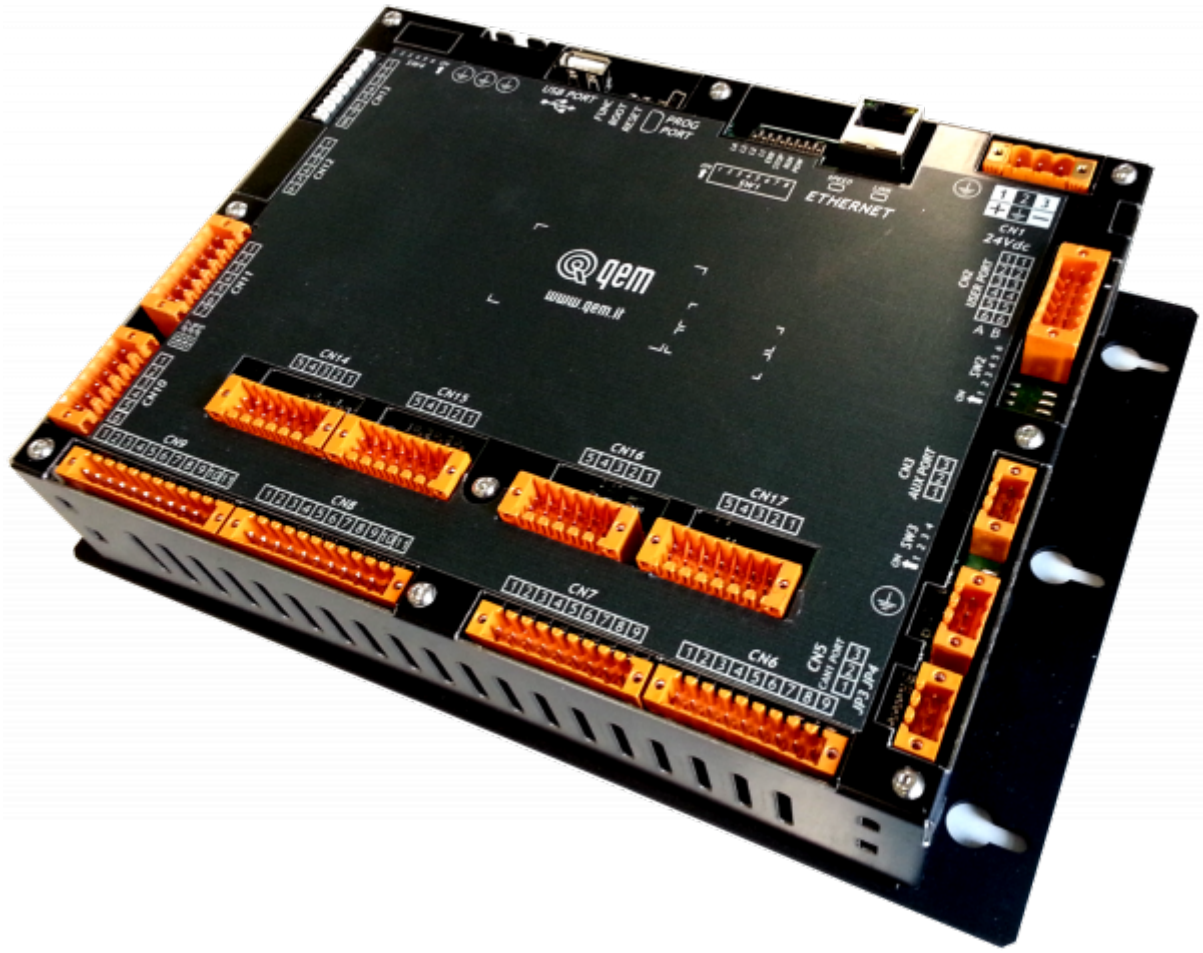
Inhaltsverzeichnis

C1-R44-Fx BASE 3
Informations 4
1. Description 5
1.1 Product identification 5
1.1.1 Product label 5
1.1.2 Ordering code 6
1.1.3 Hardware versions 7
1.1.4 Expansion cards manuals 7
1.1.5 Firmware versions 7
1.2 Product Configuration 8
1.2.1 Back terminal blocks 8
2. Technical features 9
2.1 General Features 9
2.2 CPU (F level technology) 9
2.3 Dimensions 10
2.4 Drilling template 11
3. Base card wiring 12
3.1 Power supply 13
Connection examples 14
3.2 Serial Port Connections 15
3.2.1 PROG PORT (USB mini-B) 15
3.2.2 USER PORT 15
3.2.3 AUX PORT 16
3.2.4 ETHERNET port 18
3.2.5 MMC/SD 19
3.2.6 USB 20
3.3 Digital inputs 21
3.3.1 16 PNP digital inputs 21
3.3.2 4 bidirectional counters 200KHz 22
3.3.3 2 SSI absolute counters 24
3.4 Analog inputs 25
3.4.1 2 multistandard analog inputs 25
3.5 Digital outputs 26
3.5.1 16 protected outputs 26
3.5.2 2 STEP-DIRECTION outputs 27
3.6 Analog outputs 28
3.6.1 4 analog outputs +/-10V, 16bit 28
4. Electrical features 29
4.1 PROG PORT (USB mini-B) 29
4.2 RS232 30
4.3 RS422 31
4.4 RS485 32
4.5 CANbus 33
4.6 ETHERNET 34
4.7 MMC/SD 35
4.8 USB 36
4.9 Standard digital inputs 37
4.10 Bidirectional counter inputs 200KHz 38
4.11 SSI absolute counters 39

4.12 Analog inputs 40
4.12.1 Conversion times 40
4.12.2 Amperometric input configuration 0-20mA 40
4.12.3 Potentiometric analog input configuration 41
4.12.4 Voltmetric analog input configuration 42
4.12.5 PT100 analog inputs configuration 43
4.12.6 Termocouple analog input configuration 44
4.13 Protected digital outputs 45
4.14 Stepper outputs 46
4.15 Analog outputs 47
5. Connection examples 48
5.1 CANbus 48
5.2 Digital inputs 49
5.3 Line Driver counter inputs 50
5.4 PNP / Push Pull counter inputs 51
5.5 SSI absolute counters 52
5.6 Analog inputs 53
5.6.1 Potentiometric input 1 and voltmetric input 2 53
5.6.2 PT100 input 1 and amperometric input 2 54
5.6.3 PT100 input 1 and termocouple input 2 55
5.6.4 Termocouple inputs 1 and 2 56
5.6.5 PT100 inputs 1 and 2 57
5.7 Protected digital outputs 58
5.8 STEP - DIRECTION outputs 59
5.9 Analog outputs 60
6. Settings, procedures and signals 61
6.1 Settings, procedures and signals 61
6.2 Led 62
“System Leds” Signals 62
“User Led” signal 64
6.3 Keys 65
7. Operating Overview 66
7.1 Foreword 66
7.2 Organizing data and memories 66
7.3 CPU states 66
7.4 System functions 68
7.4.1 Access to system functions 69
7.4.2 Description of the functions 70
7.5 Information for programming 72
7.5.1 Development suite 73
Memories used 73
7.5.2 Communication ports 73
7.5.3 Firmware message error 74
7.5.4 The devices 74
8. Available accessories 77

C1-R44-Fx BASE



Informations

Documento:	**MIMC1R44Fx BASE**
Description:	Installation and maintenance manual
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Approver	Gabriele Bazzi
Link:	http://www.qem.eu/doku/doku.php/en:strumenti/qmoveplus/C1R44/mimC1R44fx_base
Language:	English

Document release	Hardware Release	Description	Note	Date
01	01	New manual	/	19/02/2015
02	01	Fixes	/	07/04/2015
03	01	Fixes description DIP-SW4	/	01/07/2015
04	01	Fixes the description of the analog input connector CN13	/	24/08/2015
05	01	Added new section “General information of operation”	/	13/01/2016
06	01	Fixes the description of the setting of the analogue inputs and related connection examples	/	01/02/2015
07	01	New „FE“ version and connection between the expansion card „1MG2F“	/	16/05/2016
08	01	Fixed the description of connectors CN14-17, for frequency meter inputs	/	05/09/2016

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

1. Description

The **C1-R44-F** is the compact instrument for panel mounting of the Qmove+ range.

1.1 Product identification

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

1.1.1 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

1.1.2 Ordering code

Model				Features		
C1	-	**R44**	-	**FA**	-	**10**
						10 = Firmware version (00 = not installed)
				F = Technology level **A** = Hardware version		
		R = Rear panel mounting instrument; **4** = Dimensions (251x175mm) **4** = Firmware-hardware correspondence				
C1 = “Motion” Qmove family						

1.1.3 Hardware versions

These are hardware versions currently available:

		Hardware versions				
		A	B	C	E	Y
SLOT 2 (Base card)	USER PORT (RS232-422-485)	1	1	1	1	1
	AUX PORT (RS485)	1	1	1	1	1
	CAN1 PORT	1	1	1	1	1
	CAN2 PORT [1)]	-	-	-	-	-
	ETHERNET PORT	1	1	1	1	1
	USB PORT	1	1	1	1	1
	Standard digital inputs	16	16	16	16	16
	Rapid digital inputs (can be used as frequency meters)	-	2	2	2	2
	Analog inputs 16bit selectable(0-10V, 0-20mA, potenziometric, termocouples, PT100)	2	2	2	2	2
	Bidirectional counters 200KHz ABZ (24V-PP, 5V-LD)	-	2	4	2	4
	SSI counter inputs	-	-	-	-	2
	Protected digital outputs	16	16	16	16	16
	Stepper outputs	-	-	-	-	2
	Analog outputs +/-10V-16bit	-	2	4	2	4
CSoftware code of the card to declare as base card		1QM4F				
Expansion card	Standard digital inputs	-	-	-	16	-
	Analog inputs 12bit	-	-	-	-	-
	Analog inputs 16bit seleectable (0-10V, 0-20mA, potenziometric, termocouples, PT100)	-	-	-	-	-
	Protected digital outputs	-	-	-	16	-
	Relay digital outputs	-	-	-	-	-
	Analog outputs 0-10V-12bit	-	-	-	-	-
	Analog outputs +/-10V-16bit	-	-	-	-	-
	Bidirectional counters 200KHz ABZ (24V-PP, 5V-LD)	-	-	-	-	-
Software code of the card to declare as expansion card		-	-	-	1MG2F	-

1.1.4 Expansion cards manuals

1MG2F rel.01

1.1.5 Firmware versions

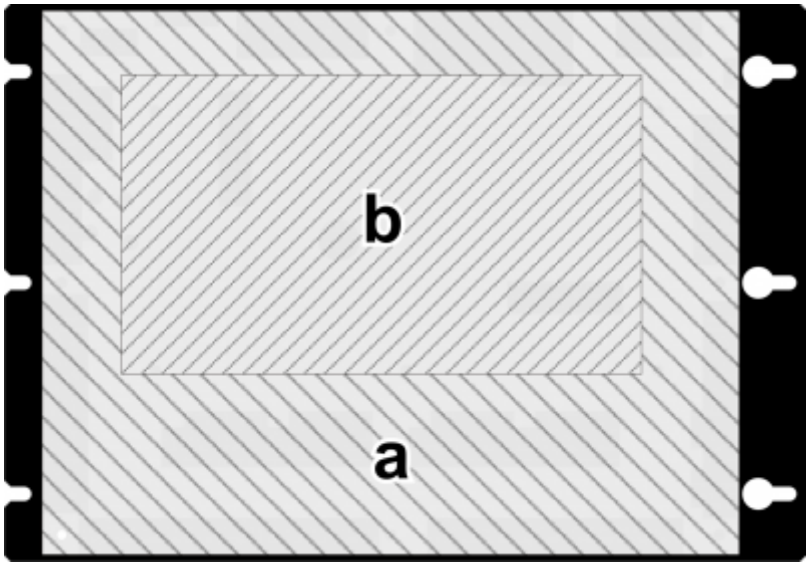
Version	Description
10	Fully programmable with PLC functions
20	Fully programmable with PLC and Motion control functions
30	Fully programmable with PLC, Motion control, Camming and Interpolation functions

For more details about the firmware, consult Devices enabled in the controllers.

1.2 Product Configuration

1.2.1 Back terminal blocks

The C1-R44-F composed of a “base” card and an “expansion” card.



- **a** = Base card
- **b** = Expansion card

2. Technical features

2.1 General Features

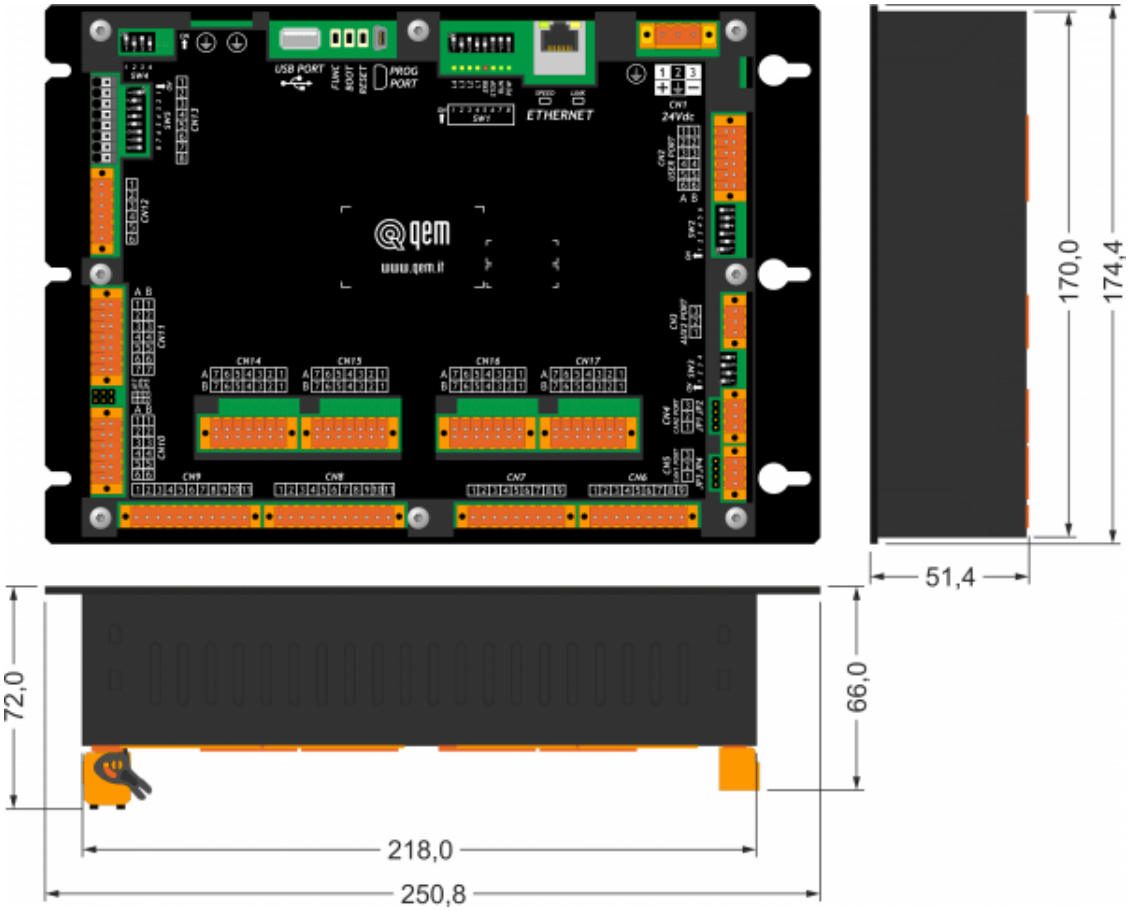
Weight (maximum hardware configuration)	1.2Kg
Material box	Sheet metal
System led	8
System keys	3
Operating temperature	0 ÷ 50°C
Transport and storage temperature	-25 ÷ +70 °C
Relative humidity	90% condensate free
Altitude	0 - 2000m s.l.m.
Front panel protection	IP20

