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J1-K31-Fx BASE



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Information



Quality in Electronic
Manufacturing

Document:	MIMJ1K31FxBASE			
Description:	Installation and maintenance manual			
Drawn up:	Riccardo Furlato			
Approved	Gabriele Bazzi			
Link:	http://www.qem.eu/doku/doku.php/en/strumenti/qmoveplus/j1k31/mimj1k31fx_base			
Language:	English			
Release documento	Release Hardware	Descrizione	Note	Data
01	01	New manual	/	14/09/2011
02	02	New system functions backup / restore	Valid for firmware 1K31F-xx.5.5 and subsequent	28/11/2011
03	02	Version available online	/	09/01/2012
04	02	Made version "BASE" for this manual	/	23/02/2015
05	02	Added chapter "Operating Overview"	/	15/10/2015

The controller has been designed for industrial 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

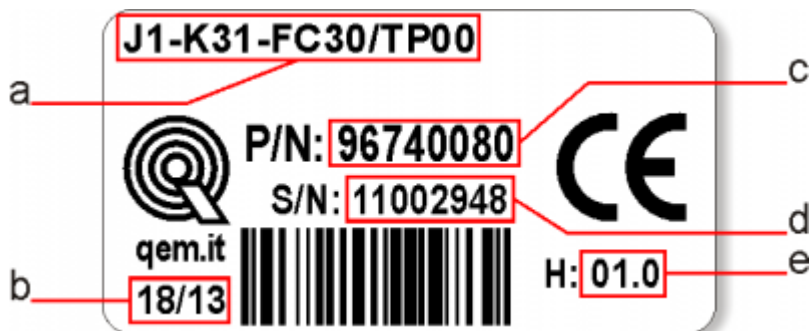
1. Description

J1-K31-F is a combined hmi + motion controller of the Qmove+ range.

1.1 Product Identification



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				Caratteristiche			
J1	-	K31	-	FA	10	/	TP01
							TP00 = Keypad Code (TP00 = pannel with resistive touchscreen , custom logo and function keys); TP01 = panel with resistive touchscreen, Qem standard logo and function keys
					10 = Firmware version (00 = not installed)		
				F = Technological level A = Hardware version			
		K = extended keyboard 3 = 7” LCD graphic display, TFT display-256 COLOUR-800x480px; front panel size (216x263mm); keypad 41 keys + 18 led; housing to DIN 43700; 1 = Firmware-hardware correspondence					
J1 = “HMI+PLC” Qmove family							

1.1.3 Hardware Versions

There are currently 6 hardware versions available:

		Hardware versions																			
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	W	Y	Z
SLOT 2 (Base card)	USER PORT (RS232, RS422, RS485)	1	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	1
	CAN2 PORT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ETHERNET PORT	-	-	-	-	-	-	1	1	-	1	1	-	1	-	1	1	1	1	1	1
	USB PORT ¹⁾	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SLOT 3 (Expansion card)	Standard digital inputs	-	16	24	16	24	24	16	16	32	32	32	32	32	32	32	32	16	-	24	24
	Fast digital inputs ²⁾	-	2	3	2	3	3	2	2	4	4	4	4	4	4	4	4	2	-	3	3
	12bit analog inputs	-	2	2	2	4	2	2	2	4	4	4	4	4	4	4	4	2	-	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	8	4	2	2	6	4	6	4	-	4	4
	Protected digital outputs	-	8	24	8	24	24	8	8	32	32	32	32	32	32	32	32	16	-	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	4
Expansion card software code declared in SLOT 3		-	1MG3F	1MG4F	1MG3F	1MG4F	1MG4F	1MG3F	1MG3F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG8F	1MG5F	-	1MG4F	1MG4F

^{1), 3), 4)} option not currently enabled

²⁾ the rapid inputs can be used as frequency meters in the "FREQ" device

⁴⁾ 4 uscite solo Push-Pull

1.1.4 Expansions card manuals

- [1MG3F rel.02](#)
- [1MG4F rel.01](#)
- [1MG5F rel.01](#)
- [1MG6F rel.01](#)
- [1MG8F rel.01](#)

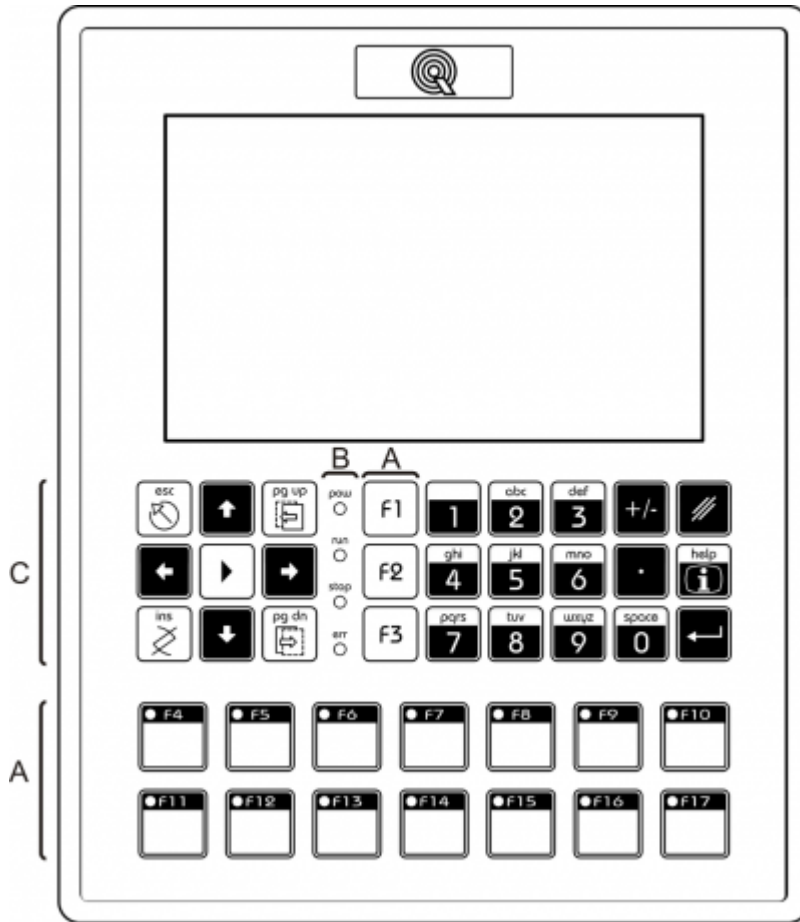
1.1.5 Firmware Versions

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

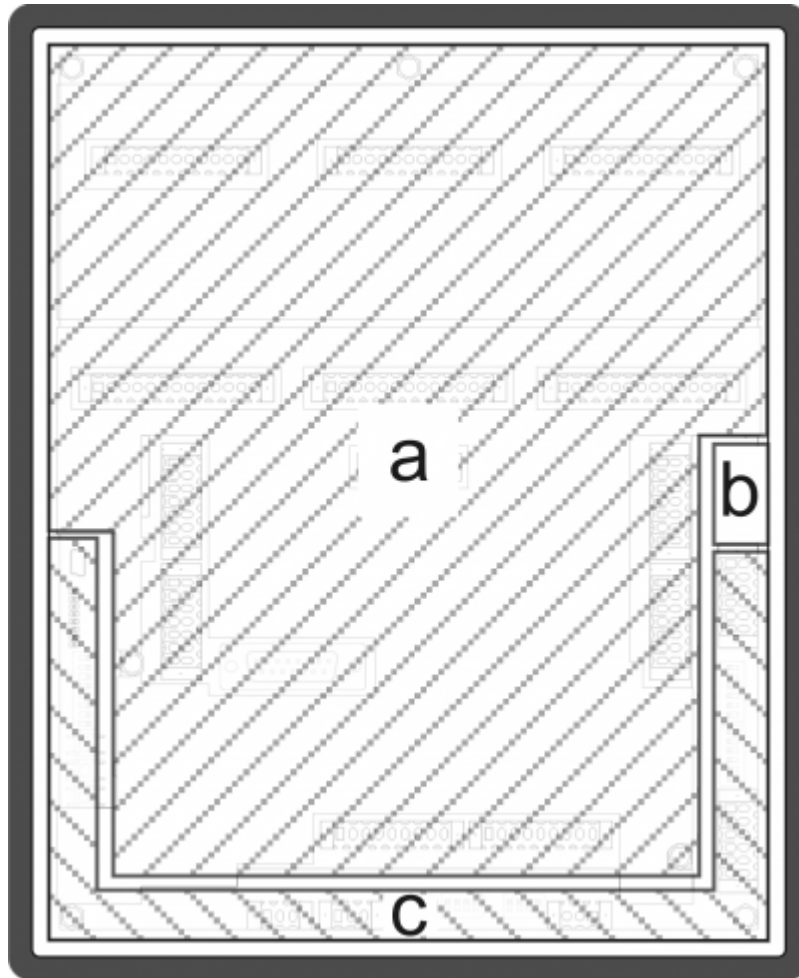
1.2.1 Front Panel



- A) Function keys and led's
- B) System led's
- C) Keyboard

1.2.2 Back terminal blocks

J1-K31-F has a specialist card.



