

- INTRODUCTION -

The speed controller CH2QM is a four quadrant chopper for PMDC motors in traction applications. The output voltage and current are controlled in both polarity to realise the rotation of the motor in both directions with continuous control of the traction and braking current.

The controller is equipped with a main relay for battery reverse protection and other relays to reverse the rotation for the motor.

The logic circuit is controlled by means of a microprocessor, that realises an efficient diagnostics of failures and wrong wiring connections.

A failure is easily found looking blinking of the red warning led on the board.

The Mosfet power stage operates at a frequency of 18KHz with the pulse width modulation technology (P.W.M.).

The system is much very efficient: the current of the motor has a very low ripple, that means less heating and longer battery life.

The safety functions of switch from one direction to the other is obtained with the continuous control of the motor current; the switching of the relays is enabled only with low current and voltage.

The limit of the braking current is independent on the motor armature resistance.

The regenerative braking stops the motor with the desired torque and with a reduction of the deceleration space.

Different features are available for wig-wag (center-off) and single ended (speed potentiometer and direction switch) throttle for 5k Ω potentiometers.

- FEATURES -

| | |
|--------------------------|---|
| POWER SUPPLY | : 24 - 36 VDC (UPON REQUEST) |
| RATED CURRENT | : 25 ADC (DEPENDS ON POWER DISSIPATION) |
| MAX CURRENT | : 90 ADC ($T_a = 25^{\circ}\text{C}$) |
| FREQUENCY | : 18 KHz |
| MAX TEMPERATURE | : 80 $^{\circ}\text{C}$ |
| REGENERATIVE BRAKING | |
| BACKWARD SPEED REDUCTION | |

SAFETY:

- REVERSE POWER SUPPLY PROTECTION
- OUTPUT SHORT CIRCUIT PROTECTION
- MOSFET SHORT CIRCUIT PROTECTION
- POTENTIOMETER FAULT
- KEY-HANDLE SEQUENCE

- I/O CONNECTOR -

| PIN | FUNCTION | DESCRIPTION |
|-----|-----------------|----------------------------------|
| 1 | KEY | KEY-SWITCH INPUT +V BATT |
| 2 | COMMON HIGH | OUTPUT COMMON FOR SWITCHES |
| 3 | FORWARD SWITCH | INPUT ACTIVE HIGH (+V BATT/PIN2) |
| 4 | BACKWARD SWITCH | INPUT ACTIVE HIGH (+V BATT/PIN2) |
| 5 | HI-POT. INPUT | POTENTIOMETER SUPPLY |
| 6 | C-POT.INPUT | CENTRAL POTENTIOMETER |
| 7 | LO-POT.INPUT | REFERENCE GND POTENTIOMETER |
| 8 | NOT CONNECTED | |

- ALARMS -
(RED LED BLINKING)

CH2QM WIG-WAG CONNECTION: **CH2QMW**

| N° OF BLINKINGS | ALARMS | WHAT TO DO |
|------------------------|---|--|
| 1 | MOSFET SHORT CIRCUIT OR RELAIS ON AT POWER ON OR IN STOP POSITION | CHANGE THE CARD |
| 4 | POTI > 2,7V OR < 2,4V AT POWER ON | VERIFY THE MIDDLE POSITION OF THE POTI |
| 5 | BREAKING POTI > 4,8V OR < 0,2 V | VERIFY THE WIRING OF THE POTI |
| ALWAYS ON | THERMAL PROTECTION | WAIT SOME MINUTES AND RESTART |