2.2 CPU (F level technology)

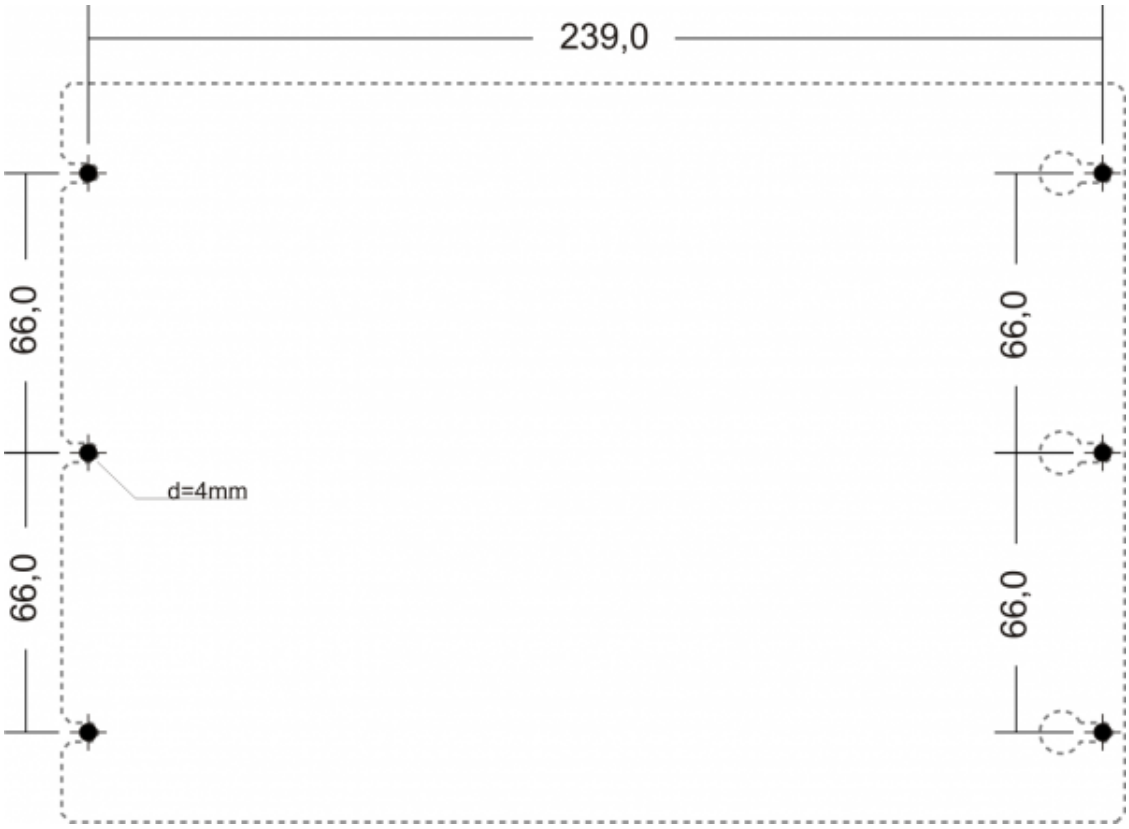
RISC microprocessor (32 bit)	
Work frequency	200MHz
RAM	32MB
Flash	16MB

2.3 Dimensions

	Lengths in mm



2.4 Drilling template



3. Base card wiring

	**For details about cable sections and connectors, see application note AN021**

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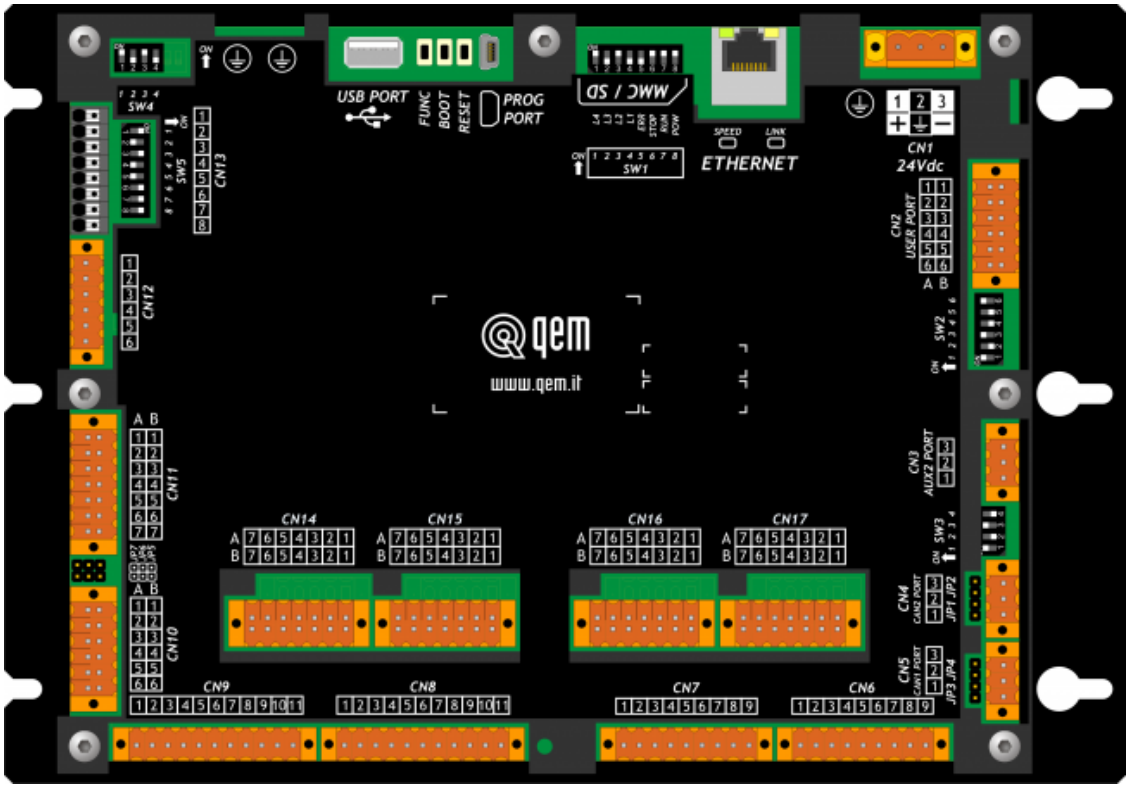
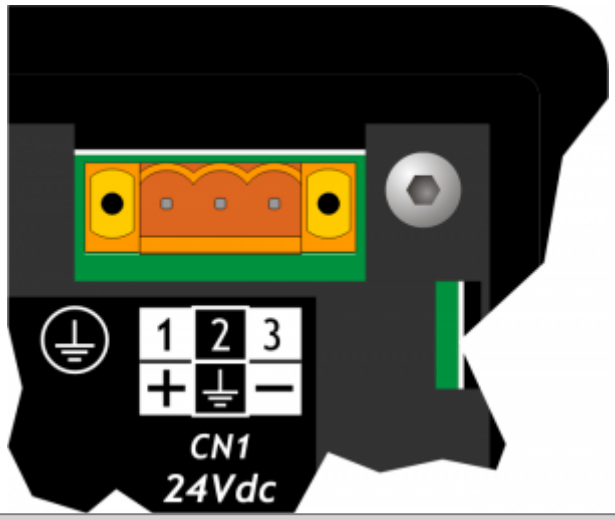
	**The electrical features are described in the section Electrical features. The wiring examples are given in section Connection examples**



3.1 Power 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.**

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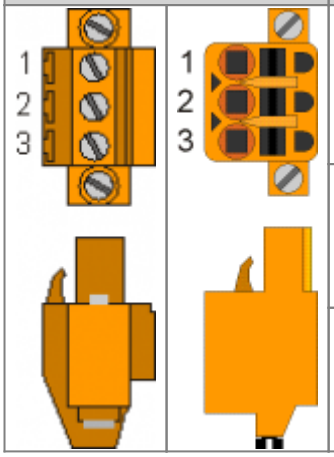
Power supply	**24 Vdc**
Voltage range	22 - 27 Vdc
Max. absorption	10W

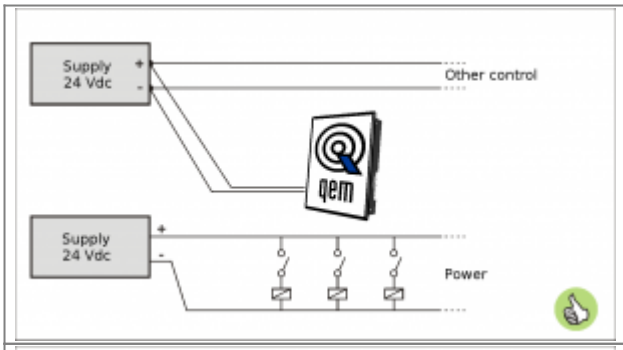
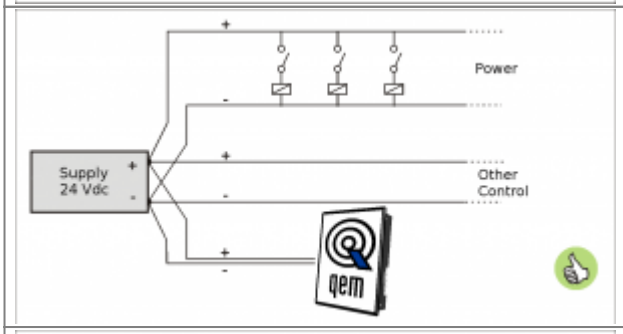
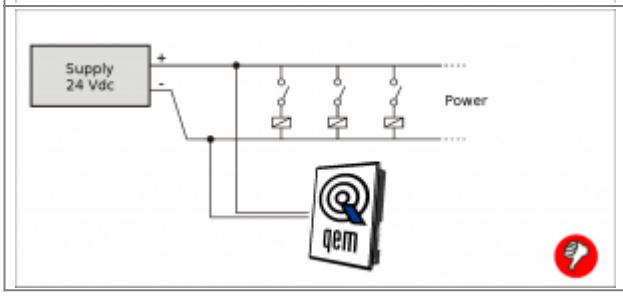
Connector

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

Connection examples

	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

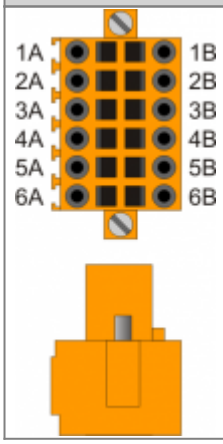
3.2 Serial Port Connections

3.2.1 PROG PORT (USB mini-B)

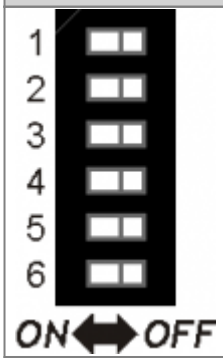
PROG PORT	Description
	Serial port used for the transfer and debugging of the application program in the CPU. Use only with IQ009 or IQ013.

3.2.2 USER PORT

Connector

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	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			

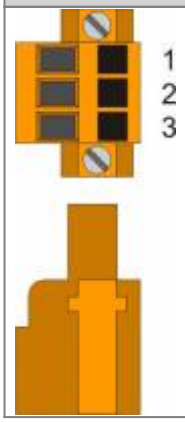
Setting USER PORT electric standard

SW2	Num. Dip	Name DIP	Setting of DIP			Function
	1	JP2	ON	X[2]	X[3]	Termination RS485
	2	JP3	ON	X[4]	X[5]	Polarisation RS485
	3	JP1	ON	X[6]	X[7]	
	4		OFF	ON	OFF	Selection of USER PORT electric standard
	5		ON	OFF	OFF	
	6		OFF	OFF	ON	
			RS485	**RS422**	**RS232**[8]	

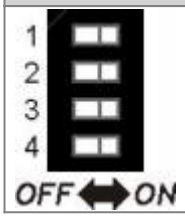
[1], [3], [4], [5], [6], [7] option not enabled
[2] X = setting not significant
[8] the USER PORT can be used as PROG PORT with RS232 electric standard, setting ON in DIP-8 of SW1 and OFF in DIP-6 of SW2

3.2.3 AUX PORT

Connector

CN3	Terminal	Symbol	Description
	1	0V	RS485 serial common
	2	B	Terminal RS485 B
	3	A	Terminal RS485 A

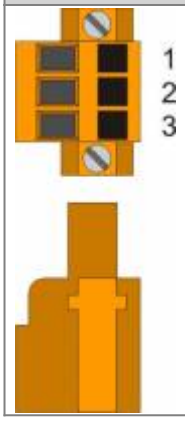
Setup of AUX2 PORT polarisation and termination resistances

SW3	Num. Dip	Name Dip	Setting of DIP	Function
	1	JP3	ON	Polarisation RS485
	2	JP2	ON	Termination RS485
	3	JP1	ON	Polarisation RS485
	4		X[1)]	None

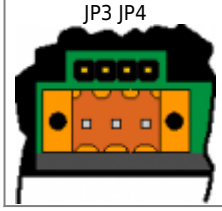
[1)] X = setting not significant

3.2.3.1 CANbus PORT

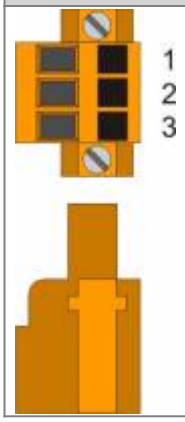
Connector

CN5 CAN1 PORT	Terminal	Symbol	Description
	1	0V	CAN common
	2	CAN L	Terminal CAN L
	3	CAN H	Terminal CAN H

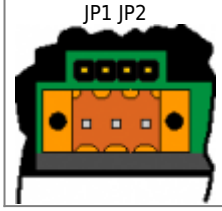
Termination resistor setting

	Name jumper	Setting of DIP	Function
JP3 JP4 	JP3	INSERTED	Termination CAN active
	JP4		

Connector

CN4 CAN2 PORT	Terminal	Symbol	Description
	1	0V	CAN common
	2	CAN L	Terminal CAN L
	3	CAN H	Terminal CAN H

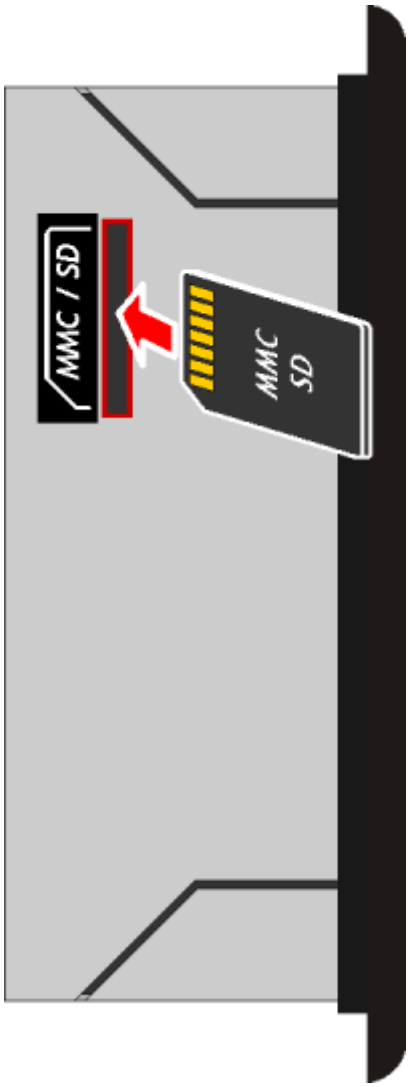
Termination resistor setting

	Name jumper	Setting of DIP	Function
JP1 JP2 	JP1	INSERTED	Termination CAN active
	JP2		

3.2.4 ETHERNET port

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)

3.2.5 MMC/SD

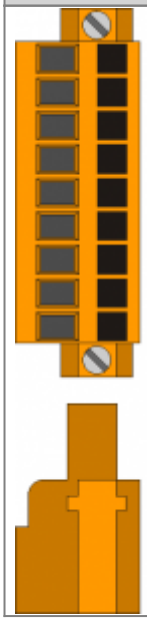


Memory card slot (marked by an arrow)

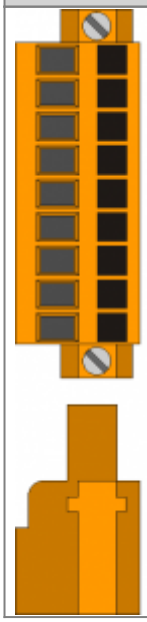
3.2.6 USB

3.3 Digital inputs

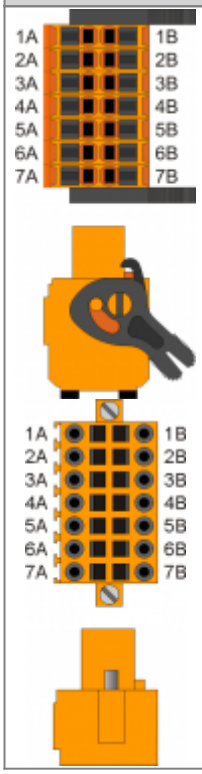
3.3.1 16 PNP digital inputs

CN7	Terminal	Symbol	Description	Addres
	1	0V	Common for digital inputs	
	2	I1	Input I1	2.INP01
	3	I2	Input I2	2.INP02
	4	I3	Input I3	2.INP03
	5	I4	Input I4	2.INP04
	6	I5	Input I5	2.INP05
	7	I6	Input I6	2.INP06
	8	I7	Input I7	2.INP07
	9	I8	Input I8	2.INP08

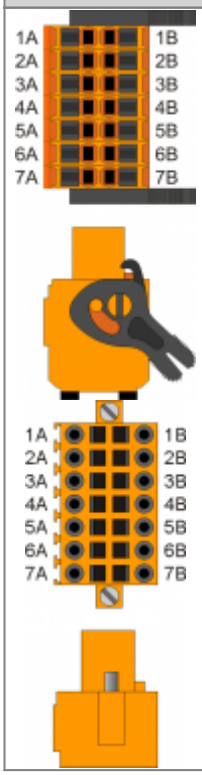
.