- **a** = Expansion card
- **b** = Power connector on Base card
- **c** = Base card

2. Technical features

2.1 General Features

Weight (full hardware)	1,8Kg
Housing	Sheet metal
Front panel	Aluminium
Outer Frame	Noryl autoestinguente
Display	LCD LCD TFT-256 COLOURS-800 x 600px
Touch screen	4-wire Resistive
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% condensate free
Altitude	0 - 2000m a.s.l.
Front protection rating	IP64

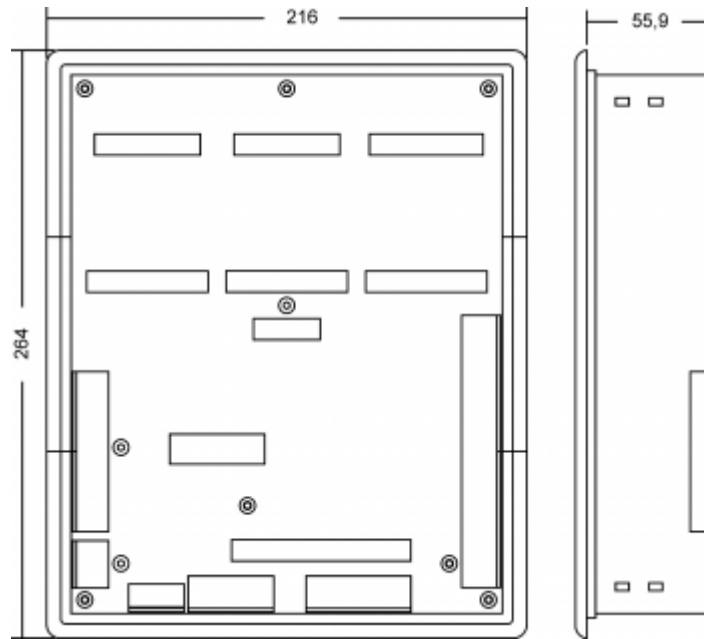
2.2 CPU (F level technology)

RISC Microprocessor (32 bit)	
Work Frequency	200MHz
RAM	16MB
Flash	8MB

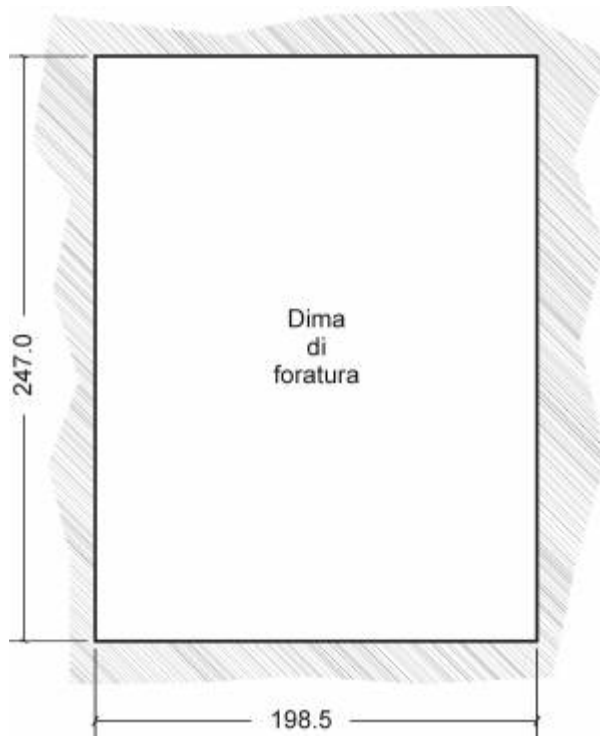
2.3 Dimensions



Quote in mm.

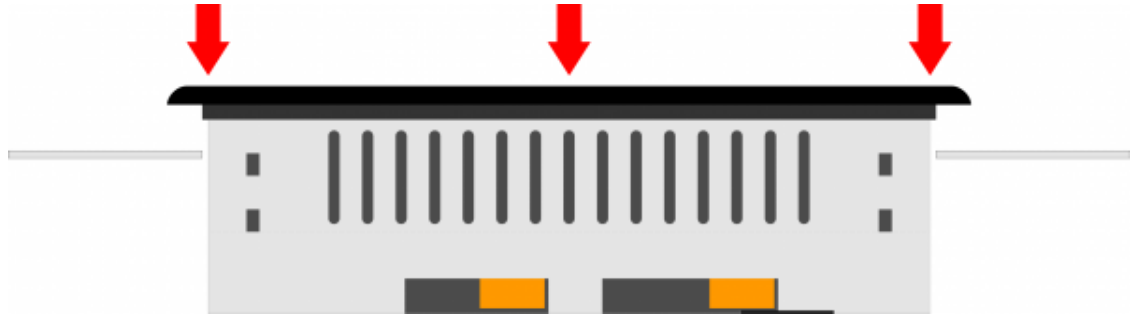


2.4 Hole template



2.5 Installation

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.

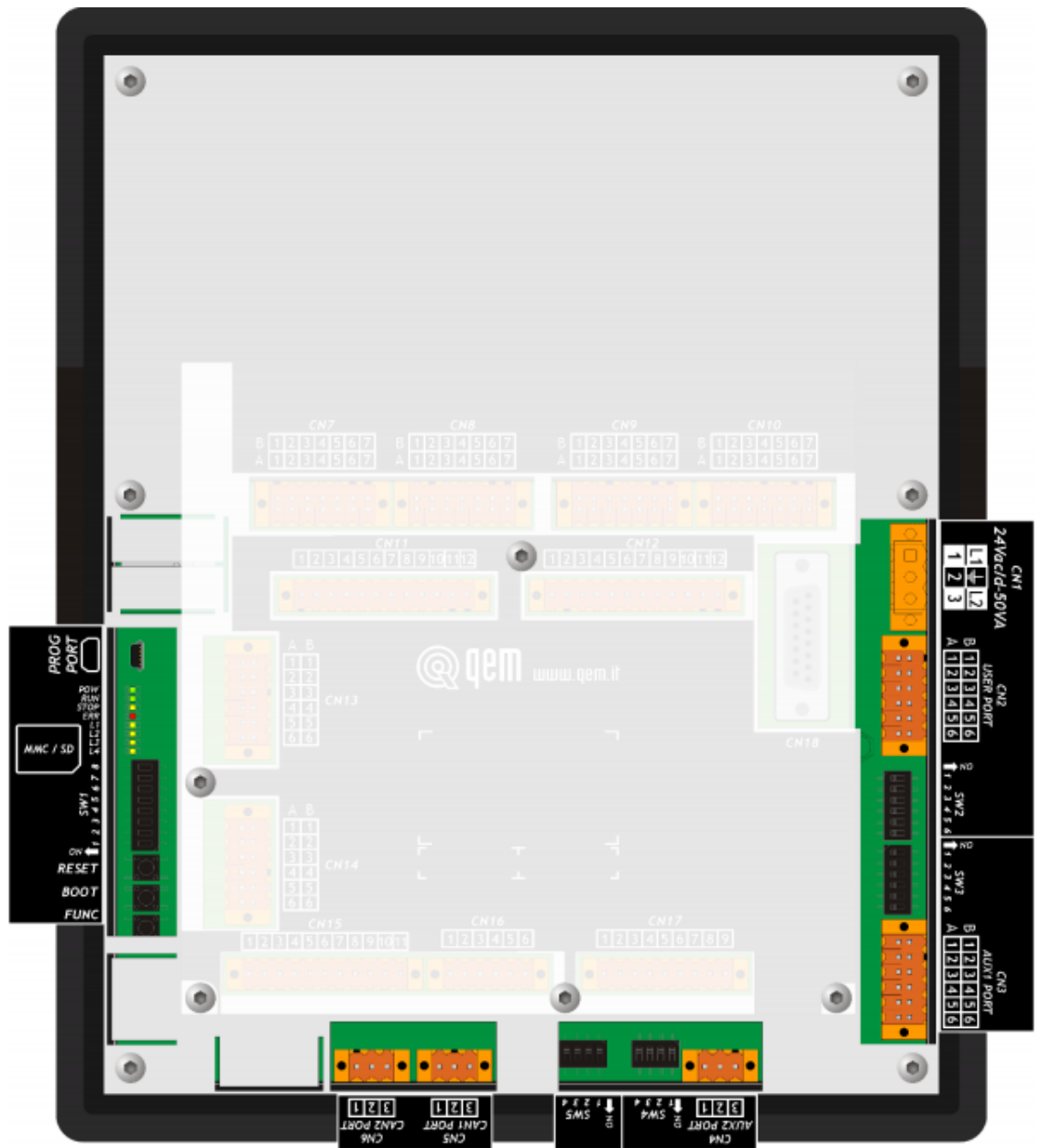


Warning: after putting the pin of fixing, do only half rotation to not tear the frame!

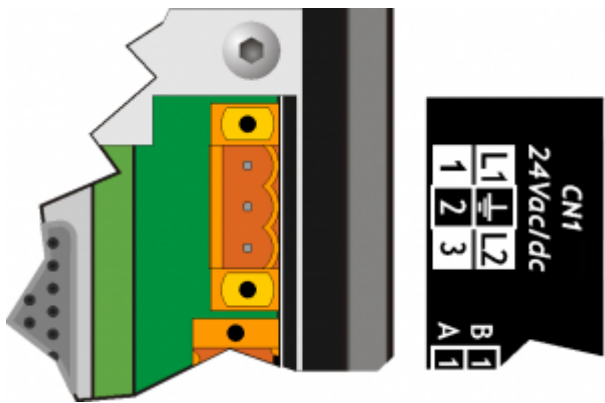
3. Base card wiring



For details about cable sections and connectors, see application note [AN021](#)

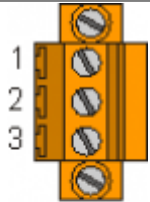

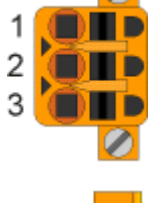


3.1 Power Supply


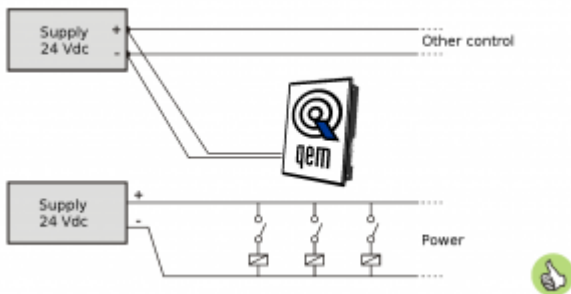
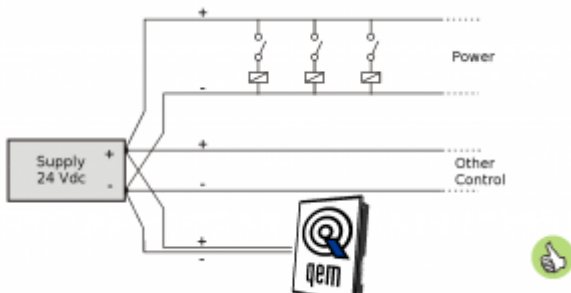


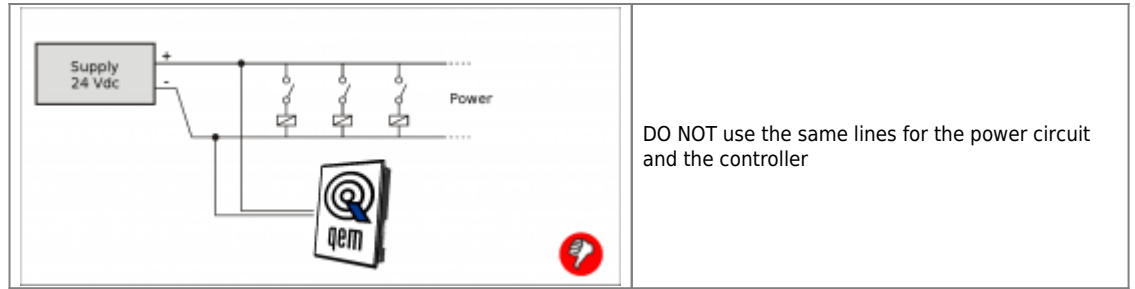
The cabling must be carried out by specialist personnel and fitted with suitable anti-static precautions.
Before handling the controller, disconnect the power and all parts connected to it.
To guarantee compliance with EC regulations, the power supply must have a galvanic isolation of at least 1500Vac.