CH2QM SINGLE ENDED CONNECTIONS: **CH2QM**

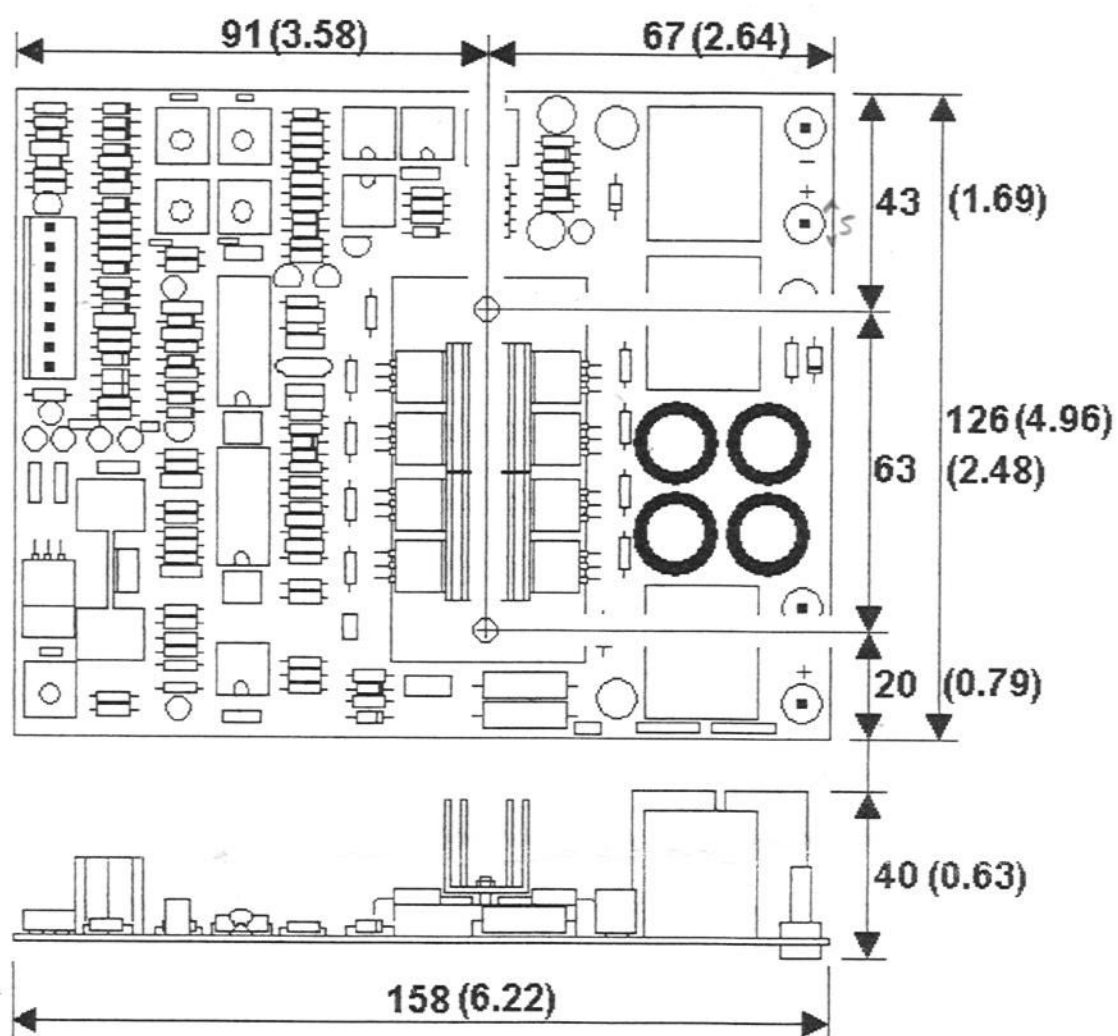
| N° OF BLINKINGS | ALARMS | WHAT TO DO |
|------------------------|---|-----------------------------------|
| 1 | MOSFET SHORT CIRCUIT OR RELAIS ON AT POWER ON OR IN STOP POSITION | CHANGE THE CARD |
| 2 | FORWARD SWITCH ON AT POWER-ON | VERIFY THE WIRING OF THE SWITCHES |
| 3 | BACKWARD SWITCH ON AT POWER-ON | VERIFY THE WIRING OF THE SWITCHES |
| 4 | POTI > 170mV AT POWER ON | VERIFY THE WIRING OF THE POTI |
| 5 | BREAKING POTI > 4,8V OR < 40 mV | VERIFY THE WIRING OF THE POTI |
| 6 | FORWARD AND BACKWARD SWITCHES ON | VERIFY THE WIRING OF THE SWITCHES |
| ALWAYS ON | THERMAL PROTECTION | WAIT SOME MINUTES AND RESTART |

NOTES.