CN6	Terminal	Symbol	Description	Address
	1	0V	Common for digital inputs	
	2	I9	Input I9	2.INP09
	3	I10	Input I10	2.INP10
	4	I11	Input I11	2.INP11
	5	I12	Input I12	2.INP12
	6	I13	Input I13	2.INP13
	7	I14	Input I14	2.INP14
	8	I15	Input I15	2.INP15
	9	I16	Input I16	2.INP16

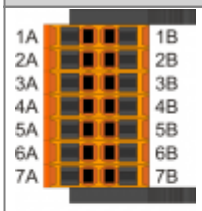
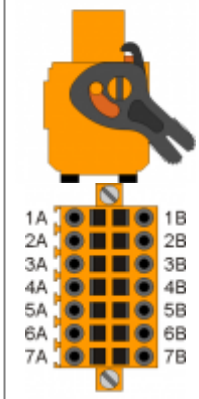
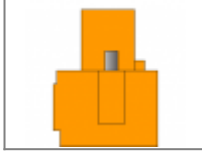
3.3.2 4 bidirectional counters 200KHz

CN14	Terminal	Symbol	Description		Address	
	1A		Output + 24V dc[1)]			
	2A	PHA1	Phase A	Count 1 PNP / Push-Pull[2)]	2.INP17	2.CNT01
	3A	PHB1	Phase B		2.INP18	
	4A	Z1	Z		1.INT01	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Output + 24V dc[3)]			
	2B	PHA1+	+ PHA	Count 1 Line Driver	2.INP17	2.CNT01
	3B	PHB1+	+ PHB		2.INP18	
	4B	Z1+	+ Z		1.INT01	
	5B	PHA1-	- PHA			
	6B	PHB1-	- PHB			
	7B	Z1-	- Z			

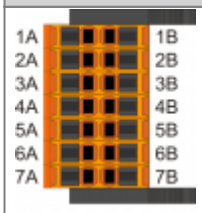
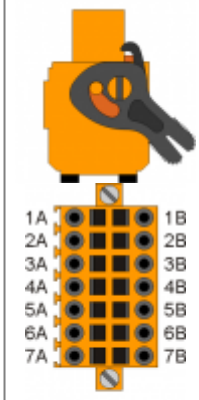
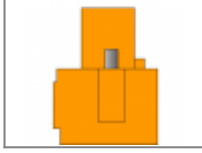
[1), 3)] Used to power the encoder. See Connection examples.
[2)] **PNP/Push-Pull type count input configuration**:
Terminal 5B: connect to terminal 5A
Terminal 6B: connect to terminal 6A
Terminal 7B: connect to terminal 7A

CN15	Terminal	Symbol	Description		Address	
	1A		Output + 24V dc[1)]			
	2A	PHA2	Phase A	Count 2 PNP / Push-Pull[2)]	2.INP19	2.CNT02
	3A	PHB2	Phase B		2.INP20	
	4A	Z2	Z		1.INT02	
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Output + 24V dc[3)]			
	2B	PHA2+	+ PHA	Count 2 Line Driver	2.INP19	2.CNT02
	3B	PHB2+	+ PHB		2.INP20	
	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

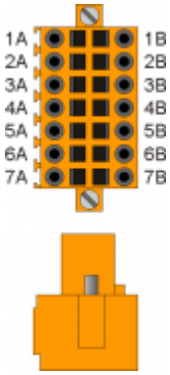
CN16	Terminal	Symbol	Description		Address	
	1A		Output + 24V dc[1)]			
	2A	PHA3	Phase A	Count 3 PNP / Push-Pull[2)]	2.INP21	2.CNT03
	3A	PHB3	Phase B		2.INP22	
	4A	Z3	Z		1.INT03	FREQ1[3)]
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Output + 24V dc[4)]			
	2B	PHA3+	+ PHA	Count 3 Line Driver	2.INP21	2.CNT03
	3B	PHB3+	+ PHB		2.INP22	
	4B	Z3+	+ Z		1.INT03	FREQ1[5)]
	5B	PHA3-	- PHA			
	6B	PHB3-	- PHB			
	7B	Z3-	- Z			

[1), 4)] 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
[3), 5)] Can be used as frequency input for a FREQ device, indicating 1 in the device declaration

CN17	Terminal	Symbol	Description		Address	
	1A		Output + 24V dc[1)]			
	2A	PHA4	Phase A	Count 4 PNP / Push-Pull[2)]	2.INP23	2.CNT04
	3A	PHB4	Phase B		2.INP24	
	4A	Z4	Z		1.INT04	FREQ2[3)]
	5A	0V	Common for count inputs			
	6A	0V				
	7A	0V				
	1B		Output + 24V dc[4)]			
	2B	PHA4+	+ PHA	Count 4 Line Driver	2.INP23	2.CNT04
	3B	PHB4+	+ PHB		2.INP24	
	4B	Z4+	+ Z		1.INT04	FREQ2[5)]
	5B	PHA4-	- PHA			
	6B	PHB4-	- PHB			
	7B	Z4-	- Z			

[1), 4)] 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
[3), 5)] Can be used as frequency input for a FREQ device, indicating 2 in the device declaration

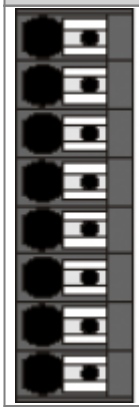
3.3.3 2 SSI absolute counters

CN11	Terminal	Symbol	Description	Address
	1A		Internal bridge 1A-2A-1B-2B	
	2A			
	3A	DATA1+	DATA in SSI1	1
	4A	DATA1-		
	5A	CLOCK1+	CLOCK out SSI1	
	6A	CLOCK1-		
	7A	0V	Common for count inputs	
	1B		Internal bridge 1A-2A-1B-2B	
	2B			
	3B	DATA2+	DATA in SSI2	2
	4B	DATA2-		
	5B	CLOCK2+	CLOCK out SSI1	
	6B	CLOCK2-		
	7B	0V	Common for count inputs	

3.4 Analog inputs

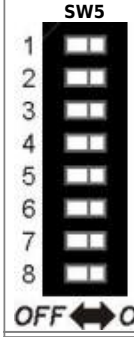
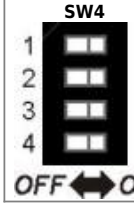
3.4.1 2 multistandard analog inputs

Connector

CN13	Terminal	Symbol	Description			Address
			Potenziometers / 0-10V / 0-20mA	Thermocouple	PT100	
 1	1	AI2_C	-	TC 2 +	C	2.AI02
2	2	AI2_B	-	TC 2 -	B	
3	3	AI2_A	Analog input 2	-	A [1)]	
4	4	AI1_C	-	TC 1 +	C	2.AI01
5	5	AI1_B	-	TC 1 -	B	
6	6	AI1_A	Analog input 1	-	A [2)]	
7	7	VREF	Reference voltage [3)]	-	-	
8	8	GAI	Common	-	-	

[1), 2)] A and B cables are connected to the same head of the PT100 wire and have the same colors.
In the case of 2-wire PT100 make a jumper between A and B.
[3)] For potentiometers

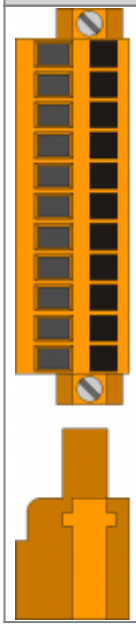
Analog inputs setting

	Num. Dip	Analog input 1					Analog input 2				
		PT100	Thermocouple	Pot.	0-10V	0-20mA	PT100	Thermocouple	Pot.	0-10V	0-20mA
SW5 	1	ON	X	OFF	OFF	OFF	X	X	X	X	X
	2	OFF	X	ON	ON	ON	X	X	X	X	X
	3	X	X	X	X	X	ON	X	OFF	OFF	OFF
	4	X	X	X	X	X	OFF	X	ON	ON	ON
	5	ON	ON	OFF	OFF	OFF	X	X	X	X	X
	6	OFF	OFF	ON	ON	ON	X	X	X	X	X
	7	OFF	ON	X	X	X	X	X	X	X	X
	8	X	X	X	X	X	OFF	ON	X	X	X
SW4 	1	X	X	X	X	X	X	X	OFF	OFF	ON
	2	X	X	X	X	X	X	X	OFF	ON	OFF
	3	X	X	OFF	OFF	ON	X	X	X	X	X
	4	X	X	OFF	ON	OFF	X	X	X	X	X

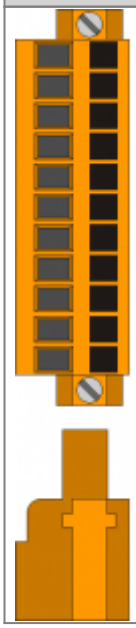
X = irrelevant setting
Pot. = potentiometric type input

3.5 Digital outputs

3.5.1 16 protected outputs

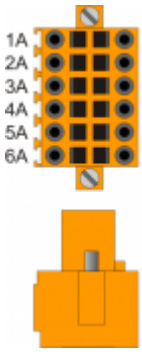
CN9	Terminal	Symbol	Description	Address
	1	V+	Outputs power input O1÷O4 (12÷28V dc)	
	2	O1	Digital output 1	2.OUT01
	3	O2	Digital output 2	2.OUT02
	4	O3	Digital output 3	2.OUT03
	5	O4	Digital output 4	2.OUT04
	6	V+	Outputs power input O5÷O8(12÷28V dc)	
	7	O5	Digital output 5	2.OUT05
	8	O6	Digital output 6	2.OUT06
	9	O7	Digital output 7	2.OUT07
	10	O8	Digital output 8	2.OUT08
	11	V-	Outputs power in (0V dc)	

.

CN8	Terminal	Symbol	Description	Address
	1	V+	Outputs power input O9÷O12(12÷28V dc)	
	2	O9	Digital output 9	2.OUT09
	3	O10	Digital output 10	2.OUT10
	4	O11	Digital output 11	2.OUT11
	5	O12	Digital output 12	2.OUT12
	6	V+	Outputs power input O13÷O16(12÷28V dc)	
	7	O13	Digital output 13	2.OUT13
	8	O14	Digital output 14	2.OUT14
	9	O15	Digital output 15	2.OUT15
	10	O16	Digital output 16	2.OUT16
	11	V-	Outputs power in (0V dc)	

3.5.2 2 STEP-DIRECTION outputs

Connector

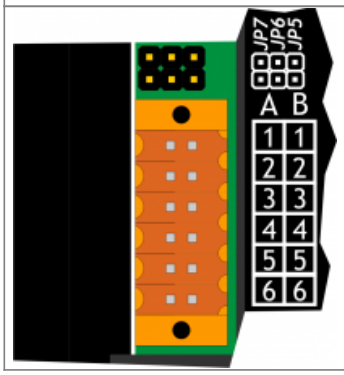
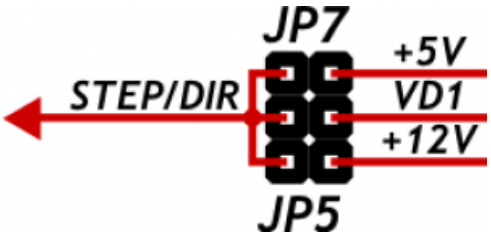
CN10	Terminal	Symbol	Description		Address
	1A	VD1	Internal bridge 1A -1B		
	2A	DIR1+	Output DIRECTION 1	**Push-Pull Line Driver**	2.PULSE01
	3A	STEP1+	Output STEP 1		
	4A	DIR2+	Output DIRECTION 2		2.PULSE02
	5A	STEP2+	Output STEP 2		
	6A	0V	Common for stepper outputs		
	1B	VD1	Internal bridge 1A -1B		
	2B	DIR1-	Complementary output DIRECTION 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		

Outputs STEP-DIRECTION voltage setting

By placing one of several jumpers JP5, JP6 and JP7, you can choose Nominal Operating Voltage of STEP and DIRECTION outputs.

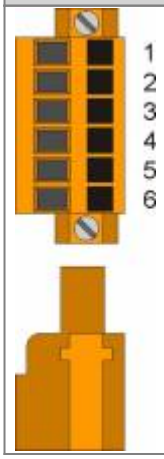
	**Must be inserted only one jumper at a time** **If you select one of the two voltage 5V (JP7) or 12V (JP5) terminals 1A and 1B must remain disconnected**

.

	jumper name	Setting	Nominal voltage	
	JP5	INSERTED	12V (Voltage supplied by the instrument)	
	JP6	INSERTED	VD1 (Voltage to be supplied to the terminals 1A or 1B)	
	JP7	INSERTED	5V (Voltage supplied by the instrument)	

3.6 Analog outputs

3.6.1 4 analog outputs +/-10V, 16bit

CN12	Terminal	Symbol	Description	Address
	1	GAO	Common for analog outputs	
	2	AO1	Analog output 1	2.AN01
	3	AO2	Analog output 2	2.AN02
	4	GAO	Common for analog outputs	
	5	AO3	Analog output 3	2.AN03
	6	AO4	Analog output 4	2.AN04

4. Electrical features

The electrical features of the hardware are given below. Maximum and minimum frequency values and actual acquisition times, can still depend on any additional software filters, see for example the system “QMOVE:sys004” variable on the section “QMOVE:sys004” on the section System variables.

4.1 PROG PORT (USB mini-B)

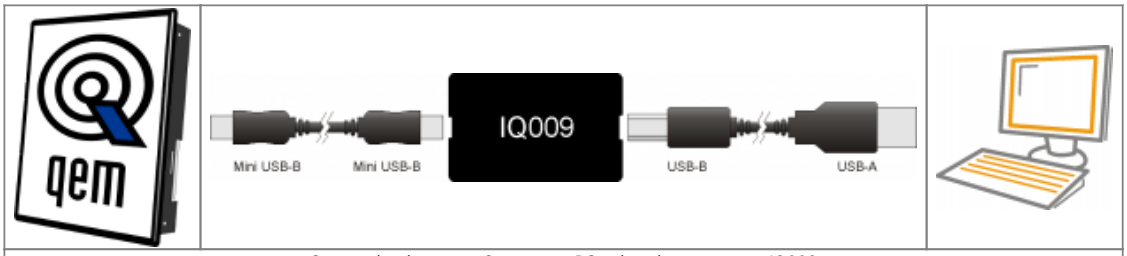
Connector for IQ009 or IQ013

	**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.

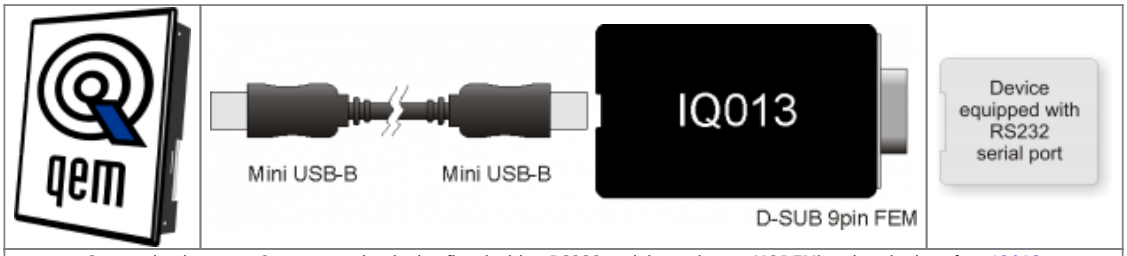
Electrical standard	TTL (Use serial interface IQ009 or IQ013)
Communication speed	Min. 9.6 Kbaud - max 115200 Kbaud settable by dip1 and 2 of the switch SW1
Insulation	None

.



Connection between Qmove+ e PC using the accessory IQ009

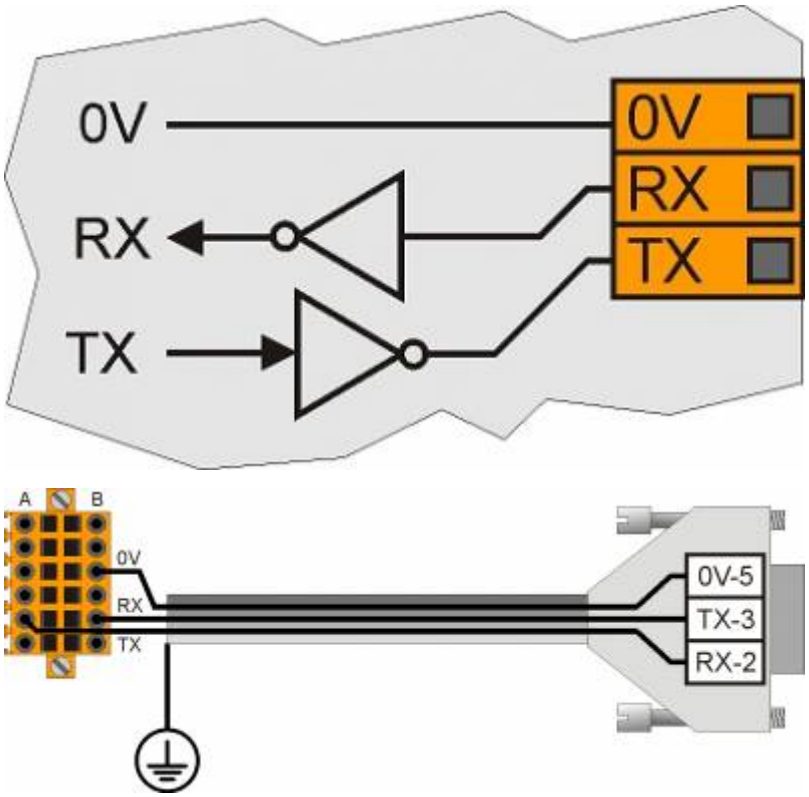
.