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



3.2 Serial Port Connections

3.2.1 PROG PORT

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

3.2.2 USER PORT

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

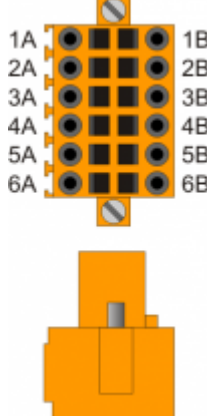
Setup of USER PORT electric standard

SW2	Num. Dip	Name DIP	Setting of DIP			Function
1	1	JP2	ON	X ¹⁾	X ²⁾	Termination RS485
2	2	JP3	ON	X ³⁾	X ⁴⁾	Polarization RS485
3	3	JP1	ON	X ⁵⁾	X ⁶⁾	
4	4		OFF	ON	OFF	Selection of USER PORT electric standard
5	5		ON	OFF	OFF	
6	6		OFF	OFF	ON	
ON ↔ OFF			RS485	RS422	RS232⁷⁾	

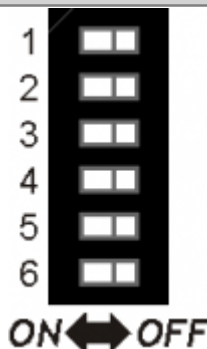
¹⁾ 1, ²⁾ 2, ³⁾ 3, ⁴⁾ 4, ⁵⁾ 5, ⁶⁾ 6 X = setting not significant

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](#)

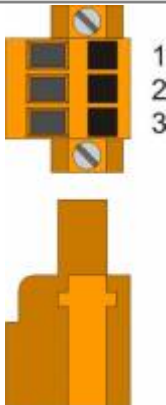
3.2.3 AUX1 PORT

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	

3.2.4 AUX2 PORT

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

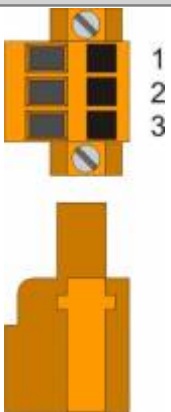
Setup of AUX2 PORT polarisation and termination resistances

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

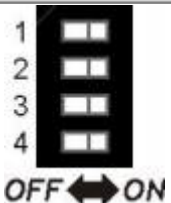
3) 2) 3) 4) 5) 6) X = setting not significant
7) X = setting not significant

3.2.5 CANbus PORT

Connectors

CN5-CAN1 PORT CN6-CAN2 PORT	Terminal	Symbol	Description
	1	0V	CAN common
	2	CAN L	Terminal CAN L
	3	CAN H	Terminal CAN H

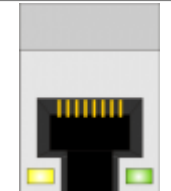
Setup of CAN1 and CAN2 PORT Termination resistances

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

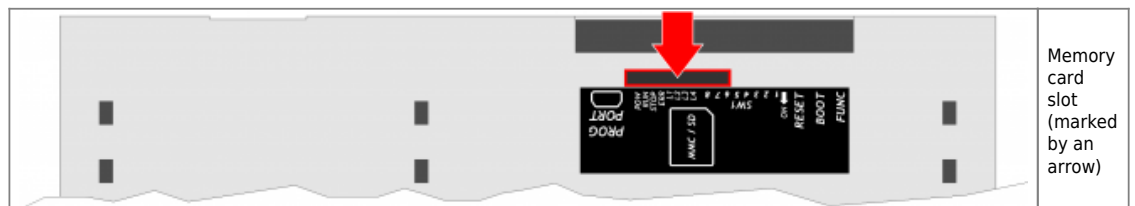


When activating the CAN1 port termination, set dip's JP1 and JP2 to ON.
When activating the CAN2 port termination, set dip's JP1 and JP2 to ON.

3.2.6 Ethernet

ETHERNET PORT	Description
	<p>Connector RJ45.</p> <p>LED:</p> <ul style="list-style-type: none"> * 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)

3.2.6.1 MMC/SD



Memory card slot (marked by an arrow)

4. Electric features

The electrical features 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".

4.1 PROG PORT

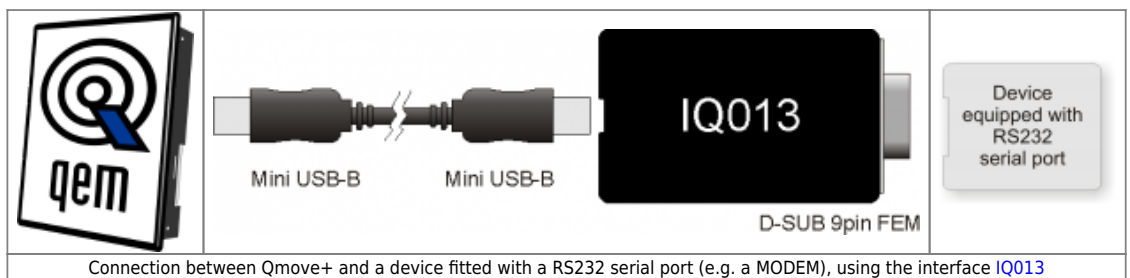
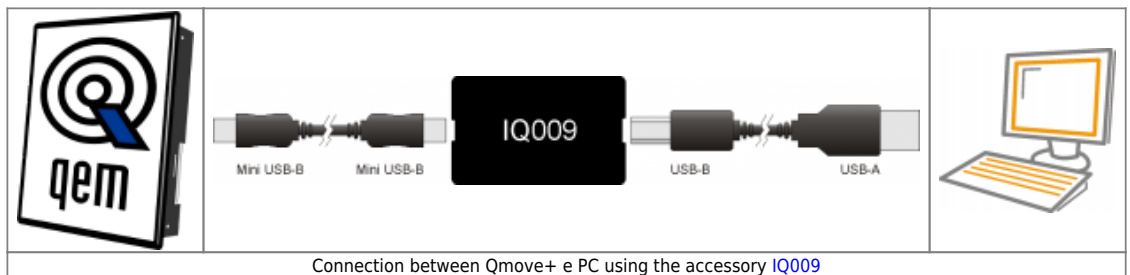
Connector for [IQ009](#) or [IQ013](#)



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

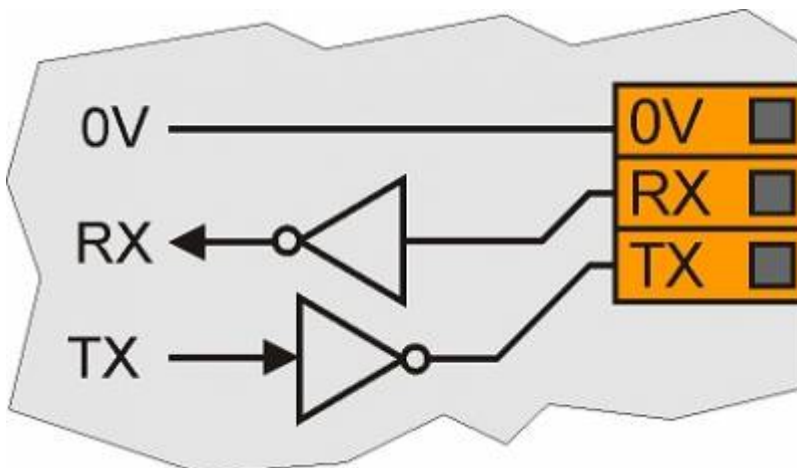
It is used for the transfer and debugging of the application program in the CPU.