IF AN ALARM IS PRESENT AT POWER-ON THE MOVEMENT OF THE MACHINE IS DISABLED.

TO RESET THE ALARMS YOU HOVE TO POWER-OFF BY THE KEY-SWITCH THE CONTROLLER .

- SIZE -



All size in mm.(inches).

WITH BOX: - 200 x 140 x 55(h) mm
- 7.87 x 5.51 x 2.16(h) inches

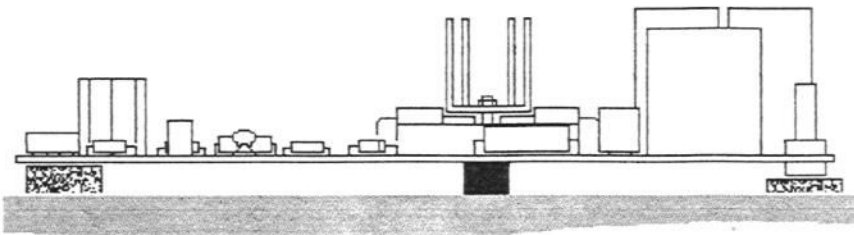


- INSTALLATION -

THE CIRCUIT BOARD MUST BE MOUNTED USING ALUMINUM SPACERS. THE INSTALLATION HEATSINK MUST BE MINIMUM A 126x158 mm ALUMINUM PLATE 3mm THICK.

LOCATE THE CONTROLLER IN AN AREA PROTECT AGAINST MECHANICAL ABUSE, WATER AND DIRTY.

POWER WIRES (MOTOR AND BATTERY) MUST BE 4mm², 1mm² FOR THE KEY WIRES AND FOR THE POTI WIRES.



- WIRING DIAGRAM -

Here-below you can see 2 examples of wiring diagram for the speed controller CH2QM.

The key switch feeds power to the control circuit of the board and to the coil of the main relay on the board.

On the picture 1 you can see the speed controller CH2QM with a wig-wag connections to control speed and motion direction.

In picture 2 you can see the outline diagram with a complete wiring of the speed controller CH2QM; the potentiometer and the two switches for the selection of the forward/backward speed.

In both cases is recommended to use a protection device on the positive connection from the battery (thermal protector or fuse).

Furthermore in order to avoid failures due to voltage generated by the motor in case of opening of the protection during the movement it is recommended to connect parallel a diode to the protection device with the cathode towards the battery.

Code CH2QMW

INPUT POTI:

< 2,3V:
BACKWARD SPEED

= 2,5V:
STOP POSITION

> 2,7V:
FORWARD SPEED

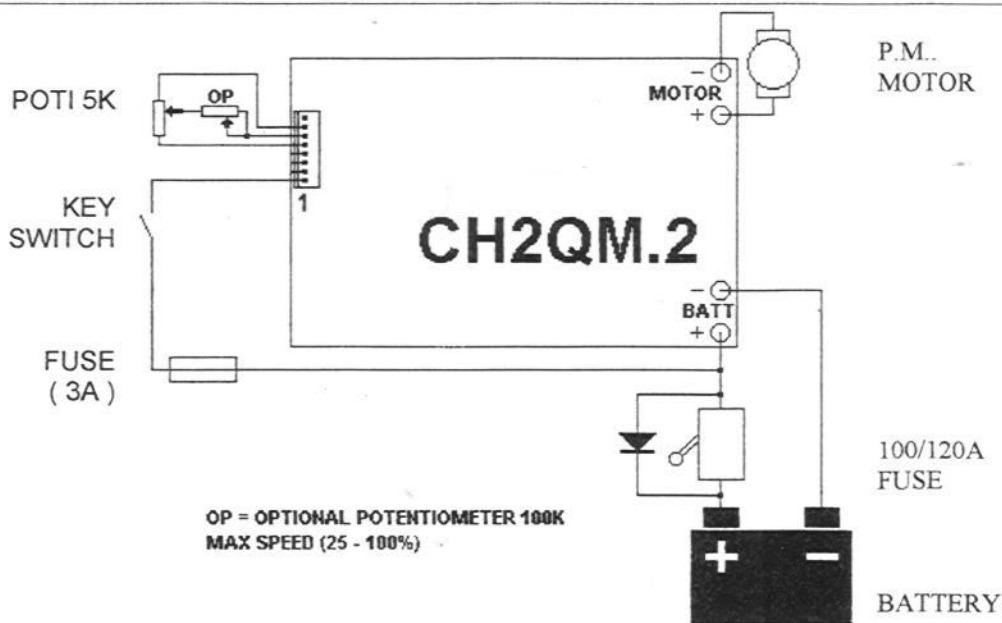


fig.1

Code CH2QM

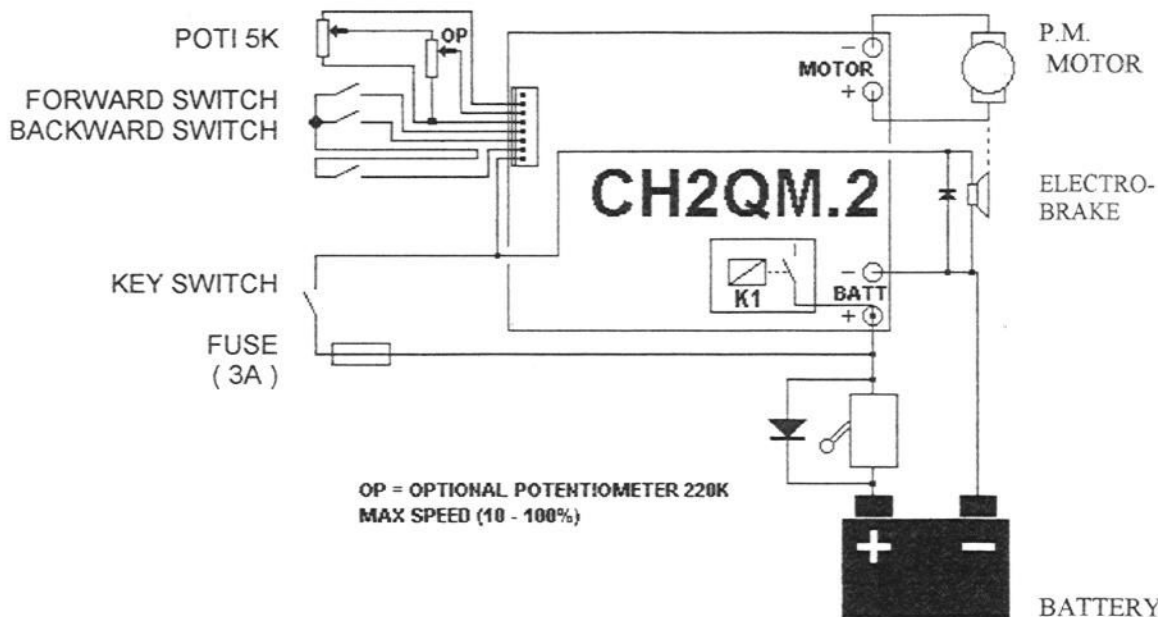


fig.2

- TRIMMERS -

IMAX50 – 90 A
(max driving current)