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

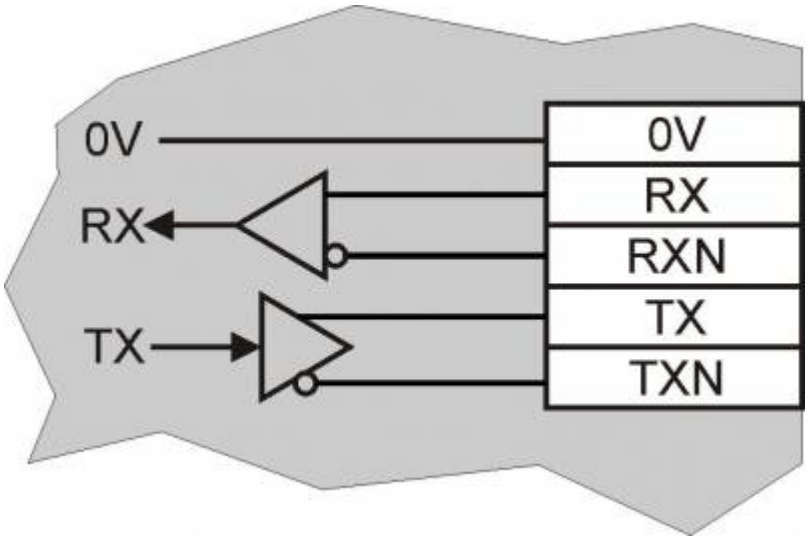
4.2 RS232

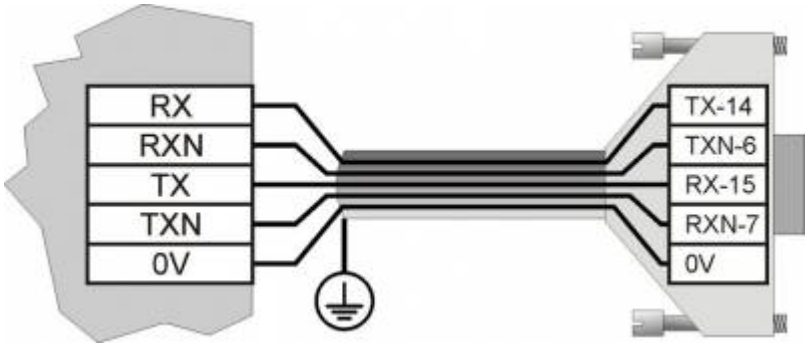
Communication speed	4800, 9600, 19200, 38400, 57600, 115200 baud
Communication mode	Full duplex
Operating mode	Referred to 0V
Max. number of devices connected on the line	1
Max. cable length	15 m
Input impedence	≥ 3 Kohm
Short-circuit current limit	7 mA



4.3 RS422

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



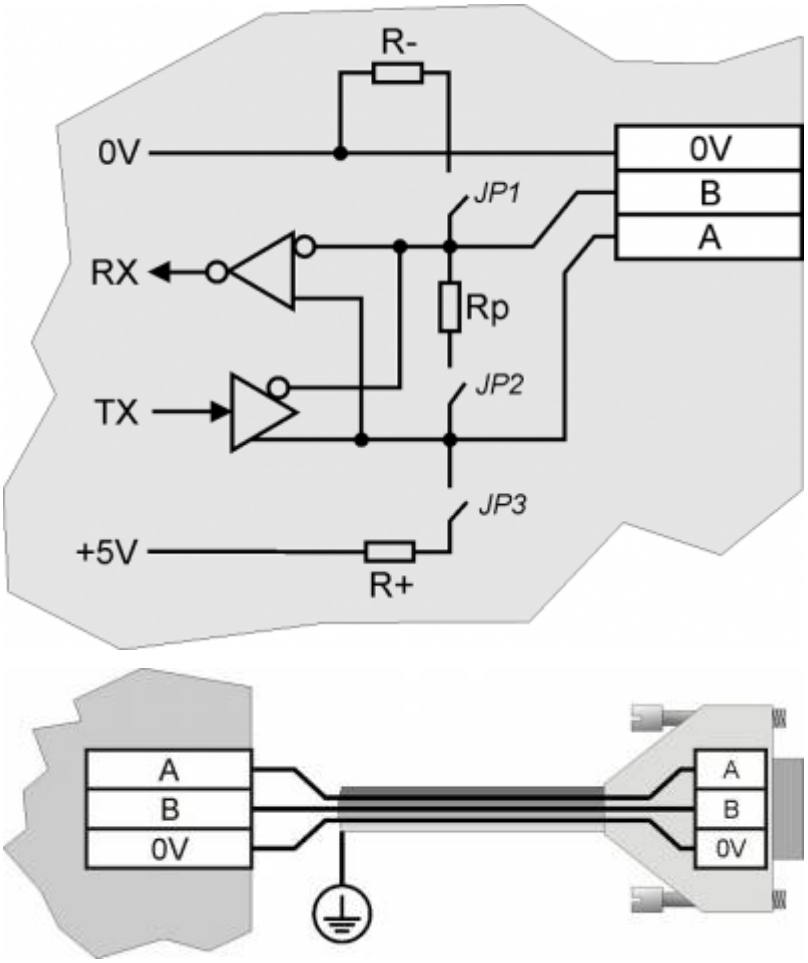


4.4 RS485

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

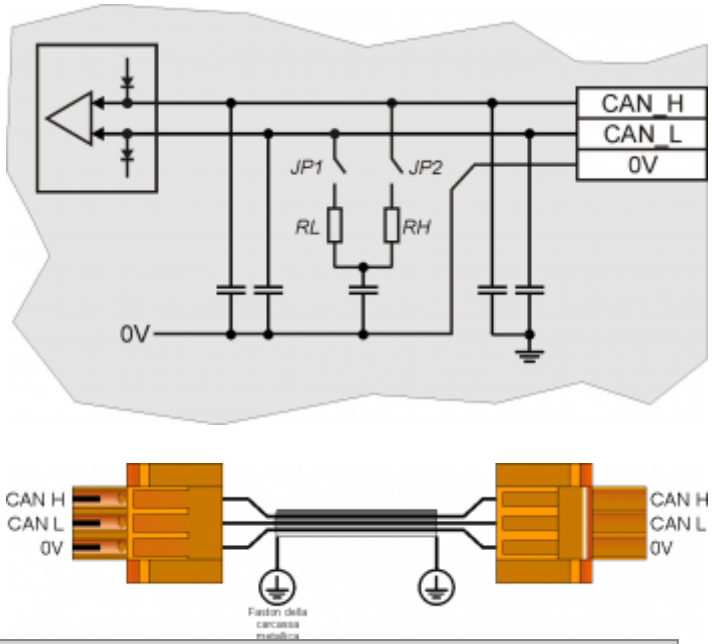


4.5 CANbus

	To activate the internal termination resistance see section Terminating resistors setting CAN1 and CAN2 PORT

.

Comunication speed	125, 250, 500, 1000 Kbit/s
Maximum numr of Drivers/Receiver on the line	100
Maximum cable length	500m @ 125Kbit/s, 250m @ 250Kbit/s, 100m @ 500Kbit/s, 25m @ 1000Kbit/s
Input impedance	>15Kohm
Short circuit current limit	45mA

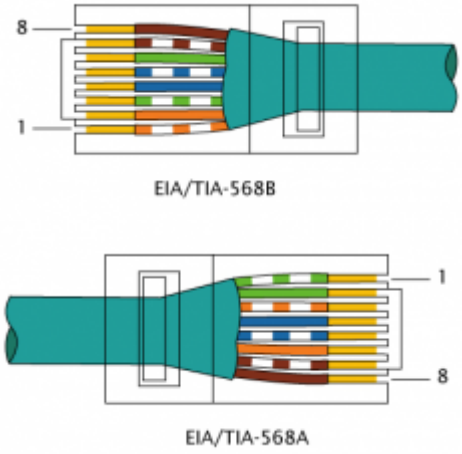


	On the first and last device, must be insert the termination resistance.

4.6 ETHERNET

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

4.7 MMC/SD

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).

.

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

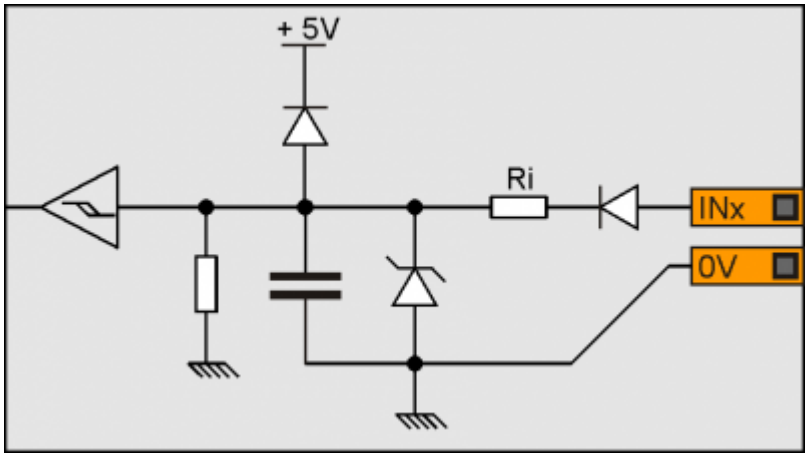
4.8 USB

Max output current	500mA

4.9 Standard digital inputs

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.**



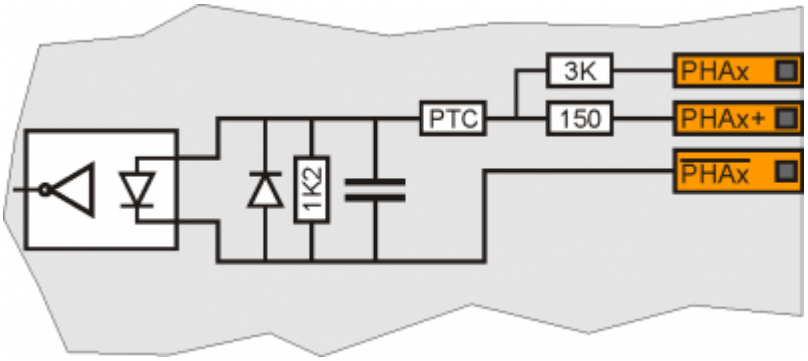
4.10 Bidirectional counter inputs 200KHz

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

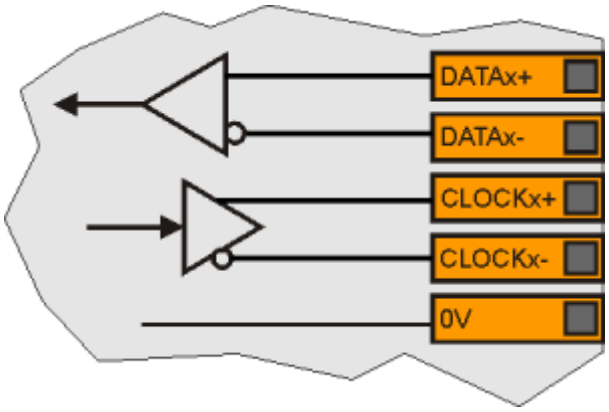
Line-Driver

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



4.11 SSI absolute counters

Frequency	320KHz
Operation mode	Differential
Input impedance	>= 12KO
Short circuit current limit	>= 35mA



4.12 Analog inputs

4.12.1 Conversion times

The electrical features depend on the type of input, configurable via DIP switch.

The conversion times from analog to digital depend on the configuration according to the table:

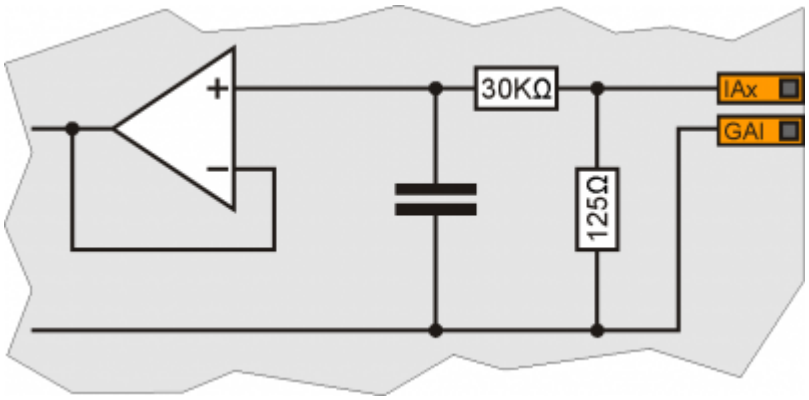
Analog Input Configuration		Conversion time per channel
Input 1	**Input 2**	
DC[1)]	-	4.6 ms
-	DC[2)]	4.6 ms
DC[3)]	DC[4)]	9.3 ms
DC[5)]	TC	9.3 ms
DC[6)]	PT100	79.1 ms
TC	-	9.3 ms
-	TC	9.3 ms
TC	DC[7)]	9.3 ms
TC	TC	9.3 ms
TC	PT100	83.8 ms
PT100	-	74.5 ms
-	PT100	74.5 ms
PT100	DC[8)]	79.1 ms
PT100	TC	79.1 ms
PT100	PT100	79.1 ms

[1), 2), 3), 4), 5), 6), 7), 8)] Amperometric, voltmetric or potentiometric type

4.12.2 Amperometric input configuration 0-20mA

Connection type	Amperometric (0-20 mA)
Resolution	12bit/16bit[1)]
Input resistance	125Ω
Value of damage	25 mA
Max. Linearity error	± 0,1% Vfs
Max. Offset error	± 0,1% Vfs
S.n.	71 dB
Conversion time	It depends on the configuration of the analog input. See section Conversion times if present [2)]
Isolation	1000 Vrms

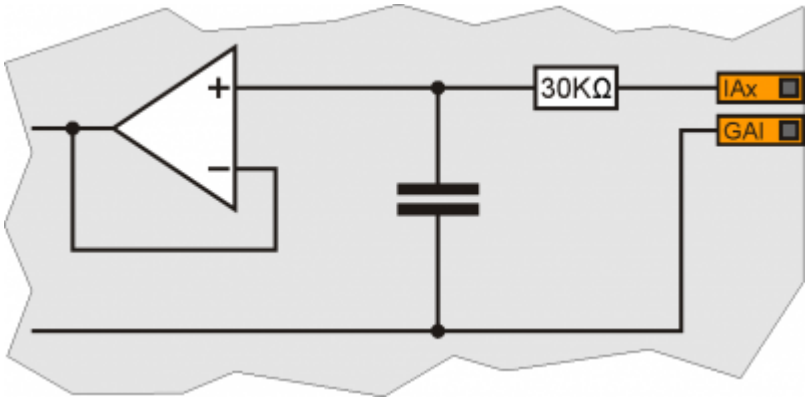
[1)] It depends on the Hardware versions
[2)] The sampling time of the device must be equal or higher than the conversion time



4.12.3 Potentiometric analog input configuration

Connection type	Potentiometric 1KΩ÷20KΩ
Resolution	12bit/16bit[1)]
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
Conversion time	It depends on the configuration of the analog input. See section Conversion times if present [2)]
Isolation	1000 Vrms

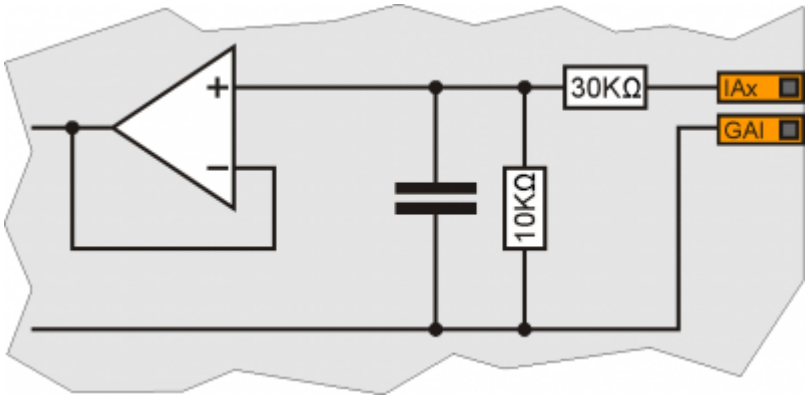
[1)] It depend on the Hardware versions
[2)] The sampling time of the device must be equal or higher than the conversion time



4.12.4 Voltmetric analog input configuration

Connection type	Voltmetrico 0÷10V
Resolution	12bit/16bit[1)]
Input resistance (Rin)	40KΩ
Value of damage	20V
Max. Linearity error	± 0,1% Vfs
Max. Offset error	± 0,1% Vfs
S.n.	71 dB
Conversion time	It depends on the configuration of the analog input. See section Conversion times if present [2)]
Isolation	1000 Vrms

[1)] It depends on the Hardware versions
[2)] The sampling time of the device must be equal or higher than the conversion time



4.12.5 PT100 analog inputs configuration

Sensor type collegabile	PT100 3 wire [1)]
Measure type	Resistance [2)]
Resolution	15 bit (32767 corresponds to 250.00 O)
Input resistance (Rin)	15 MO
Measuring current	1 mA
Value of damage	10V
Accuracy of resistance measurement	± 0,04%
Conversion time	It depends on the configuration of the analog input. See section Conversion times if present [3)]
Isolation	1000 Vrms

[1)] Also connected to 2-wire terminals with jumper
[2)] Temperature calculated by software
[3)] The sampling time of the device must be equal or higher than the conversion time