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



4.2 RS232

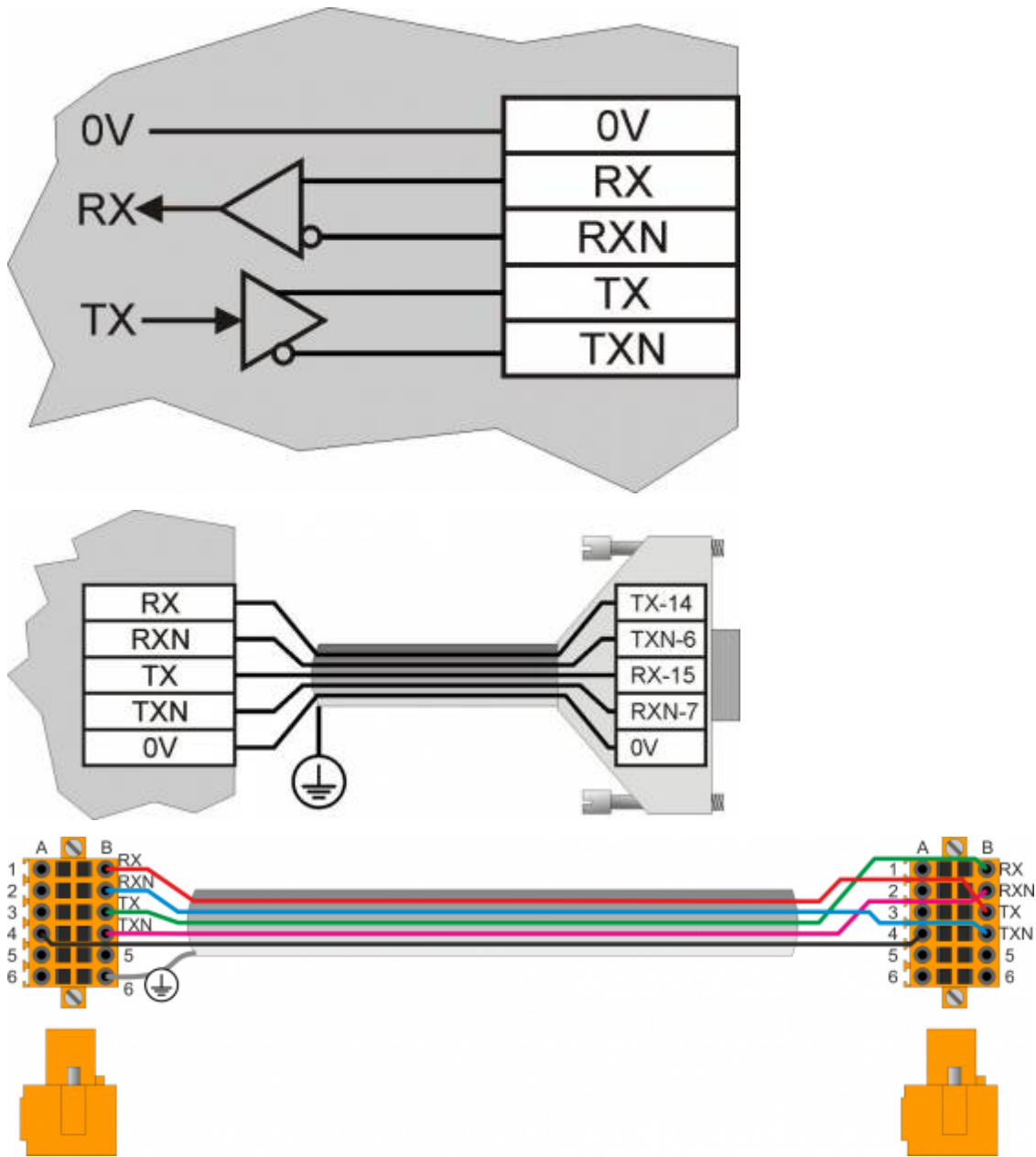
Communication speed	4800, 9600, 19200, 38400, 57600, 115200 baud
Communication mode	Full duplex
Operating mode	Referred to 0V
Max. number of devices connected on the line	1
Max. cable length	15 m
Input impedance	≥ 3 Kohm
Short-circuit current limit	7 mA





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 impedance	≥ 12 Kohm
Short-circuit current limit	35 mA

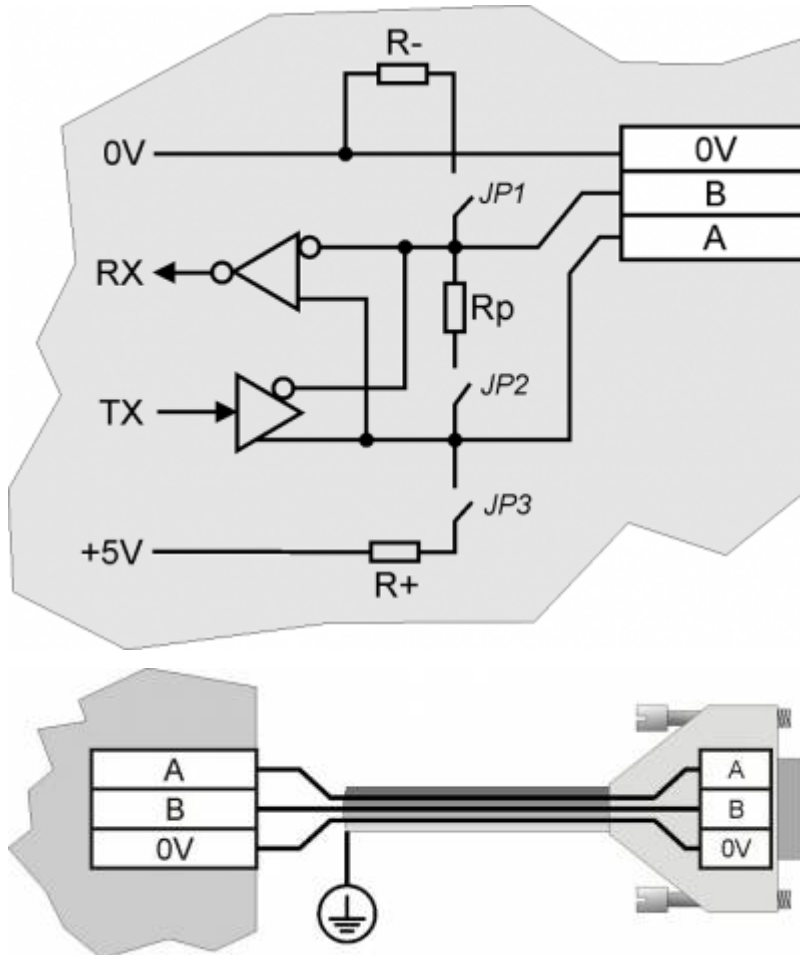


4.4 RS485



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 impedance	$\geq 12 \text{ Kohm}$
Short-circuit current limit	35 mA

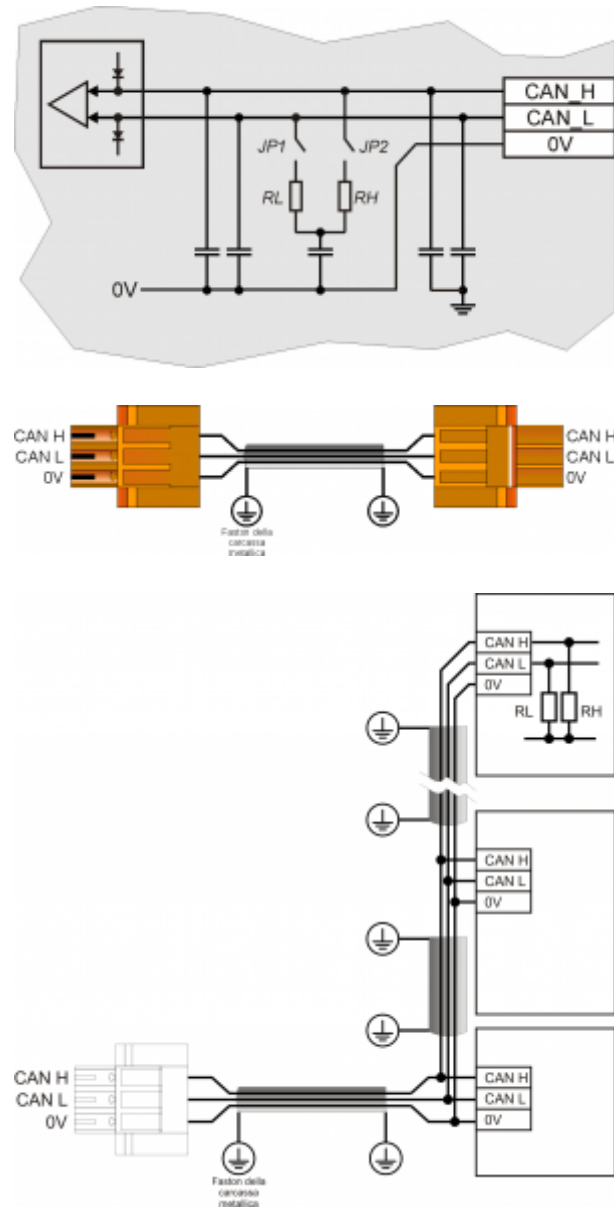


4.5 CANbus



To activate the internal termination resistance see paragraph [Setup Termination resistances](#)

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 impedance	$>15 \text{ Kohm}$
Short-circuit current limit	45mA



CAN BUS connection examples.


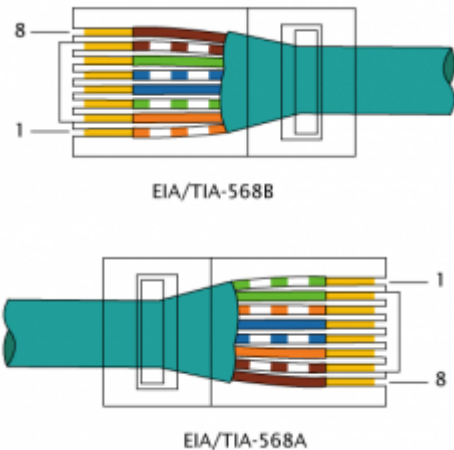



Caution:
Close DIP's JP1 and JP2 and insert the termination resistances (RL, RH) on the last device of the chain.

4.6 Ethernet

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

Connection between Qmove + and PC:

	 <p>EIA/TIA-568B</p> <p>EIA/TIA-568A</p>	
Qmove+	Cross-over cable EIA/TIA-568A/B	PC

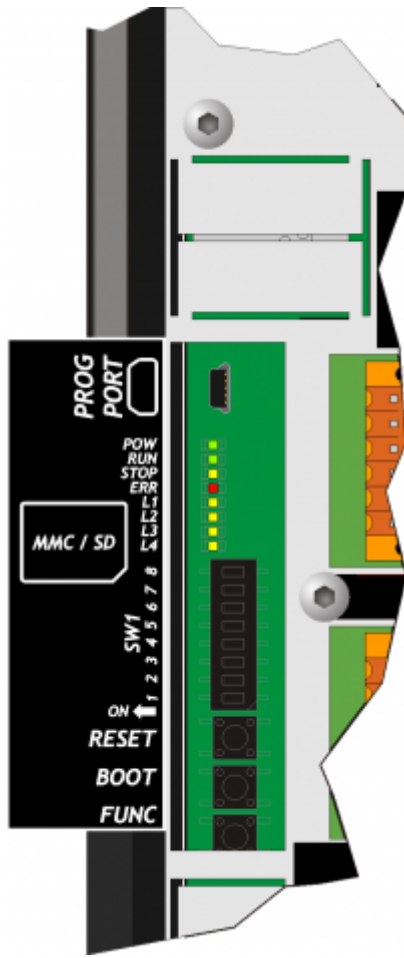
4.7 MMC/SD

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.

