct compatibility with applications written for level A CPU's. Conversion of the application is very simple.

Details of other limitations:

Description	Notes
Watchpoint	Not available

When downloading the Qmove application, the QView-6 development environment can give error messages that are not described in the development environment manual. These errors are special and the description string given by QView-6 is generated directly by the firmware.

The table below describes possible error messages generated by the firmware.

Firmware error messages

Possible error message	Description
`Error: SYSTEM + ARRSYS + DATAGROUP + INTDEVICE size overflow by 234bytes.`	Given when the retentive variables exceed the maximum limit.
`Error: serial port not avaliable in SERCOM or MODBUS device declaration.`	Given when the wrong number is used during the device declaration to select the communication channel.
`Error: CANOPEN device required if you use more than 3 slots.`	In the BUS definition more than 3 slots are being used and so the application requests the use of Canopen modules. To manage this, a CANOPEN device must be declared.
`Error: incorrect bus fault mode in CANOPEN declaration.`	The CANOPEN device declaration indicates a fault mode (last value in the declaration) that is not supported.
`Error: incorrect canbus speed in CANOPEN declaration.`	The CANOPEN device declaration indicates an invalid speed.
`Error: too much CANOPEN device declaration.`	Only one CANOPEN device can be declared.
`Error: absol. encoder resource num in ABSCNT device declar. is not avail.`	The ABSCNT device declaration indicates an inexistent resource.
`Error: COUNT in ABSCNT device declaration is not a simulated counter.`	The counter address used in the ABSCNT device declaration cannot be a simulated type (e.g. 1.CNT01).
`QMos version error. Unsupported instructions set.`	One or more statements in the project QCL are not supported by the firmware.
`Error: compression file type not support.`	The compression of the compiled QCL program is not supported by the firmware.
`Error: too mutch slots in bus declarations.`	They were declared under BUS more slots than those allowed by the hardware.

The development environment provides a series of ready-made variables that can be used by putting the word „QMOVE.“ before the name. For example „QMOVE.is_suspend“, „QMOVE.sys001“, etc. This paragraph is designed to illustrate the 16 system variables called sys001-sys016, whose meaning depends on the firmware that is being used.

sys001

This is a read only variable that indicates the status of the FUNC (bit 0) and BOOT (bit 1) buttons. The following settings are possible:
0 = no button pressed.

1 = FUNC button pressed.
2 = BOOT button pressed.
3 = FUNC and BOOT buttons pressed.

sys002

This variabile allows to read a dump of the SW1 dip-switches. The dump is acquired only after the controller is powered. The Bit 0 corresponds to dip 1 and so on.

NOTE: Some dips are not connected to the microprocessor and is therefore always read at logic level 0.

sys003

This variable allows the command of led's L1-L2-L3-L4. The bit 0 corresponds to L1, the bit1 to L2 and so on.

sys004

This variable allows toxet the anti-glitch filter on the phase signals in the two-way counters. The setting is expressed in KHz and refers to the signal frequency of one phase. The setting range is 30-220. The default setting is 220KHz. The variable can also be reread. The filter can be modified at any time.

sys005-16

Not used.

The term device identifies a category of software devices designed to perform more or less complex support and control actions, to solve problems tied to the automation of systems. There are two types of device: internal and external. Internal devices have their codes residing and performed by the firmware of the actual product. External devices have the code residing and executed in the „intelligent“ specialist cards that have their own calculation capability. The controller can only manage internal type devices . The list of devices implemented in the firmware depends on the firmware **version**. This paragraph is designed to illustrate the list and characteristics of the devices available.