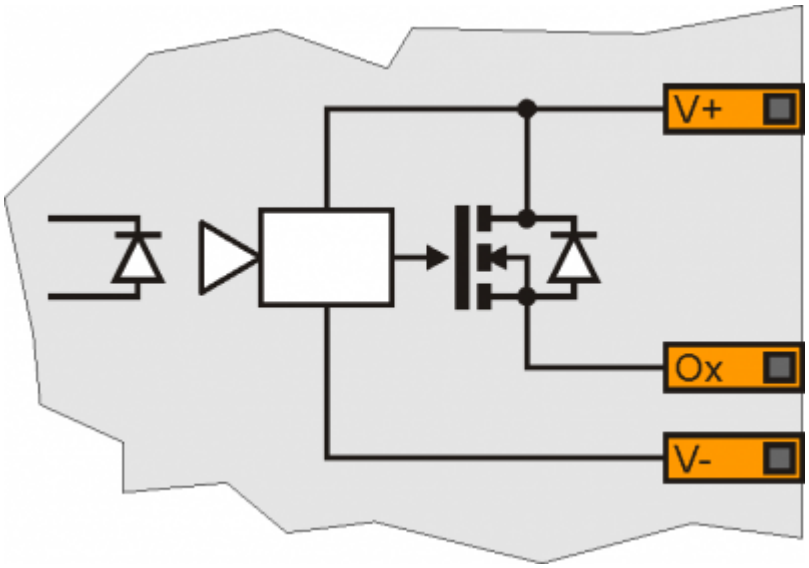
4.12.6 Termocouple analog input configuration

Sensor type	Thermocouple type J,K,R,S,B,N,T,E [1)]
Type of measure	Differential voltage
Resolution	16 bit
Measuring range	±156.25 mV
Measure for cold junction compensation	Integrated
Input resistance (Rin)	15 MO
Value of damage	30V
Measurement accuracy	± 0,2% (excluding cold junction compensation)
Conversion time	It depends on the configuration of the analog input. See section Conversion times if present [2)]
Isolation	1000 Vrms

[1)] J and K only supported by SW. Contact QEM for the support of the other sensor types.
[2)] The sampling time of the device must be equal or higher than the conversion time

4.13 Protected digital outputs

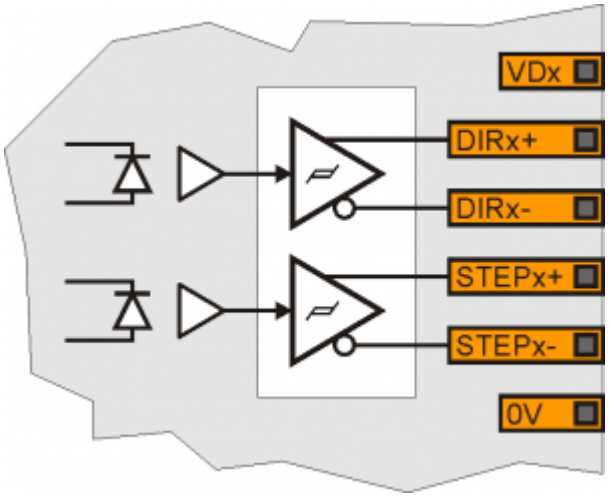
Switchable load	Dc (PNP)
Max. operating voltage	28V
Insulation	1000Vpp
Max. internal voltage drop	600mV
Max internal resistance @ON	90mΩ
Max. protection current	12A
Max. operating current	2A
Max. current @OFF	5µA
Max switching time from ON to OFF	270µs
Max switching time from OFF to ON	250µs



4.14 Stepper outputs

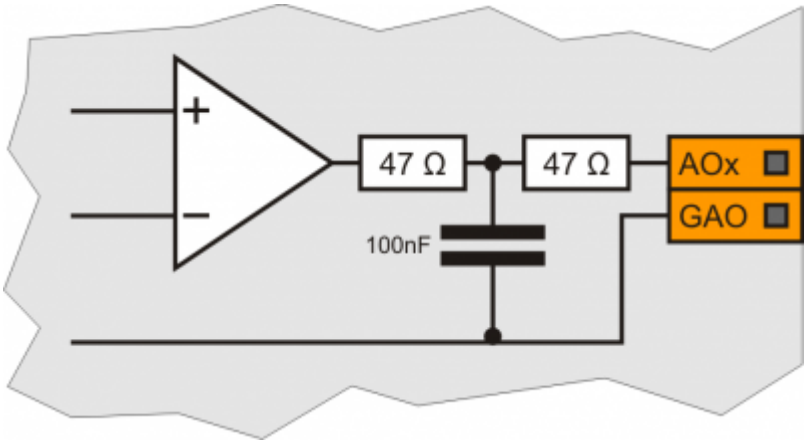
Type of polarisation	Push-Pull / Line-Driver
Max output frequency	200KHz
Insulation	1000Vpp
Max. operating current	20mA
Max. voltage	24Vdc[1)]

[1)] Selectable via jumpers: 5V e 12V supplied by the instrument, 24V supply from outside to the terminal VDx



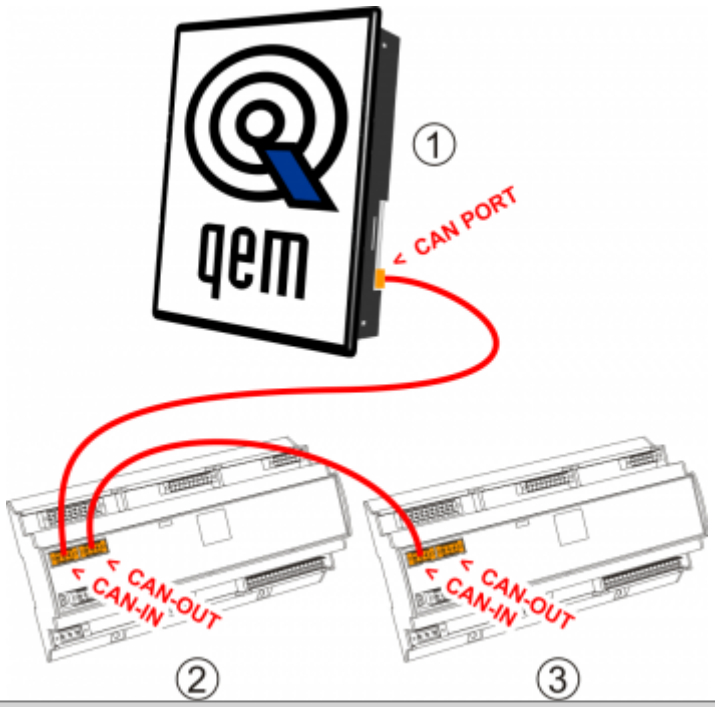
4.15 Analog outputs

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



5. Connection examples

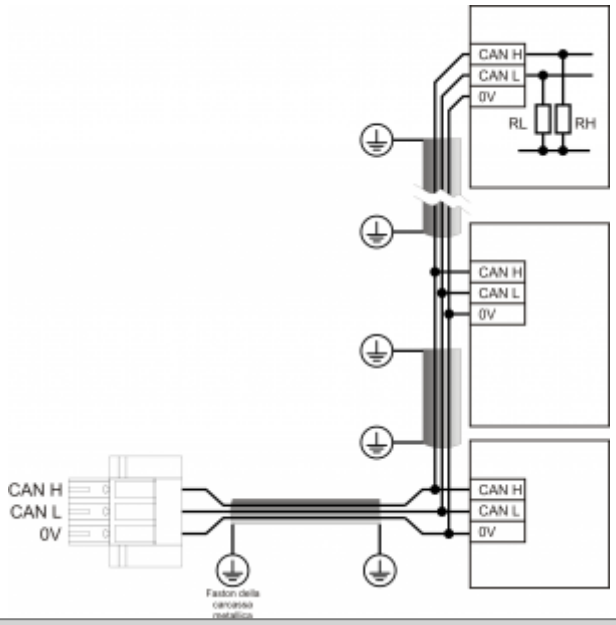
5.1 CANbus



	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.**

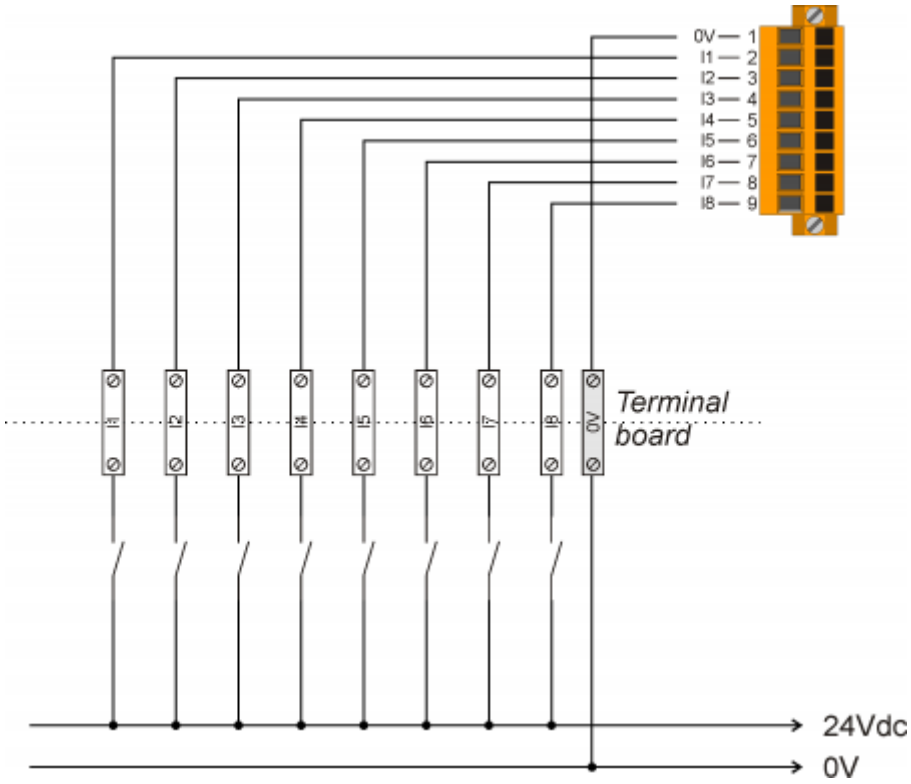
.

	To activate the internal termination resistance see paragraph Setup of CAN1 and CAN2 PORT Termination resistances

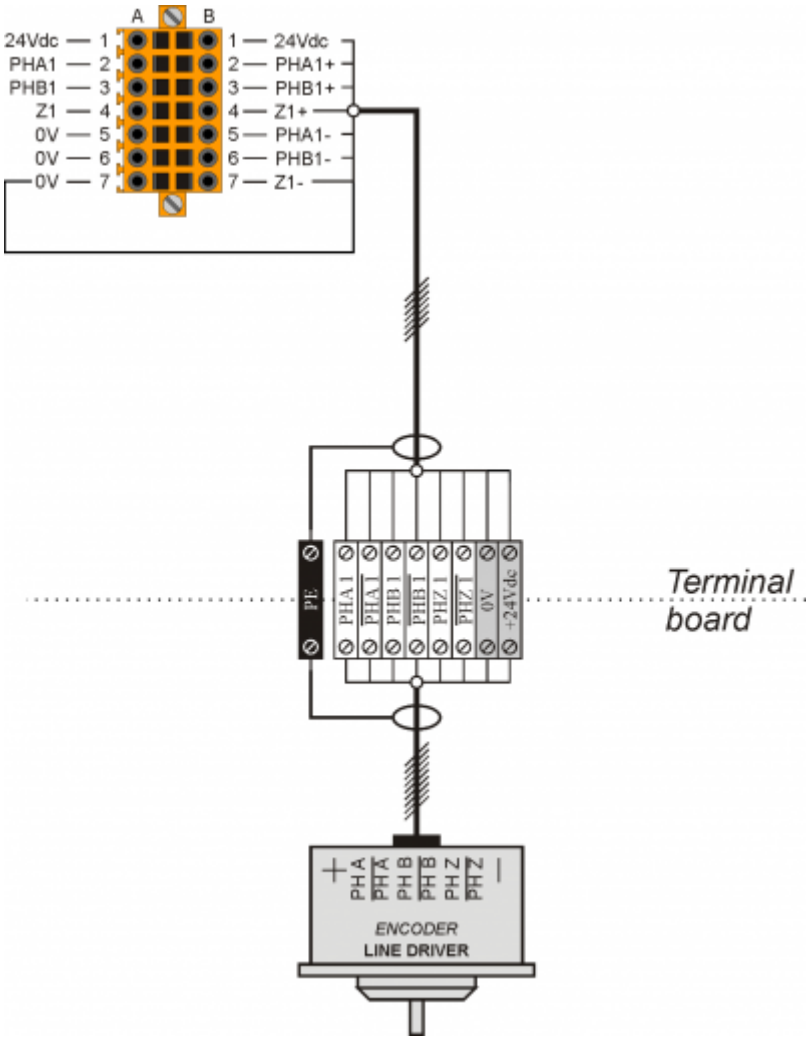


	Caution: close the DIP JP1 and JP2 and insert the terminating resistors (RL, RH) on the last device in the chain.