5. Settings, procedures and signals



5.1 PROG PORT and USER PORT baud-rate selector

SW1		Dip	DIP settings				Function
<div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div></div> <div>OFF↔ON</div>	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			

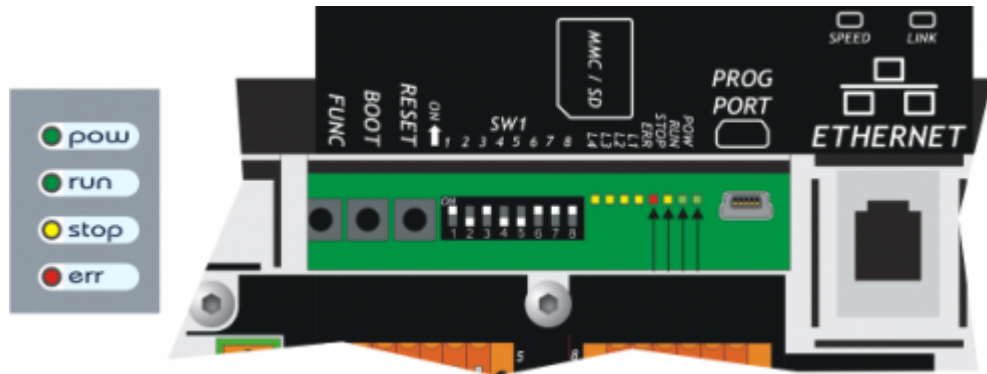
¹⁾ It is possible to use the USER PORT connector as PROG PORT with RS232 electric standard, doing this the mini-USB connector of the PROG PORT is disconnected (Setting USER PORT electric standard). **For this function mode also set dip 6 of SW2 to OFF.**

5.2 CANbus baud-rate selector

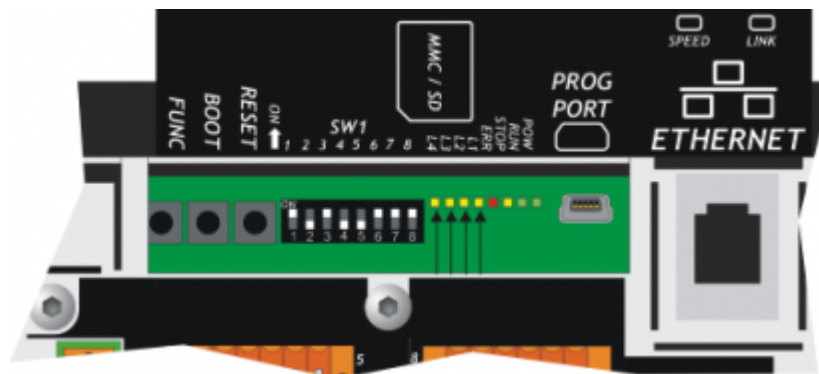
SW1		Dip	DIP settings				Function
<div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div></div> <div>OFF↔ON</div>	1	-				-	
	2	-				-	
	3	-				-	
	4	-				-	
	5	OFF	ON	OFF	ON	Select speed of CANbus transmission	
	7	OFF	OFF	ON	ON		
		Baud-rate 125KB/S	Baud-rate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

5.3 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.

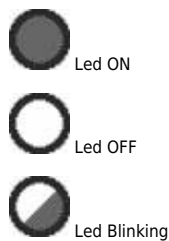


The user leds **“L1, L2, L3 e L4”** are found on the rear:



“System Leds” Signals

Legend:




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 application 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

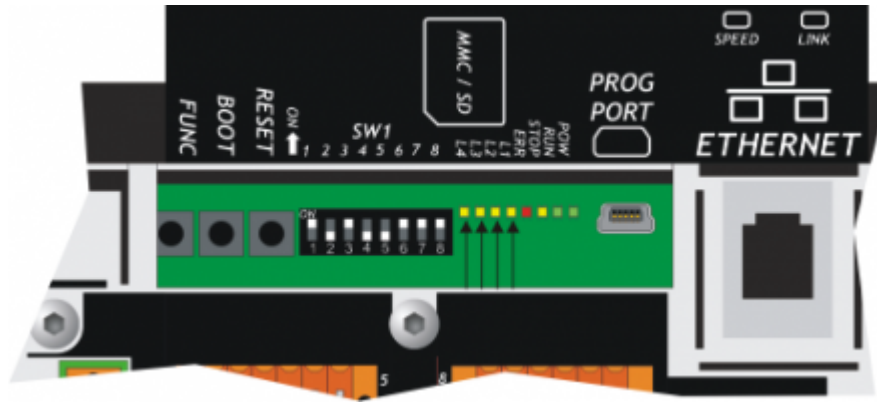
During the startup sequence, if a malfunction of any peripheral is detected, the system blocks and the error is signaled by the flashing led  err while the other system led's remain off.





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	<i>Signal not active</i>
8	<i>Signal not active</i>
9	Exception

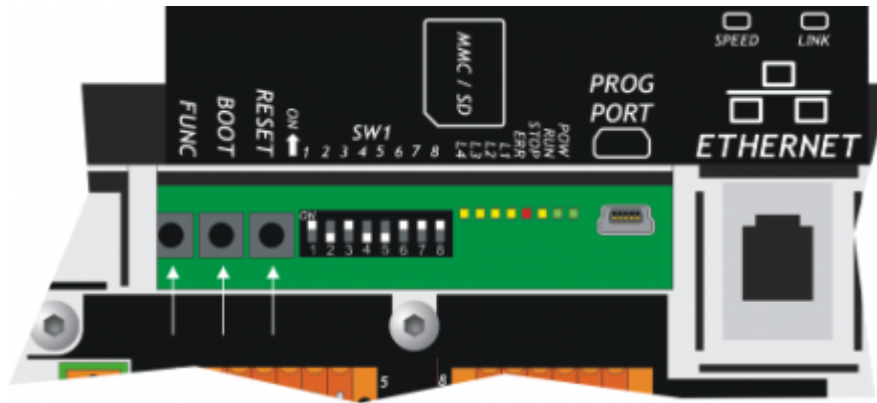





Each of these signals indicates a serious error situation. The product must be sent to the QEM aftersales service.

“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		

5.4 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)

6. Operating Overview

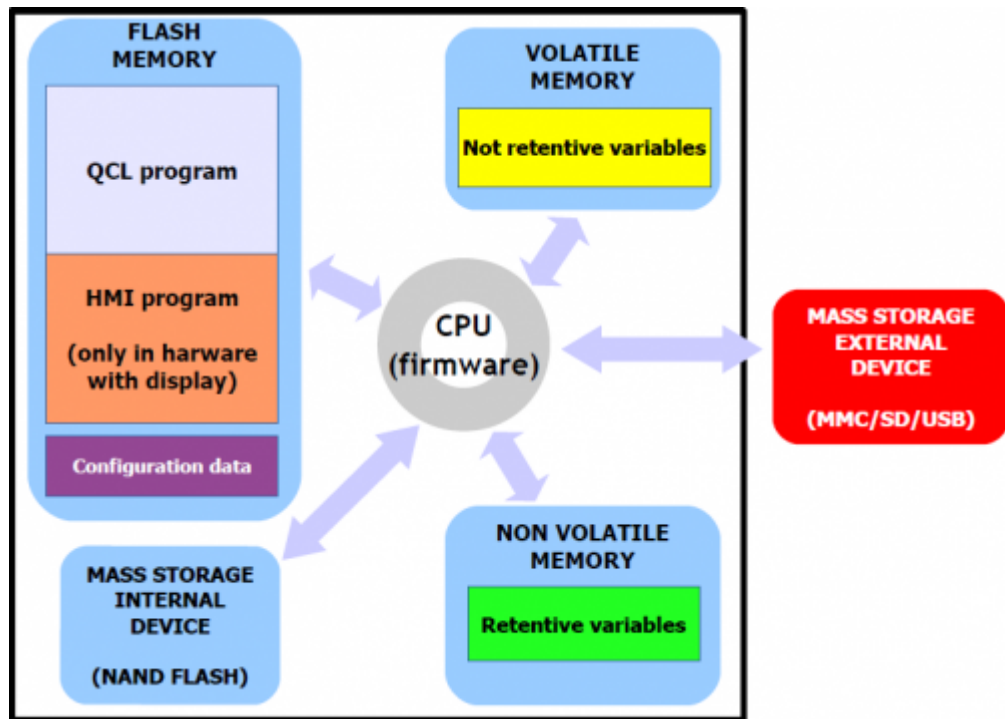
6.1 Foreword

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.

6.2 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 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, ARGBL, 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, various setups, etc). It's also used to store the backup of the application QMOVE and other service files.