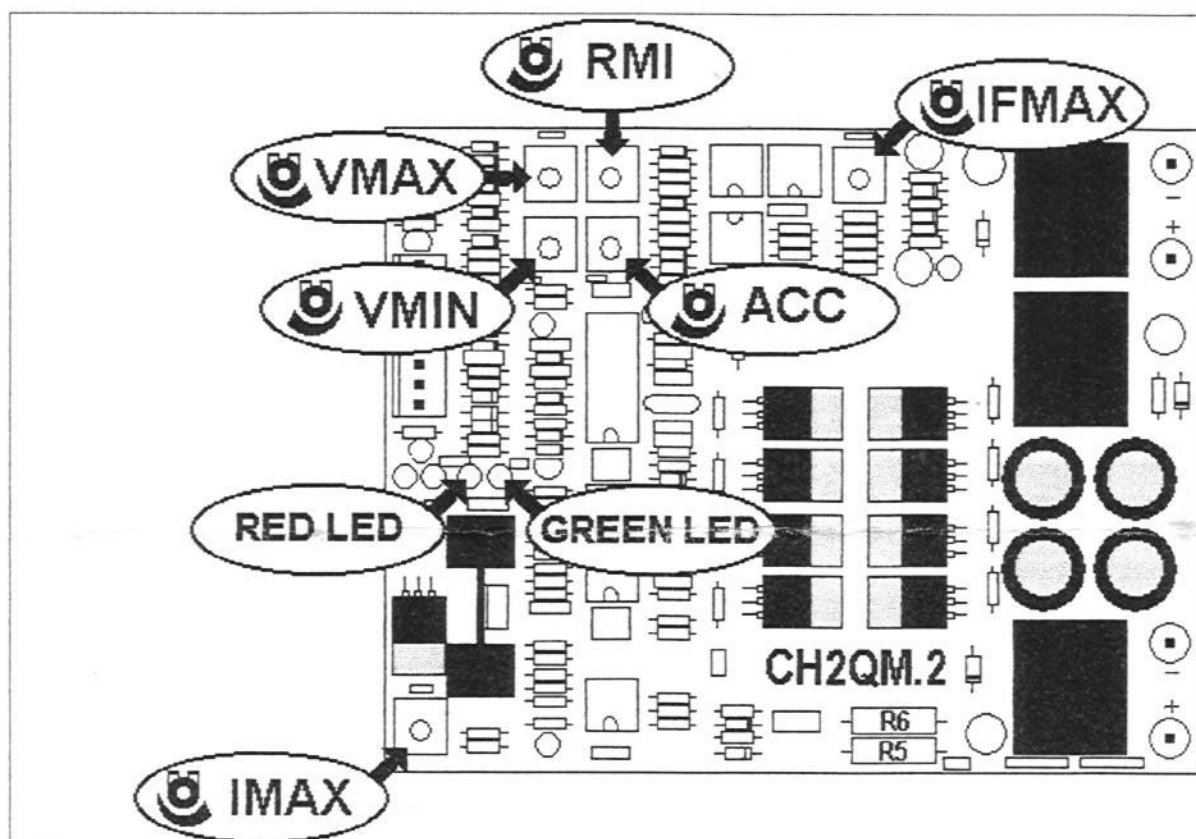
IFMAX25 – 70 A
(max braking current)

RMI.....60 – 100%
(backward speed)

VMIN5 – 10 %
(minimum speed)

ACC 0 – 3 sec.
(acceleration ramp)

VMAX
(max forward speed)



- OPERATION -

The **battery** feeds the logic and the power stage through the external **key switch** and the **main relay**.

The stage "**power supply**" stabilizes and filters the input voltage.

The stage "**input/output control management**" exchanges information between the microprocessor and the operator receiving in real time the control signals coming from outside and from the adjustments of the trimmer on the board.

The stage "**microprocessor**" controls the input signals, the alarms for possible anomalies inside or outside the board; it controls the power stage and the direction of the motor and the level of the braking current. The switch from one direction to the other is enabled only when the current on the motor is below a safety value for the relays.

The microprocessor enables the stage "**power management**" and gives a reference signal to the integrated circuits for the PWM modulation.

This stage controls only the power part and the main functions are:

- PWM modulation,
- limit of the current on the motor,
- limit of the braking current.

The "**power stage**" includes the power Mosfets and the relays to reverse the motor voltage.

When the motor is stop it is in a short circuit position to avoid undesired movement of the machine.