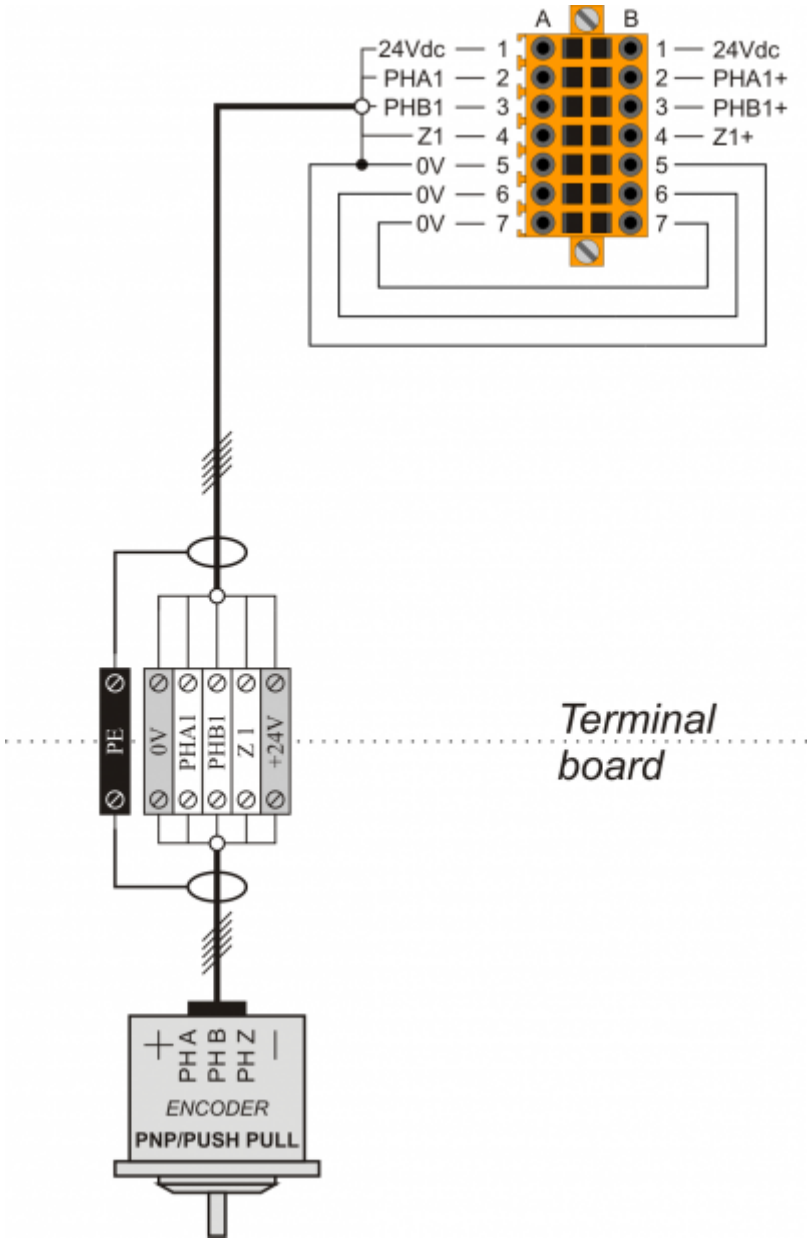
5.2 Digital inputs



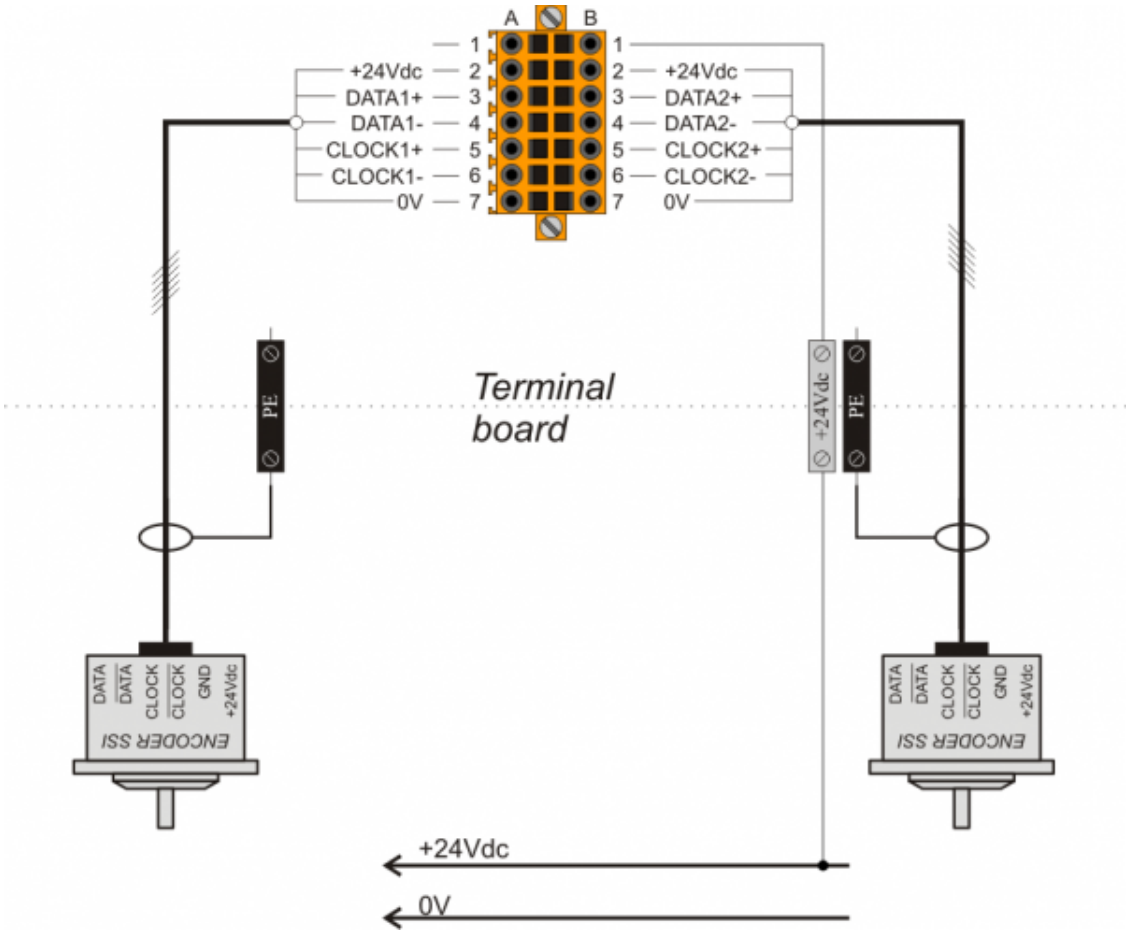
5.3 Line Driver counter inputs



5.4 PNP / Push Pull counter inputs

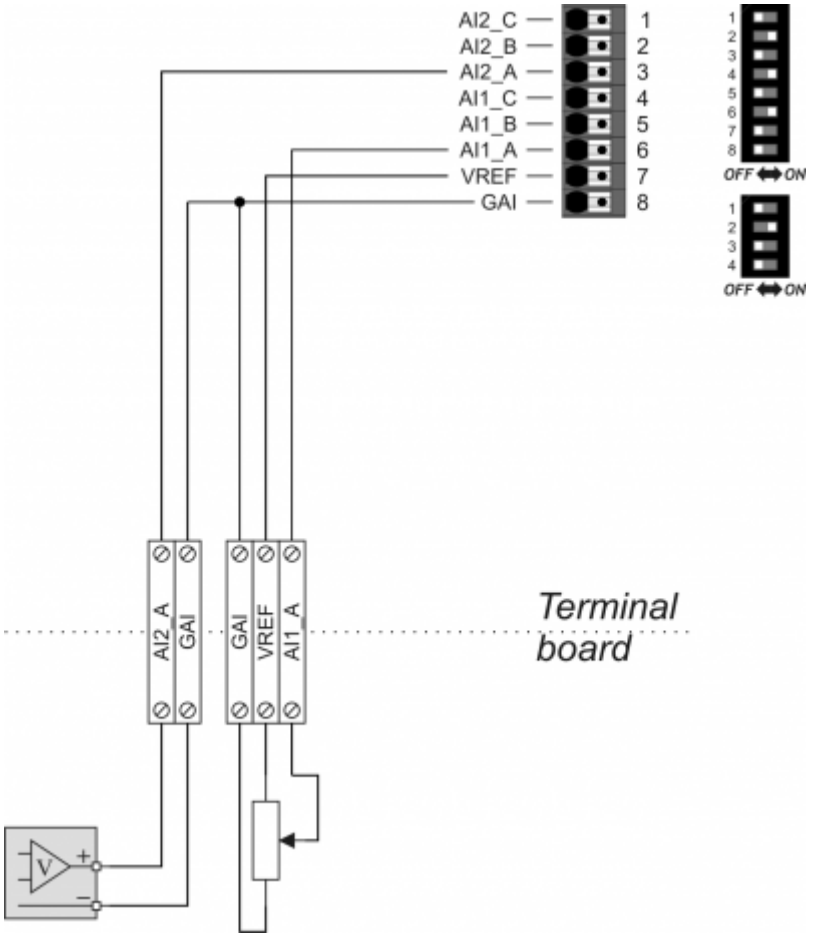


5.5 SSI absolute counters

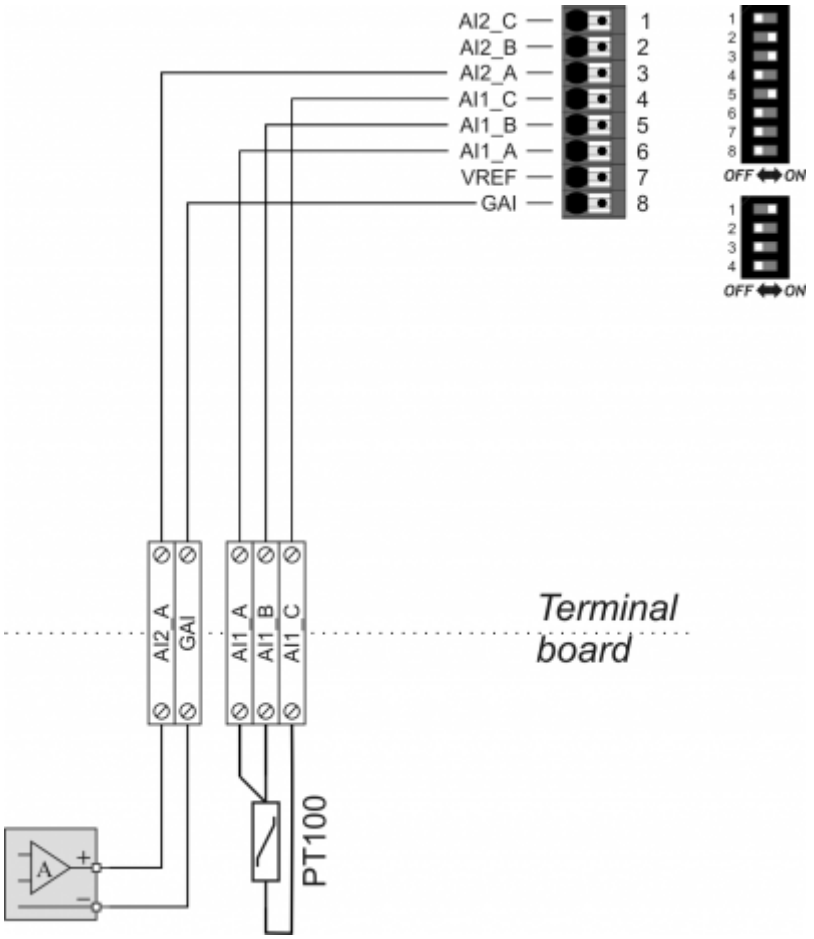


5.6 Analog inputs

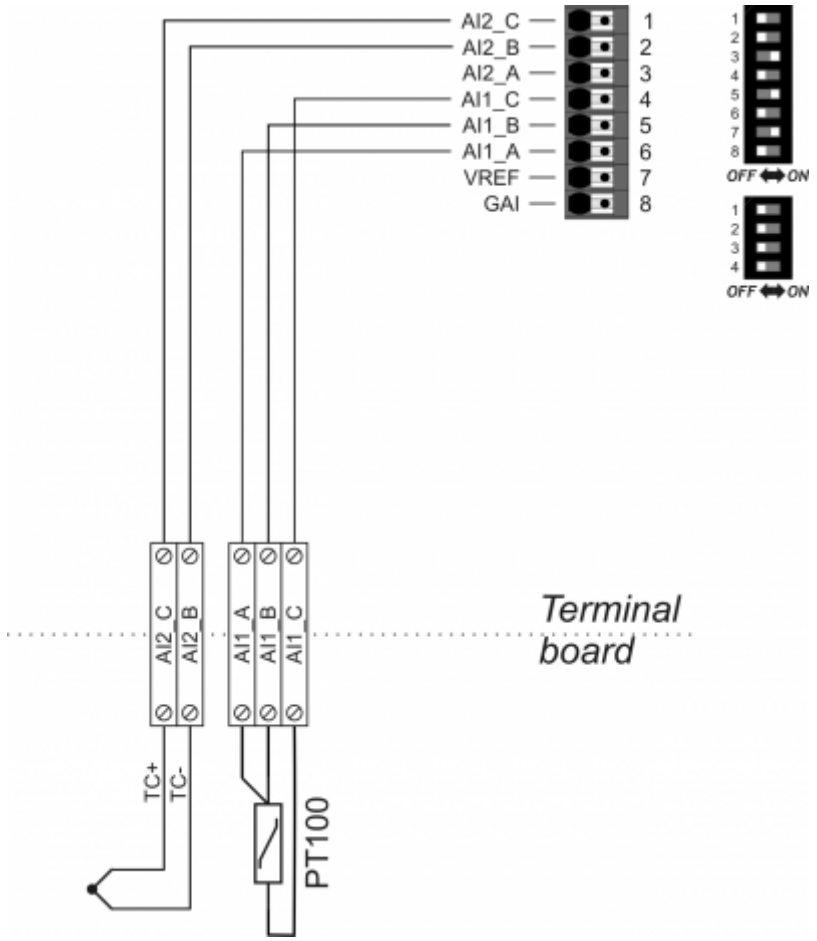
5.6.1 Potentiometric input 1 and voltmetric input 2



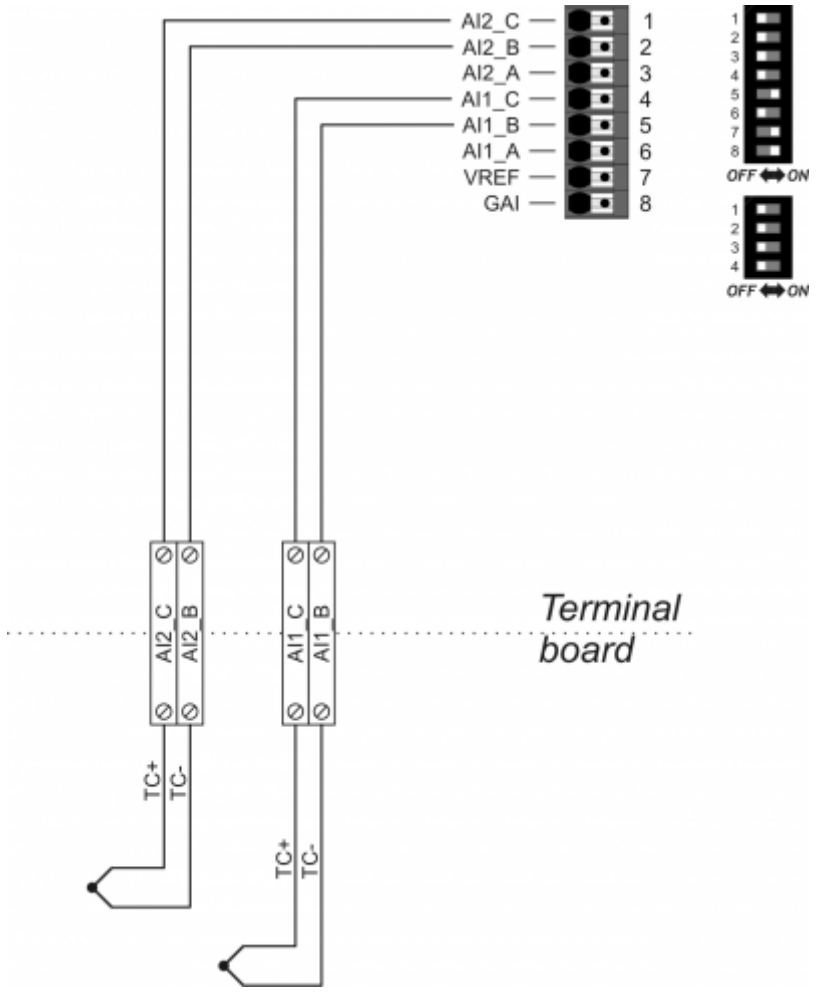
5.6.2 PT100 input 1 and amperometric input 2



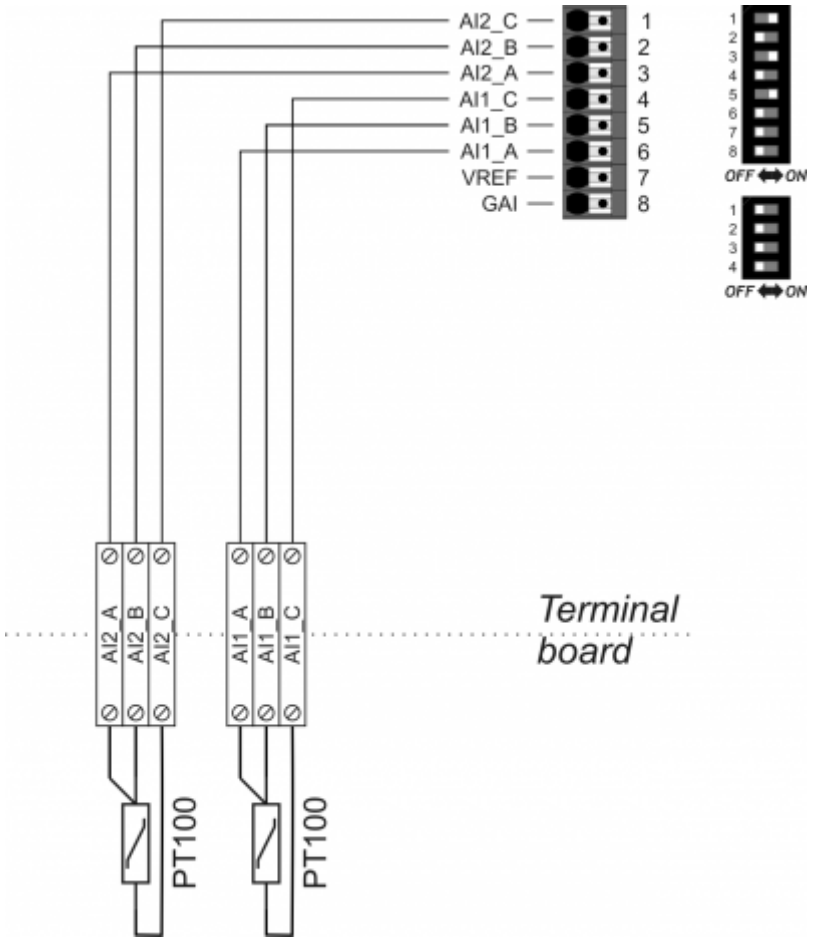
5.6.3 PT100 input 1 and termocouple input 2