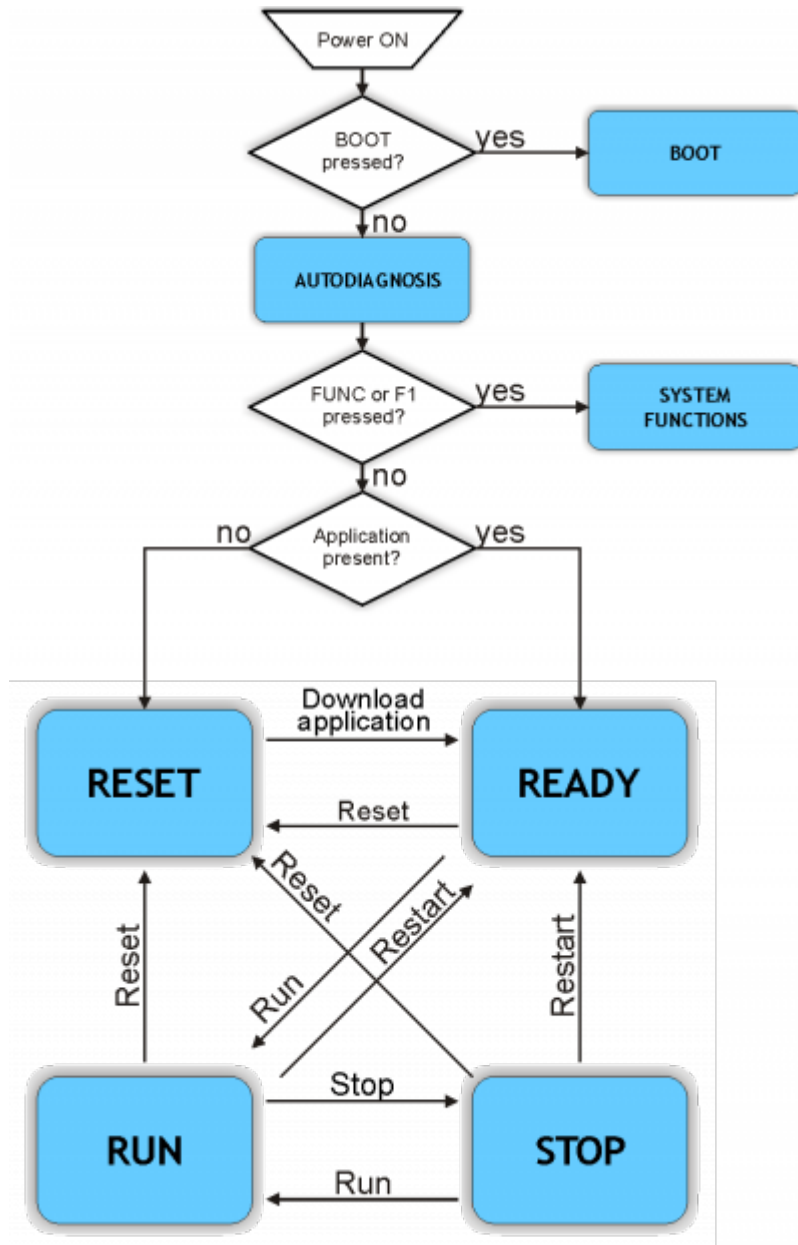
“Mass storage external device” is managed by a standard filesystem and is useful for loading the QMOVE application, data loading/saving, firmware update or to save informations by the DATASTORE device.

6.3 CPU Status

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-diagnosis 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.

During the SYSTEM BOOTING state instruments with displays, displays some important information about the system as in the example shown in the following figure:

```

                        SYSTEM BOOTING
Boot status: POWER-ON
Firmware: 1K31F-30.5.6
S/N: 12345678
Date(DMY)/Time: 31/12/2010 - 12:34:56
Dip-Switch = 0x2E
MMC: not present !
NAND: PRESENT 40510/63794 KB
Touch Screen: PRESENT
ETHERNET: IP = 192.168.0.253
              NM = 255.255.255.0
              GW = 0.0.0.0

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
Press F1/FUNC for 2s to System Functions

```




WARNING: The values shown in the figure are examples and may vary according to the instrument.

List of the information displayed


n.	Message	Description
1	Boot status: POWER-ON	It displays the status of the boot: POWER-ON Switching on the instrument INIT Download application initialization RESTART Restarting the instrument software BACKUP Performing the Backup RESTORE Performing the Restore
2	Firmware: 1K31F-30.5.6	They show the name, version, major releases and minor releases of firmware. In the example we have: 1K31F Firmware name 30 Version 5 Major release 6 Minor release (build)
3	S/N: 12345678	This displays the serial number of the instrument.
4	Date(DMY)/Time: 31/12/2010 - 12:34:56	The clock/calendar is displayed in the format: DD/MM/YYYY - hh:mm:ss
5	Dip-Switch = 0x2E	It displays a hexadecimal value representing the status of the switch SW1. It is equivalent to the value of the system variable SYS002.
6	MMC: PRESENT 510/31250 KB	If a MMC/SD is inserted into the slot, at this stage we are displayed device data such as KB used (510) and KB total (31250). In the case where the device is not present is displayed "not present !"
7	NAND: PRESENT 40510/63794 KB	It checks for all of the internal NAND, and then displays the KB used and KB total. In the case where the device is not detected, an error is reported and is displayed "NAND: NOT PRESENT !"
8	Touch Screen: PRESENT	Instruments equipped with a touch screen, it is detected and then are verified the calibration data. In the event that has yet to be performed calibration, the message displayed is "CALIBRATION REQUIRED !". The touchscreen calibration is possible with the system function "Touch Calibration".
9	ETHERNET: IP = 192.168.0.253 NM = 255.255.255.0 GW = 0.0.0.0	On instruments equipped with Ethernet interface, displays the parameters IP address (IP), subnet mask (NM) and Gateway (GW). Changing these values is possible with the system function "Set Ethernet communic. parameter" or through special programs available within the development environment.

n.	Message	Description
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	It is checked for a valid backup in NAND and then displays the data of date and time of backup files relating to the application QCL (QCL App), the application data QCL (QCL Dat) and to the application QTP (QTP App). If after "BACKUP" is displayed "VALID" means that the backup can be successfully restored by system function "Restore from NAND". If after "BACKUP" appears "NOT PRESENT" it means that the backup is not present. If after "BACKUP" is displayed "NOT VALID" means that the backup can not be restored properly as the checksum of the three files that make up are not consistent with each other. After each file (QCL App, QCL Dat and QTP App), in addition to the information of the date and time of creation, is also displayed further information: "MATCH" indicates that the file is consistent with the running application. "NO MATCH" indicates that the file is not consistent with the running application. "SIZE ERROR" indicates that the size of the file is invalid, possibly because the writing procedure was not completed correctly. "NOT PRESENT" indicates that the file is not present.
11	Press F1/FUNC for 2s to System Functions	The display of this message indicates that the pressure for at least 2 seconds of the F1 key or the FUNC button provides access to system functions as described in the procedure. The message is displayed for 4 seconds.
12	!!! WARNING detected !!! Press FUNC or F1 to continue	If during the previous phases, they are displayed some warning messages, which do not affect the operation of the system, to allow the operator to easily read the screen is waited a time of about 20 seconds. To not wait and go before, press the F1 key or the FUNC button.
13	!!! ERROR detected !!! Press FUNC or F1 to continue	Message displayed if the previous phases are displayed some error messages. To continue, press the F1 key or the FUNC button.


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	
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	
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	
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	
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.

6.4 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. 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").

DEVICE indicates an external storage media. MMC / SD or USB for hardware that they have the port.

System Functions

n.	Led ON	System Functions	PWD	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 external DEVICE to NAND Flash memory.
3	 L1  L2	03 - Copy all files NAND → DEVICE	-	Copy all files from NAND Flash memory to external DEVICE.
4	 L3	04 - Application delete	Y	Delete the application.
5	 L1  L3	05 - Application upload from DEVICE	Y	Upload the application from external DEVICE.
6	 L2  L3	06 - System Settings	-	Adjust the system clock and selection of the DEVICE (only for hardware that possess both ports).
7	 L1  L2  L3	07 - Downl. retentive data to DEVICE	-	Save the retentive data on external DEVICE.
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.
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.
15	 L1  L2  L3  L4	15 - Firmware Upgrade	Y	Run the firmware upgrade from external DEVICE. Available only in some hardware.

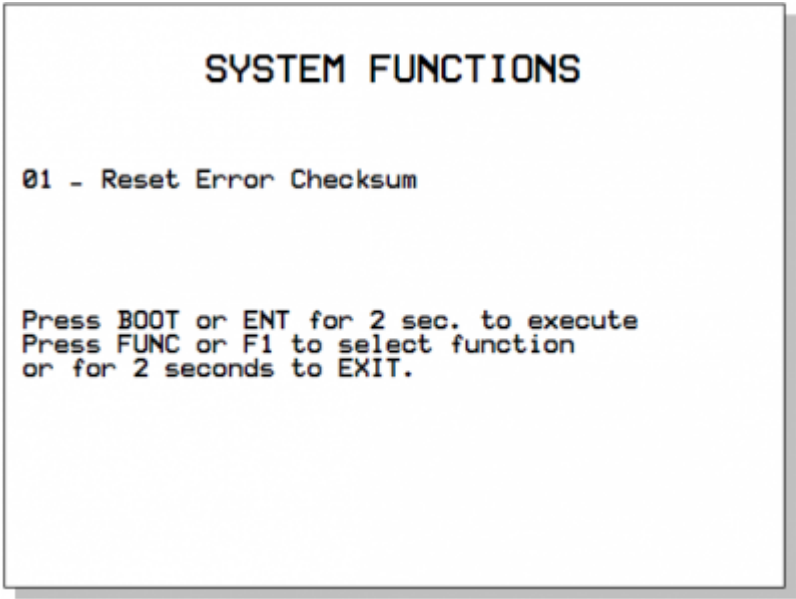
Note: To exit system functions press the keep the **F1** key or **FUNC** button for at least two seconds.


Access to system functions



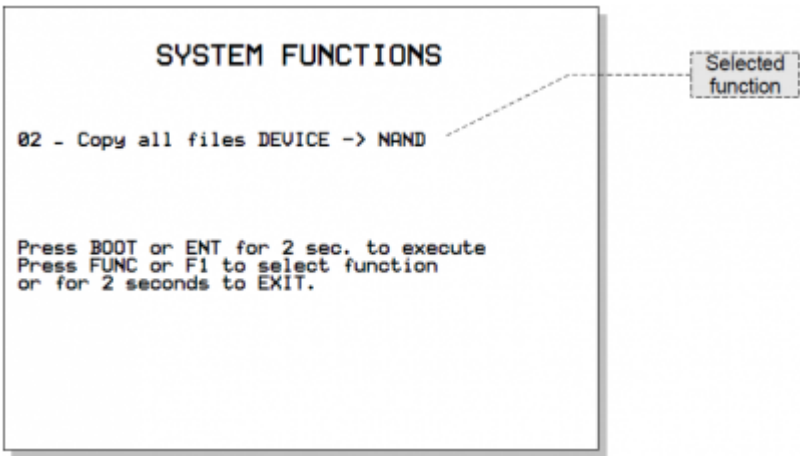
To access the System Functions, start up the controller with FUNC button or F1 key pressed.