Firmware version **10** implements the following devices:

Device name	Sampling time minimum (msec)	Sampling time maximum (msec)	Execution time (%)
CANOPEN	1	250	100
CALENDAR	-	-	0
DATASTORE	1	20	90,5
FREQ	1	250	4,75
DAC	-	-	0
ANINP	1	250	14,25
COUNTER3	1	250	5,94
SERCOM	1	250	9,26
MODBUS	1	250	32,07
MMIQ2	1	10	90,5
RECDATA	1	250	5,34
QMOS	-	-	0

Firmware version **20** implements the following **extra** devices:

Device name	Sampling time minimum (msec)	Sampling time maximum (msec)	Execution time (%)
EANPOS	1	250	55,94
OOPOS3	1	250	27,91
HEAD2	1	125	23,75

Firmware version **30 also** implements the following devices:

Device name	Sampling time minimum (msec)	Sampling time maximum (msec)	Execution time (%)
CAMMING3	1	250	55,94
JOINT[1)]	1	250	95,01

[1)] the effective sampling time is double the actual setting

Details of devices

CANOPEN

If the device declaration CANOPEN indicates the zero speed, then it can be set by SW1 dip's 5 and 7. The first slot to address resources that reside in Canopen modules is 4.

DATASTORE

The files processed by the device DATASTORE are all contained in the /DS directoty. If this directory does not exist, it is created automatically.

The device DATASTORE can operate both with the MMC/SD card and with the internal NAND memory (not removable). To define which mass memory to operate the priority paramenter is used (0=MMC/SD, 1=NAND). If the application has to access the two supported devices frequently and the physical removal of the MMC/SD card is not required, a special setup can be used for the priority parameter that avoids having to continuously run the memory MOUNT UMOUNT. In pratice, when wanting to change memory, before running the UMOUNT command, set „priority = -1“. This avoids the UMOUNT phase is avoided in the device, making the next MOUNT command to the memory very fast.

An example of QCL code to change device:

```
SUB SETMMC
  WAIT NOT Mmc:st_busy
  IF Mmc:st_mount
    Mmc:priority = -1
    UMOUNT Mmc
    WAIT NOT Mmc:st_mount
    CALL CHECK_ERR_WRN
  ENDIF
  Mmc:priority = 0
  MOUNT Mmc
  WAIT Mmc:st_mount
ENDSUB

SUB SETNAND
  WAIT NOT Mmc:st_busy
  IF Mmc:st_mount
    Mmc:priority = -1
    UMOUNT Mmc
    WAIT NOT Mmc:st_mount
    CALL CHECK_ERR_WRN
  ENDIF
  Mmc:priority = 1
  MOUNT Mmc
  WAIT Mmc:st_mount
  CALL CHECK_ERR_WRN
ENDSUB
```

There is a particular setting of the parameters that allows to check the existence of a file in the device. Use the „filenum“ parameter set to -1 and with the OPENFILE command the device, instead of opening the file, it searches for the first file in the „/DS/“ directory of the selected memory. When it is found, the file name is set by the device in the parameter „filenum“ (and its type in the parameter „filetype“). Setting -1 in „filenum“ again and running the OPENFILE command, the next file name is found and so on. Every time an OPENFILE operation is run with filenum different to -1, the search loog is closed. When the search has ended and there are no more files present, then the device will set as answer to the command OPENFILE „filenum = -2“. The execution of the command is signalled by the flag st_busy = 0. If the file extension is not HEX or CSV, the file is ignored by the search. If the file name is not compatible with those managed by DATASTORE (numbers 0 to 9999999) then „filenum“ will remain set to -1 and a warning is given.

RECDATA

The device can memorise up to 10000 step.

QMOS

The parameter „frwuvalue01“ contains the number value of the product serial number.

FREQ

To define the input associated to the device FREQ use the number field provided in the device declaration. The availability of frequency inputs has to be checked with the hardware version of the product. To ricavare the relation between number and terminal pin, use the information contained in the „Address“ column given in the terminal tables.

CAMMING3

The parameters related to the sectors (CodeQm, CodeQs...) are not retentive. On startup they always take on the value 0.

8. Accessories available

- IQ009
- IQ013
- IQ011
- IQ016
- Connector polarisation kit
- Kit di personalizzazione del pannello anteriore