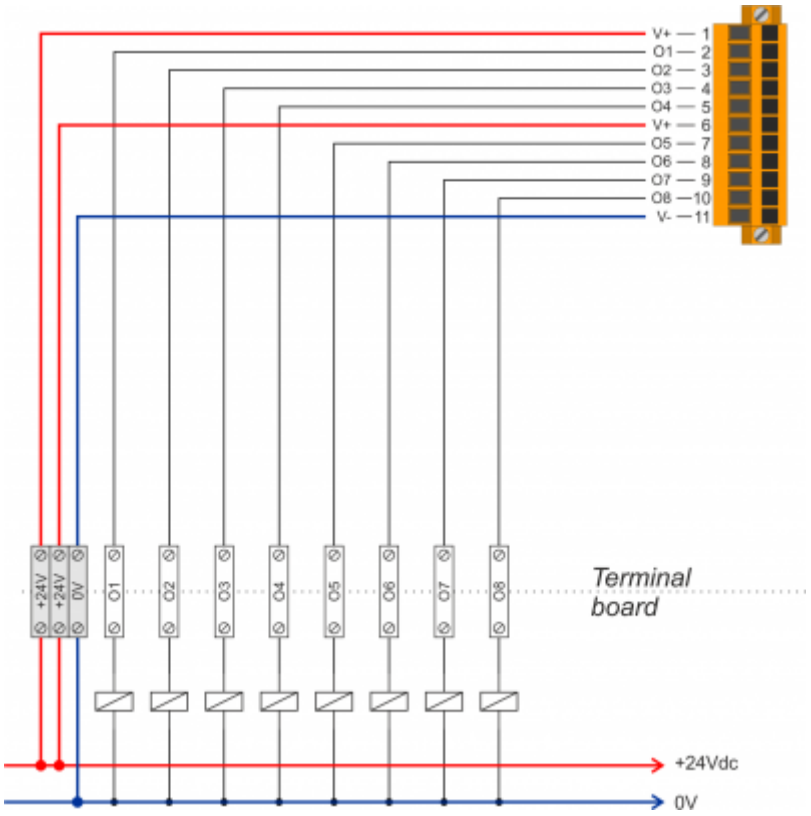
5.6.4 Termocouple inputs 1 and 2



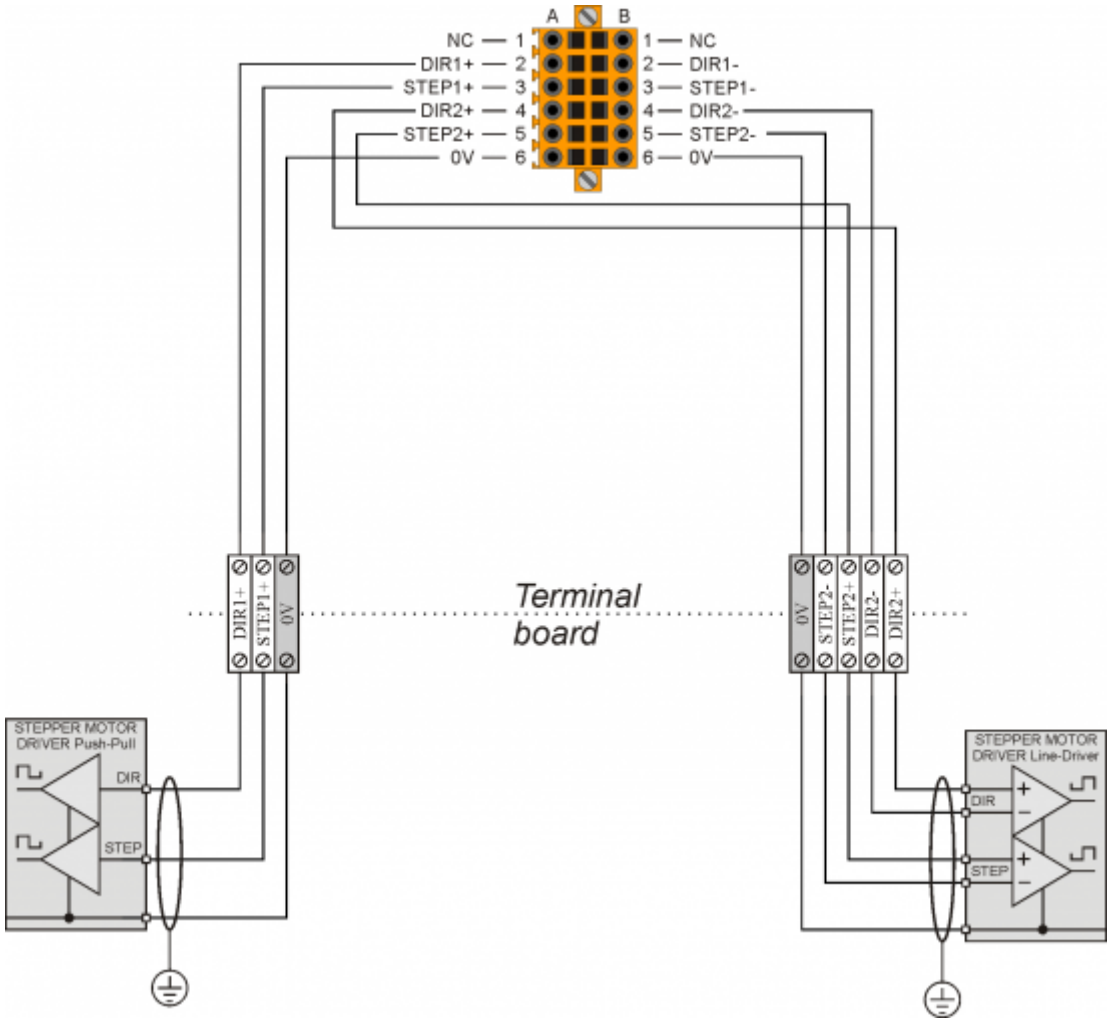
5.6.5 PT100 inputs 1 and 2



5.7 Protected digital outputs

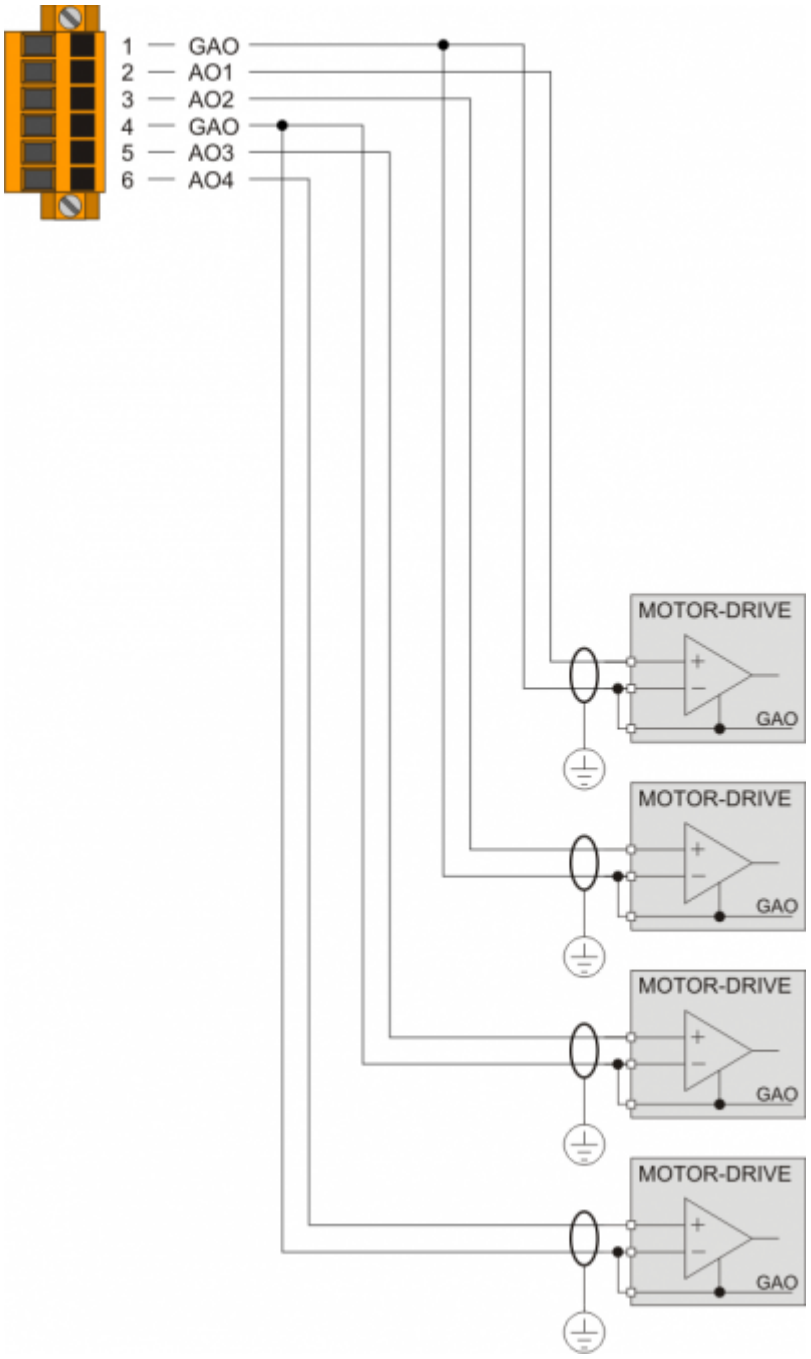


5.8 STEP - DIRECTION outputs

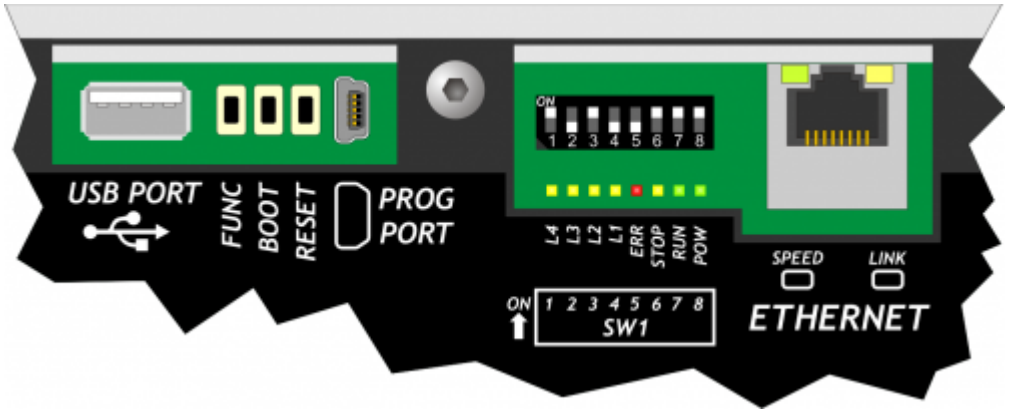


Example with Push-Pull Output 1 and Line-Driver Output 2

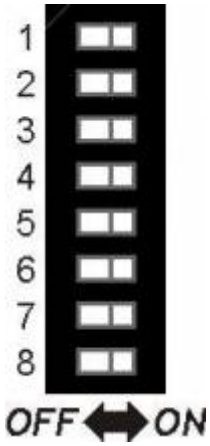
5.9 Analog outputs



6. Settings, procedures and signals



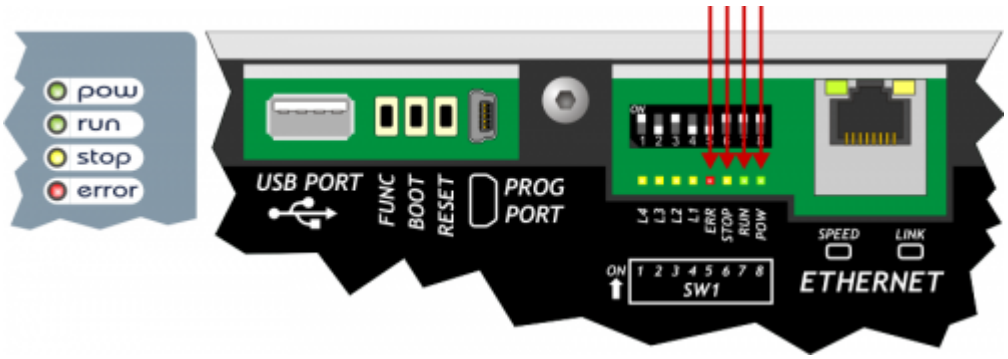
6.1 Settings, procedures and signals

SW1	Dip	DIP Settings				Function
	1	OFF	Baud-rate 57600			PROG PORT transmission speed selection
		ON	Baud-rate 115200			
	2	OFF	Baud-rate 57600			USER PORT transmission speed selection
		ON	Baud-rate 115200			
	3	OFF	Can also be used by SERCOM and MODBUS device			PROG PORT function mode selection
		ON	Cannot be used by SERCOM and MODBUS device			
	4	OFF	ON	OFF	ON	Valid if in the CANOPEN device declaration is set the speed to 0)]
	5	OFF	OFF	ON	ON	
		Baud-rate 125KB/S	Baud-rate 250KB/S	Baud-rate 500KB/S	Baud-rate 1MB/S	
	6	OFF	MMC/SD			External media device selection on the system functions
		ON	USB			
	7	Reserved. Leave OFF				
	8	OFF	PROG PORT normal			Select the USER PORT as PROG PORT[1)]
		ON	PROG PORT on the USER PORT connector			

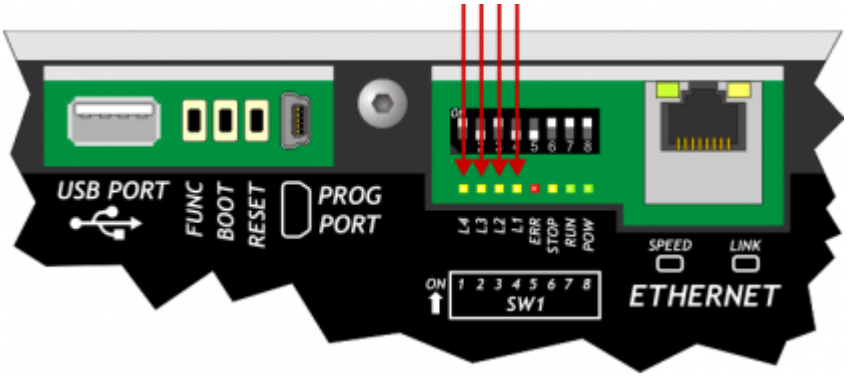
[1)] It's possible to use the connector of the USER PORT as PROG PORT with RS232 electric standard. The mini-USB PROG PORT connector is unplugged (USER PORT electric standard setting). **For this function is necessary to set at OFF the dip 6 of the SW2.**

6.2 Led

The system leds **„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 leds **„L1, L2, L3** e **L4“** are found on the rear:



“System Leds” Signals

Leggend:


Led ON


Led OFF


Led Blinking

Led	Colour	Status	Description
pow	Green		Power on
			Only this led on, signals the CPU reset status
run	Green		CPU in RUN status
			CPU in READY status
stop	Yellow		With **pow** on, signals the STOP status of the CPU With **pow** off, signals the BOOT status of the CPU
err	Red		With **pow** off, signals a hardware error. See paragraph Hardware Error codes With **pow** blinking, the flash rate gives the type of error. See paragraph **err** led signals

Err led signals

N. flashes	Error	Description	Recommended action
1	**Bus error**	Bus configuration different to 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**	Negative outcome on the integrity control of retentive variables . (see Reset Error Checksum)	Restore the machine data from a backup (.DAT file) or cancel the error with in system functions and enter the values manually.
3	**Index Out of Bound**	An array index is pointing on an inexistent element	Open a unit editor in Qview development environment and use the „Edit→Go to PC“ command to find the program line that is cause of the error. In general the index value has a value <1 or >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.

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.

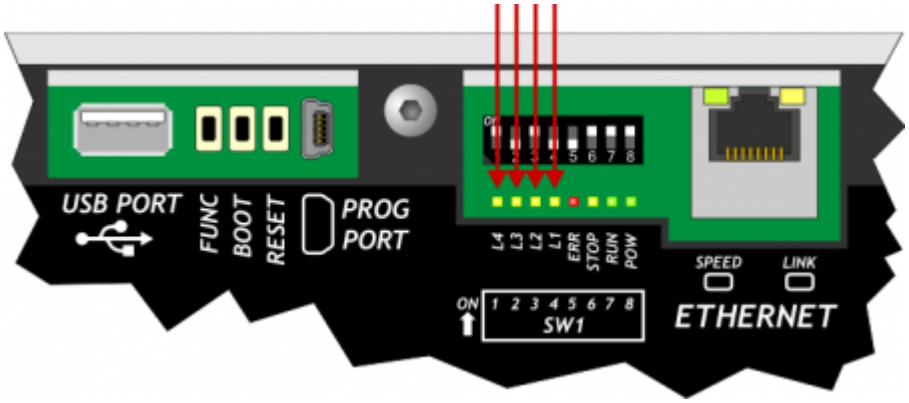
The number of flashes indicates the type of error according to the following table :

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

.

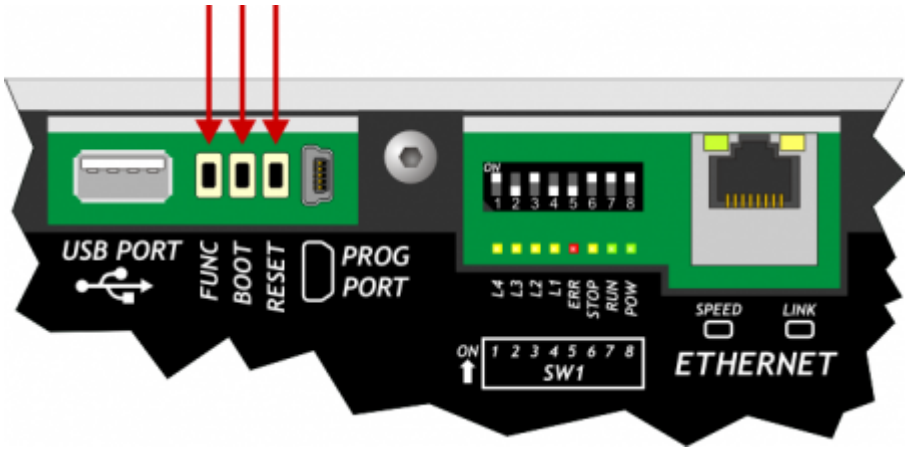
Each of these signals indicates a serious error situation. The product must be sent to the QEM aftersales service.

“User Led” signal



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

6.3 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

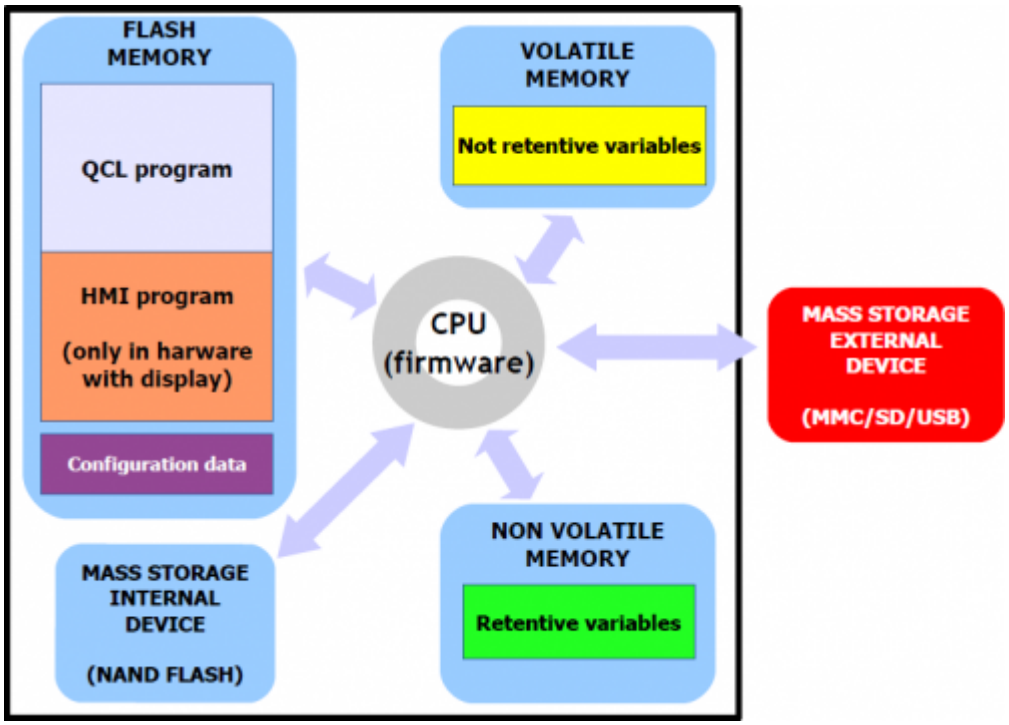
7.1 Foreword

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 Organizing 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:

„Flash 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, the touch-screen calibration settings, the ethernet communication configuration data (IP address, etc...), etc.