The QMOVE application, if present, it not executed and the led **L1** lights up.
Tools that have a display appears **“SYSTEM FUNCTIONS”**.






**Use FUNC button or F1 key to scroll through the functions.
The selected function is indicated by the combination of L1-L2-L3-L4 leds lighted up and in instruments that have a display, you see the selected function in the “SYSTEM FUNCTIONS”.**

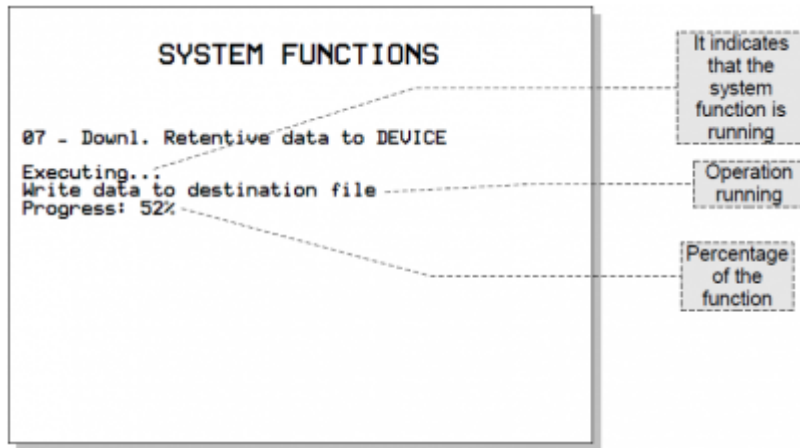


The “System Functions” table gives the list of system functions and related led combinations.

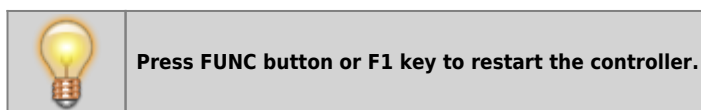
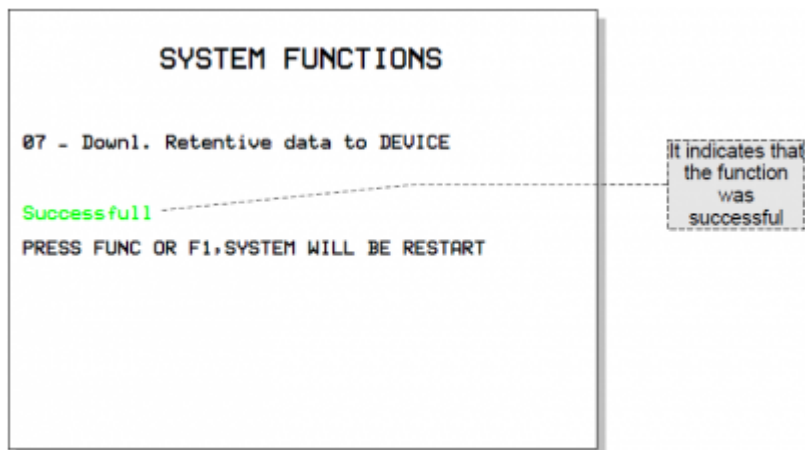


**Press BOOT button or ENTER key for 2 seconds to execute the selected function.
The POW led starts flashing to indicate that the selected function is being executed.**

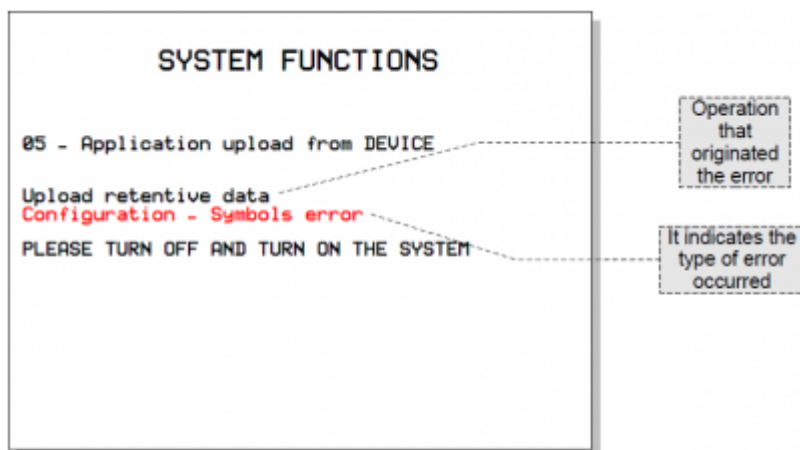
Instruments that have a display, you see the page “SYSTEM FUNCTIONS” as in the figure below.




When the function ends the **POW** led stops flashing.
Instruments that have a display, you see the page "SYSTEM FUNCTIONS" as in the figure below.



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

Error/Number of ERR led flashes	Message
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

Description of 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-sets all retentive variables**.

The procedure:

- Check the error status and end the function 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 <i>DEVICE</i> presence	Checking for the presence of the external mass storage card On <i>DEVICE</i> 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 <i>DEVICE</i> presence	Checking for the presence of the external mass storage card On <i>DEVICE</i> 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 nonvolatile data memory	Write file error
Delete QCL application	Deletion of the QCL program	Write file error
Delete HMI application	Deletion 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 <i>DEVICE</i> presence	Checking for the presence of the external mass storage card On <i>DEVICE</i> 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.

System Settings

This procedure sets the system clock/calendar and selects the type of external memory to be used.

SYSTEM FUNCTIONS

06 - System Settings

Date: 31/12/2010
Time: 12:34:56
Removable device: USB

Press BOOT or ENT to modify
PRESS FUNC OR F1 to EXIT

The string Removable device is not present in hardware that does not have a USB port.
Press ENTER key or 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.

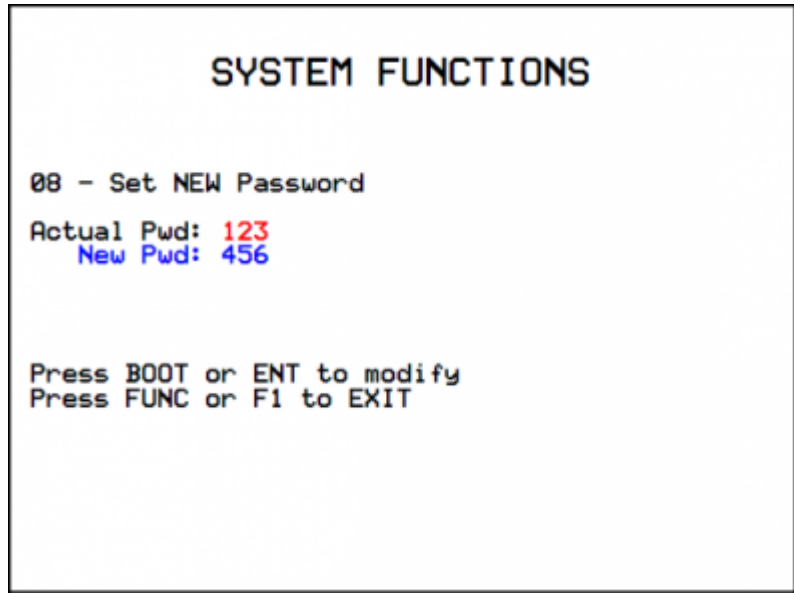
This function creates a file on external mass storage (MMC/SD or USB) containing the retentive data values.
The file created is named "**applic.dat**" and is the same as the file obtained by the "Save Data..." procedure in the QView development environment. The function can only be performed if there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

Set NEW Password

This modifies the password to access the system functions. The password is a number. The default password is: **123** The procedure 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.



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 and 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 deletion of every file found.
- Close the internal storage and end procedure

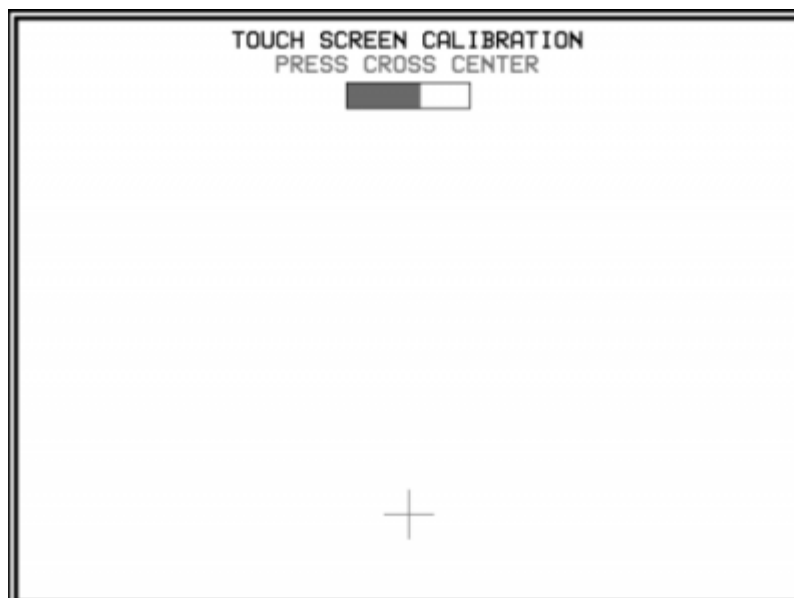
Show NAND Flash files

This procedure 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 button or the ENTER key again to continue with 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 procedure is used to calibrate the touch-screen device, if it's present.



At the entrance of the procedure, it is presented with a screen where there is a blue cross.
Press the center of the cross until the progress bar has reached completion.