„Non volatile 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 memory“, which stores:

- **Not retentive variables:** the group of variables that is set to 0 at each startup (e.g. GLOBAL, ARRGBL, etc).

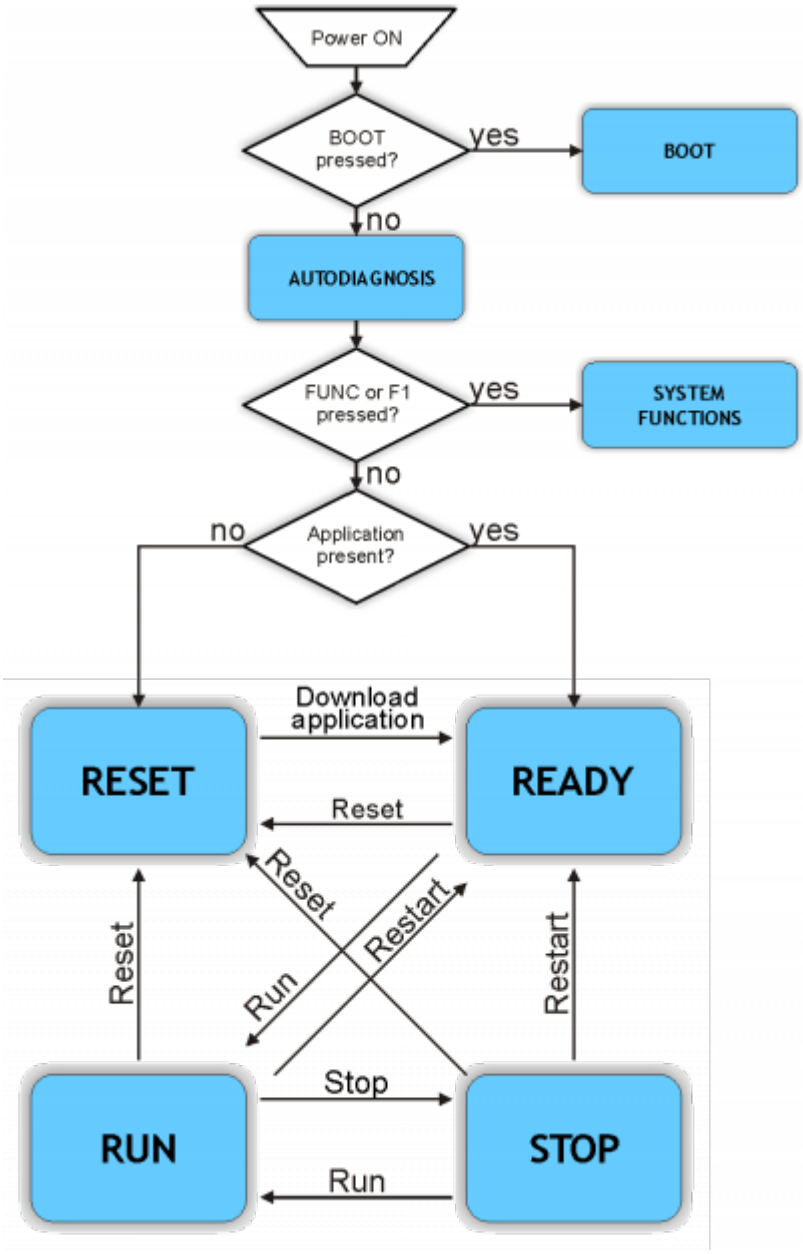
The volatile data memory is also used as dynamic memory. i.e. the memory used by the firmware for internal operations and active HMI screen management.

„Mass storage internal device“ 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).
It 'also used to store the backup of the application QMOVE and other service files.

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

7.3 CPU states

The CPU has several operating statuses. The figure below shows the main status changes from the controller startup.
The main operating 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.



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

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  or for the **F1** key  to be pressed to continue the boot procedure.

If not provided with a display, 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 controller, if provided with a display, shows the message„PLEASE TURN OFF AND TURN ON THE SYSTEM“ and remains in this state until you turn off. If the controller is not provided with a display, the led **err** flashes continuously.

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. deletion of application), therefore it is highly recommended that they are performed by qualified experts.

The system functions are speficic 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.

All the system functions are listed below.
DEVICE indicates an external storage media. MMC / SD or USB for hardware that they have the port.

System Functions

n.	Led ON	System Functions	Description
1	L1	01 - Reset Error Checksum	Reset checksum error. NOTE: if the checksum error is present, the led L1 flashes.
2	L2	02 - Copy all files DEVICE → NAND	Copy all files from DEVICE to NAND Flash memory.
3	L1 L2	03 - Copy all files NAND → DEVICE	Copy all files from NAND Flash memory to DEVICE.
4	L3	04 - Application delete	Delete the application.
5	L1 L3	05 - Application upload from DEVICE	Upload the application from DEVICE.
6	L2 L3	06 - System Settings	***Not implemented for this hardware***

n.	Led ON	System Functions	Description
7	L1 L2 L3	07 - Downl. retentive data to DEVICE	Save the retentive data on DEVICE.
8	L4	08 - Set NEW Password	***Not implemented for this hardware***
9	L1 L4	09 - Remove all files from NAND Flash	Cancel all files stored on the NAND Flash memory.
10	L2 L4	10 - Show NAND Flash files	***Not implemented for this hardware***
11	L1 L2 L4	11 - Touch Calibration	***Not implemented for this hardware***
12	L3 L4	12 - Set Ethernet communic. parameter	***Not implemented for this hardware***
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	Run the restore of the QCL application, data and HMI application from NAND memory.
15	L1 L2 L3 L4	15 - Firmware Upgrade	Run the firmware upgrade from DEVICE. Available only in some hardware.

*Note: To exit system functions press the keep the **FUNC** button for at least two seconds.*

7.4.1 Access to system functions

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

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

	**Use 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 BOOT button for 2 seconds to execute the selected function.** **The POW led starts flashing to indicate that the selected function is being executed.**

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

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

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

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

7.4.2 Description of the functions

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 nonvolatile 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 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

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

The backup procedure creates a copy of the QCL application 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

The procedure performs the following steps:

- Check the presence of the QCL application.
- Create and write in NAND the QCL application backup file: **applic.qcy**.
- Check the presence and validity of retentive data of the QCL application.
- Create and write in NAND the retentive data backup file of the QCL application: **appdat.qcy**.
- Procedure end and system reboot.

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

The procedure :

- The NAND backup file of the QCL Application is read: **applic.qcy**.
- The NAND backup file of the QCL Application retentive data is read : **appdat.qcy**.
- Procedure end and system reboot.

Upgrade the firmware of the instrument through the external storage device MMC/SD or USB.

In the external storage device MMC / SD or USB must be present the following file:

- **firmware.a21**

The procedure performs the following steps:

- Check the presence of the MMC / SD or USB.
- Firmware Update.
- Closing the file and end operation.
- Automatic restart of the instrument.

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 for programming

In this chapter are collected all the product information for programming.

7.5.1 Development suite

The product programming requires the Qview-6 environments to program the QCL code and if the product has a graphic display, also the QPaint-6 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 (in „Support“ section).

The contoller has 3 slots. The slots 4 to 32 can be declared and must be used to address recources installed in the Canopen modules.

To use the terminal in a product that has a display, you must declare under INTDEVICE the device MMIQ2.

```
INTDEVICE
   Hmi  MMIQ2    2
```

To program with the QPaint-6 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.

Example of a statement of the BUS to use on the BUS unit's configuration:

```
BUS
   1    1R44F    10
   2    1QM4F    .
```

The firmware versione must coincide, and if available, the specialization card name to the 3 slot must be correct. See the dedicate section.

Memories used

This paragraph looks at how to measure an estimate of use of the product's memories. The **non volatile memory** is available to memorise the **QCL** program and has a capacity of 1MB.
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 **non volatile 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.

7.5.2 Communication ports

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

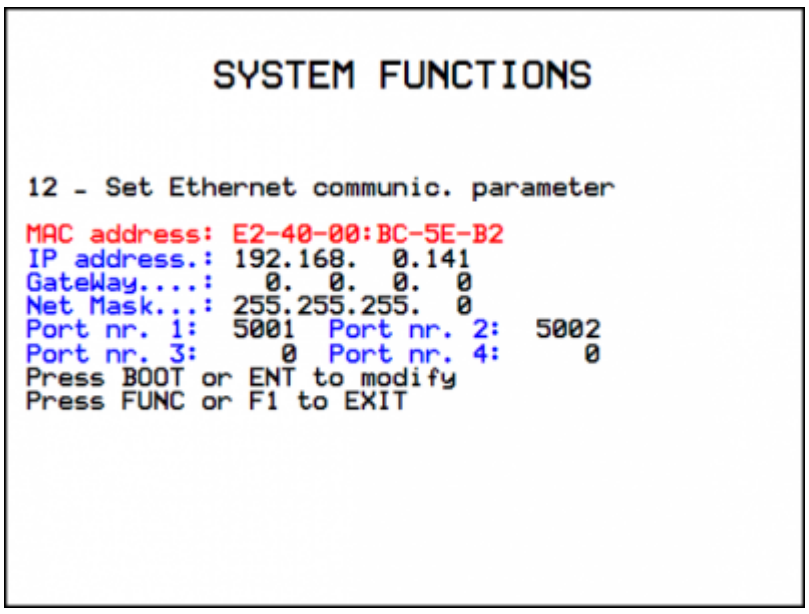
The SERCOM and MODBUS devices can be used with all communication serial ports including PROG PORT. Use the following number settings during the device declaration to select the communication channel:

```
  0     PROG PORT
  1     USER PORT
  2     AUX1 PORT
  3     AUX2 PORT    (if available for this hardware)
```

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 3.

When using the MODBUS RTU protocol on serial port AUX2 (if available in the hardware) with RS485 electric configuration, remember that when the serial port is transmitting, the controller maintains the channel (DE) active for a longer time than the „MODBUS RTU“ specification. To this must be consider a minimum time of 5 milliseconds after which it is possible to receive a new message. Also the SERCOM device, when it ends a transmission, has the same time the channel is active (DE).

The Ethernet communication port use the transport protocol TCP/IP, where the BIN1 protocol packets are encapsulated within TCP/IP data packets. There are two active connections identified by two communication ports can be freely set in the communication parameters of the Ethernet port. If the instrument is provided with a display, these values are displayed and modified using the system function *12 - Set Ethernet communic. parameter*. Other ways to view and set these figures can be realized through special programs available within the development environment (*QConfigurator-1* and *QConfigurator-2*).



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.

The Ethernet port can also be used to establish a communication type Modbus TCP/IP with other networked devices. In this case the channel that identifies the Ethernet port can be set by entering the number 43.

```
mdbs   MODBUS   2   43
```

The 3 channels of Ethernet communication port (two with BIN protocol and one MODBUS TCP/IP) can be active simultaneously.

7.5.3 Firmware message error

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.

L'ambiente di sviluppo mette a disposizione una serie di variabili predefinite che possono essere utilizzate precedendo al nome la parola chiave „QMOVE.“. Per esempio „QMOVE.is_suspend“, „QMOVE.sys001“, ecc. Lo scopo del presente paragrafo è illustrare le 16 variabili di sistema chiamate sys001÷sys016 il cui significato dipende dal firmware che si sta utilizzando.

sys001

Questa variabile a sola lettura indica lo stato dei pulsanti FUNC (bit 0) e BOOT (bit 1). I valori possibili sono dunque:
0 = nessun pulsante premuto.
1 = pulsante FUNC premuto.
2 = pulsante BOOT premuto.
3 = pulsanti FUNC e BOOT premuti.

sys002

Questa variabile permette la lettura dell'immagine del dip-switch SW1. L'immagine viene acquisita solo all'accensione del prodotto. Il bit 0 corrisponde al dip 1 e così via.

NB: Alcuni dip non sono collegati al microprocessore e quindi viene letto sempre al livello logico 0.

sys003

Questa variabile permette il comando del led L1-L2-L3-L4. Il bit 0 corrisponde a L1, il bit1 a L2 e così via.

sys004

Questa variabile permette l'impostazione del filtro anti-glitch ai segnali delle fasi nei contatori bidirezionali. Il valore è espresso in KHz e si riferisce alla frequenza del segnale di una fase. Il range di valori ammesso è 30÷220. Il valore impostato di default é 220KHz. La variabile può essere anche riletta. La modifica del filtro può essere fatta in qualsiasi momento.

sys005÷16

Non utilizzata.

7.5.4 The devices

The device term identifies a category of software capable of supporting and monitoring activities, more or less complex, to solve the automation

systems problems.
The list of implemented devices in the firmware depends from the firmware **version**.

The firmware version **10** include following device:

Device name	Minimum sampling time (msec)	Maximum sampling time (msec)	Execution time (%)
ABSCNT	1	250	8,31
ANINP	1	250	14,25
CALENDAR	-	-	0
CANOPEN	1	250	100
COUNTER3	1	250	5,94
DAC	-	-	0
DATASTORE	1	20	8,31
FREQ	1	250	4,75
MODBUS	1	250	32,07
QMOS	-	-	0
RECDATA	1	250	5,34
SERCOM	1	250	9,26

The firmware version **20** include also following device:

Device name	Minimum sampling time (msec)	Maximum sampling time (msec)	Execution time (%)
ANPOS2	1	250	8,31
EANPOS	1	250	55,94
HEAD2	1	250	23,75
OOPOS3	1	250	27,91

The firmware version **30** include also following device:

Device name	Minimum sampling time (msec)	Maximum sampling time (msec)	Execution time (%)
CAMMING3	1	250	55,94
INTERP	1	250	35,63

7.5.4.1 Features of the device

This section describes the additional information of the devices. This information complement and complete the maintenance manual of the device available on the Qem site. These are the information related to the implementation of the devices in this product.

7.5.4.1.1 CANOPEN

If in the device declaration CANOPEN viene indicata la velocità zero allora essa diventa impostabile tramite dip di SW1.
The first slot of the target resources that reside within the Canopen is the 4.
The firmware capture the input interrupt while this is located in a Canopen module.
You can enter the 2 value in the Declaration of the device on the relative sector to the port. This setting makes it possible for the startup of the QCL DS402 drives through a request (QDO number 10). This function is essential in cases where there are driver without enable input and the power supply logical is in common with main power supply. If the main power supply is turn off, the drive ot communicating in CANOPEN because also the logic section are turned off.

7.5.4.1.2 DATASTORE

The files used from the device DATASTORE are contain in the /DS folder. If this folder does not exist it is created automatically.
The DATASTORE device can can operate with MMC/SD or USB NAND memory inside the product (not removable). To define how your device used the parameter value priority (0=MMC/SD, 1=NAND, 2=USB). If your application needs to frequently access to the MMC/SD or USB device and do not require physical removal, you can use a particular priority parameter setting that avoids continually MOUNT UMOUNT devices. Before execute the UMOUNT command to set the “priority = -1”.

A QCL code example to change device may be:

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

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

Check for the existence of a file on the external memory. Do you use the “filenum” set to the -1 value and use the OPENFILE command. If you set again the -1 value in “filenum” and use the OPENFILE command will search for the name of the next file, and so on. Whenever we will use a different -1 value with OPENFILE the search loop filenum will be closes. When the search is complete and there will be no more files, then the device will response to the OPENFILE command “filenum = -2”. The successful execution of the command will be indicated by flag st_busy = 0. If the file extension is not HEX or CSV file itself is ignored by the search. In the case that the file name is not compatible with those managed by

DATASTORE (numbers from 0 to 9999999) then the “filenum” will remain set to -1 value and will report a warning.

The “disksize” and “diskfree” parameters are represented in KB.

7.5.4.1.3 RECDATA

The device can store 10000 step maximum.

7.5.4.1.4 QMOS

The “frwuvalue01” parameter contains the numeric value of the serial number of the product.
The “frwuvalue02” parameter contains the numeric value of the PN (Part Number).
The “frwuvalue03” parameter contains the numeric value of the hardware release.
The “frwuvalue04” parameter contains the numeric value of the VN (Vedi Nota).
The “frwuvalue05” parameter contains the numeric values of the QCL Level.

7.5.4.1.5 FREQ

To define the input associated to the device FREQ use the appropriate numeric field on the device. The availability of frequency inputs must be verified with the hardware version of the product. To derive the relationship between numerical value and terminal pin use the information in the “address” column in the tables in the illustration of the terminal.

7.5.4.1.6 CAMMING3

The parameters in the fields sector (CodeQm, CodeQs...) are not ritentive. At power-up they take always value 0.

8. Available accessories

- IQ009
- IQ013
- IQ011
- IQ016
- Connectors polarization Kit
- Front panel customization kit