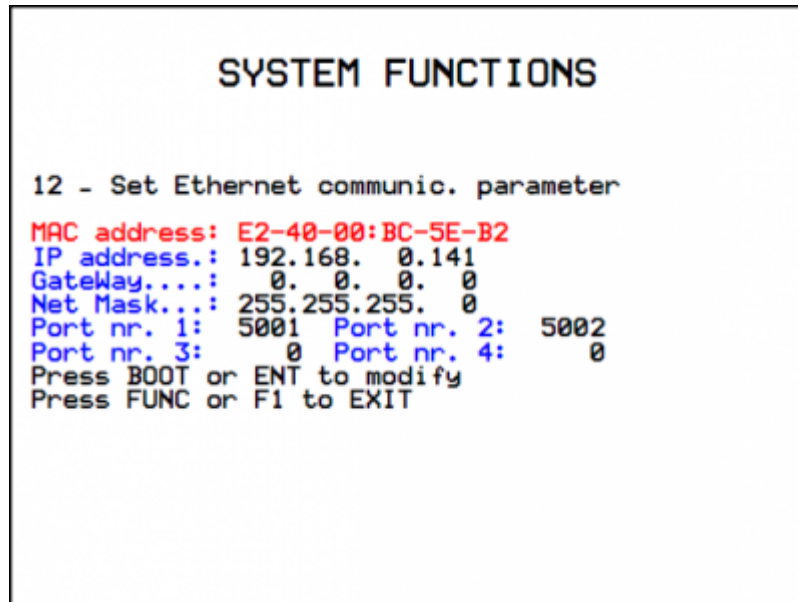
At this point, the message **"COMPLETED"** and you can release the pressure.

Note: if the pressure is released before the completion of the progress bar, the procedure is aborted and the message "!! OPERATION ABORTED !!" is given.

Repeat for the other two crosses green and cyan.

Set Ethernet communic. parameter

This procedure 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.



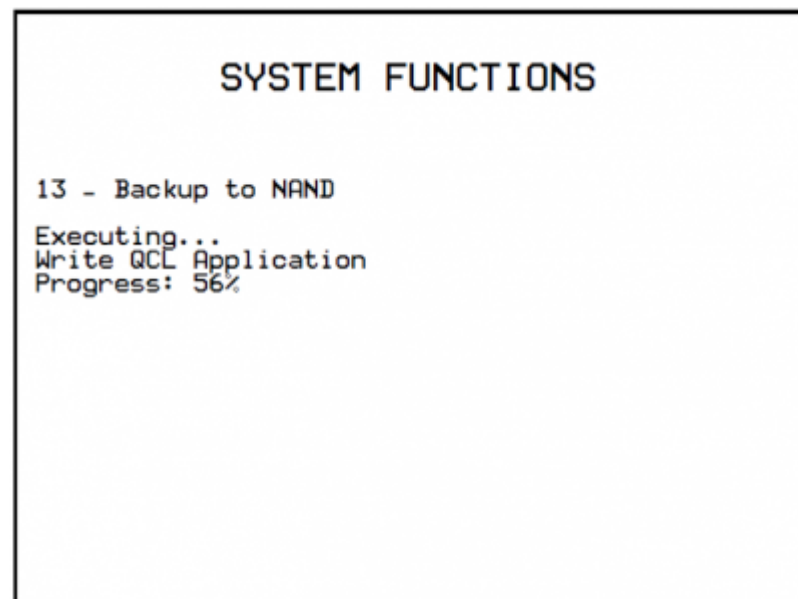
Press ENTER to go to and change the next box.

When the last box is confirmed, the data is saved and the **"saving data..."** message is given.

If the Ethernet port is not present on the hardware, the message **"Function not enabled"** 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

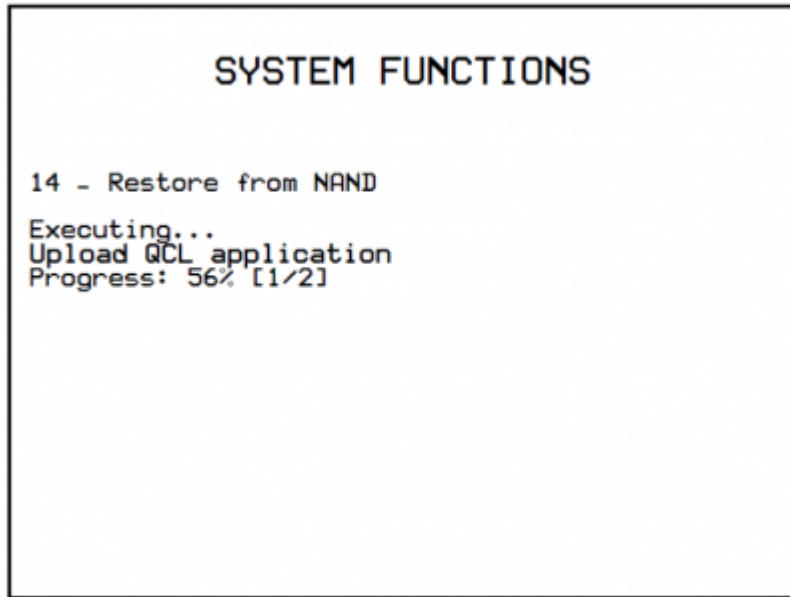


The procedure performs the following steps:

- 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.

6.5 Informations on programming

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

Development Environments

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. Both these softwares are available in the Qworkbench software package that can be downloaded as freeware from the Qem website (in “Support” section).

The controller has 3 slots. The slots 4 to 32 can be declared and must be used to address resources 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
Hm1 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.

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

```
BUS
1 1K31F 10
2 IMG8F .
3
```

The firmware version must naturally correspond and the specialist card name at slot 3 must be correct. See the chapter.

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 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 **non volatile 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 **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 (e.g. the HMI and QCL program sizes, the HMI screen being viewed, etc)

The free system general memory, available as volatile data memory, is indicated by parameter “memfree” in the MMIQ2 device.

Communication ports

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

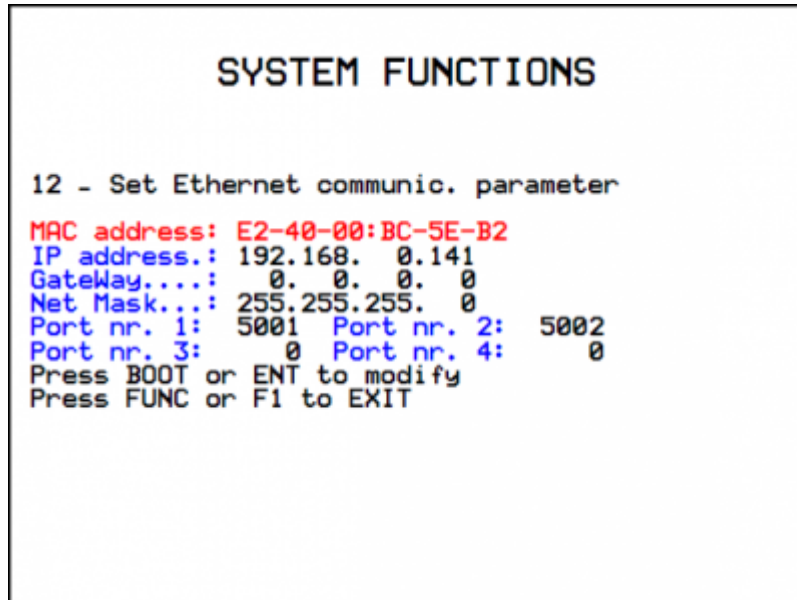
The SERCOM and MODBUS devices can be used with all communication serial ports including PROG PORT. Use the following number settings during the device declaration to select the communication channel:

```
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 6.

When using the MODBUS RTU protocol on serial port USER, AUX1 e AUX2 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 equivalent 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.

mdb5 MODBUS 2 43

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

Firmware error messages

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 available 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 ABCSNT device declar. is not avail.	The ABCSNT device declaration indicates an inexistent resource.
Error: COUNT in ABCSNT device declaration is not a simulated counter.	The counter address used in the ABCSNT 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 variable 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 to set 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.

6.5.1 The devices

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.

The list of devices implemented in the firmware depends on the firmware **version**. This paragraph is designed to illustrate the list and features of the devices available.

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

Device name	Sampling time minimum (msec)	Sampling time maximum (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	90,5
FREQ	1	250	4,75
MMIQ2	1	10	90,5
MODBUS	1	250	32,07
QMOS	-	-	0
RECDATA	1	250	5,34
SERCOM	1	250	9,26

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

Device name	Sampling time minimum (msec)	Sampling time maximum (msec)	Execution time (%)
ANPOS2	1	250	8,31
EANPOS	1	250	55,94
HEAD2	1	250	23,75
OOPOS3	1	250	27,91

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
INTERP	1	250	35,63
JOINT ¹⁾	1	250	95,01

¹⁾ The effective sampling time is double the actual setting

Details of devices

This section describes additional informations about the devices. These informations supplement and complete the user manual of the device available at QEM website. They are informations related to the implementation of the device in this particular product.

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.

The firmware manages the capture of an interrupt input even if it is located in a Canopen module.

It is possible to insert the value 2 in the declaration of the device on the port field. This setting allows the startup of the drive DS402 via a QCL

request (QDO number 10). This feature is necessary in cases where there are no enabling input of the drive and the supply of the logical part is in common with the power supply. If the power is off, the drive does not communicate in Canopen as also the logic is off.

DATASTORE

The files processed by the device **DATASTORE** are all contained in the /DS directory. If this directory does not exist, it is created automatically. The device **DATASTORE** can operate both with the MMC/SD or USB card and with the internal NAND memory (not removable). To define which mass memory to operate the priority parameter is used (0=MMC/SD, 1=NAND, 2=USB). If the application has to access the two supported devices frequently and the physical removal of the MMC/SD or USB 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 practice, 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 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
```

There is a particular setting of the parameters that allows to check the existence of a file in the device. Use the "filename" 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 "filename" (and its type in the parameter "filetype"). Setting -1 in "filename" again and running the OPENFILE command, the next file name is found and so on. Every time an OPENFILE operation is run with filename different to -1, the search loop 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 "filename = -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 "filename" will remain set to -1 and a warning is given.

The parameters "disksize" and "diskfree" are represented in KB.

RECDATA

The device can memorise up to 10000 step.

QMOS

The parameter "frwvalue01" 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.

7. Accessories available

- [IQ009](#)
- [IQ013](#)
- [IQ011](#)
- [IQ016](#)
- [Connectors polarization Kit](#)
- [Front panel customization kit](#)

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