

## H60

The RFH2406 serie is a 4 quadrand speed controller specially suited for permanent magnet DC motors (PMM).

The speed controller is a microprocessor controlled equipment with self check and alarm diagnostic already integrated.

This equipment has been developed in order to achieve very compact and high performance on small medium sized electric vehicles. The RF050H has standard regenerative braking.

The line contactor is already integrated on board and this simplifies the mounting and wiring operation on the vehicle. In case of any failure sensed by the control section of the microprocessor the line contactor is opened thus preserving safety during operation.

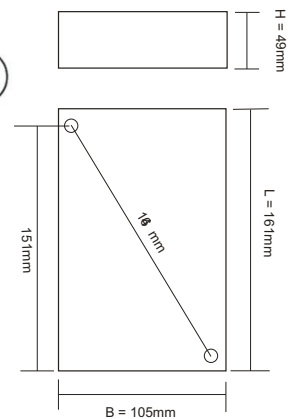
The MOSFET power technology assures best performance at high frequency chopping. Application of high frequency reduces battery over current peaks during start of electric vehicle thus prolonging battery service life and reliability.

This power technology assures compact dimensions to the power pack of the equipment.

*No direction contactors  
with regenerative braking  
integrated line contactor*



Dimensions



- Main features:
- 1 Mosfet power technology.
  - 2 Supply: 24V or 36.
  - 3 Users frequency 15 kHz.
  - 4 Self-check and alarm diagnostic led.
  - 5 Microprocessor controlled.
  - 6 Safety circuits and line contactor already Integrated.
  - 7 Wiring connection trough a 12 pole Minifit connector.

- Technical features:
- 1 Electric potentiometer: 5 kOhm with 320° electric angle.
  - 2 Adjustments: acceleration, braking(regenerative), Max.speed forward, max. speed reverse,reverse Time, temperature motor.
  - 3 Supply: 24 or 36V DC.
  - 4 Efficiency with a 50% power output: >90%.
  - 5 Max. current: 40/50 or 60 A.
  - 6 External enclosure for protection (Ip53)
  - 7 Alarms: line contactor fault, motor circuit open, insufficient line filter capacitor charge, over temperature, motor already rotating at start up and software fault.
  - 8 Max. working temperature (on mosfet power block) : 85°C +/- 5%. If failure is present the equipment doesn't start, except in case of sensed over temperature. In this case the Equipment still works at reduced power.
  - 9 Chopping frequency: 15 kHz.
  - 10 Line contactor on battery positive side Already integrated.



**Service Manual**

**Warning:** Don't change the polarity of the controller, this will damage your controller.

**Calibrator TDA/1:** The calibrator TDA/1 is developed for easy programming the RF050H. The housing is of durable material to work with it daily.

- Functions TDA/1:**
- To program the controller for every function from 0 to 100%
  - OK led green, burns when key-switch is on and the calibrator is connected correctly.
  - Diagnostic led red, also present on the controller. This led shows through a number of flashes what is wrong. By means of the alarm report the fault can be located.
  - Battery polarity diagnostic led yellow. When the battery is wrong connected the led burns directly. Immediate disconnect the battery connector.

**How to use TDA/1:** The calibrator has 6 adjust functions for an optimum adjustment of the controller.

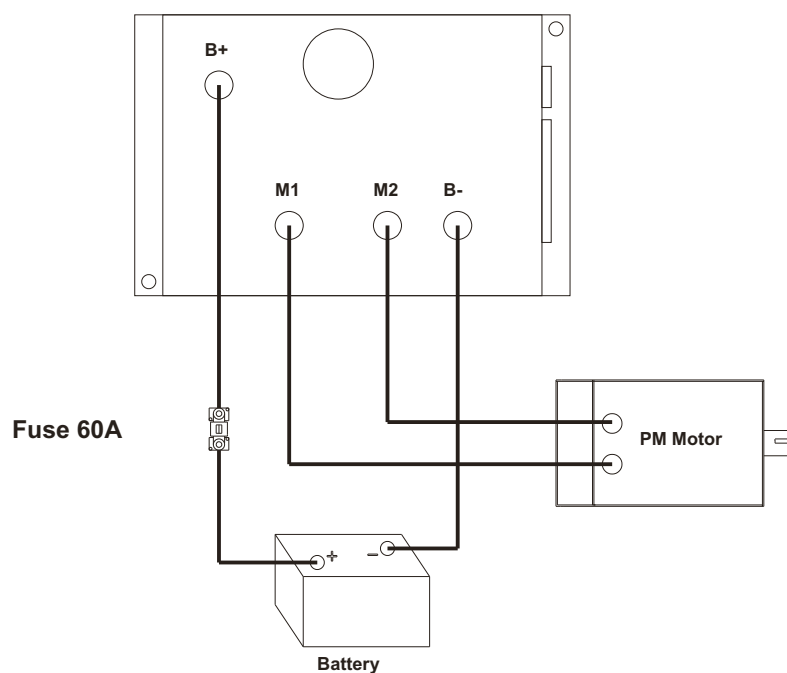
1	Acceleration	0,5 - 4 sec.
2	Deceleration	0,5 - 4 sec.
3	Maximum Speed forward	0 - 100%
4	Maximum Speed reverse	0 - 100%
6	Brake delay time	0,5 - 5 sec.
8	Rapid reversal speed	

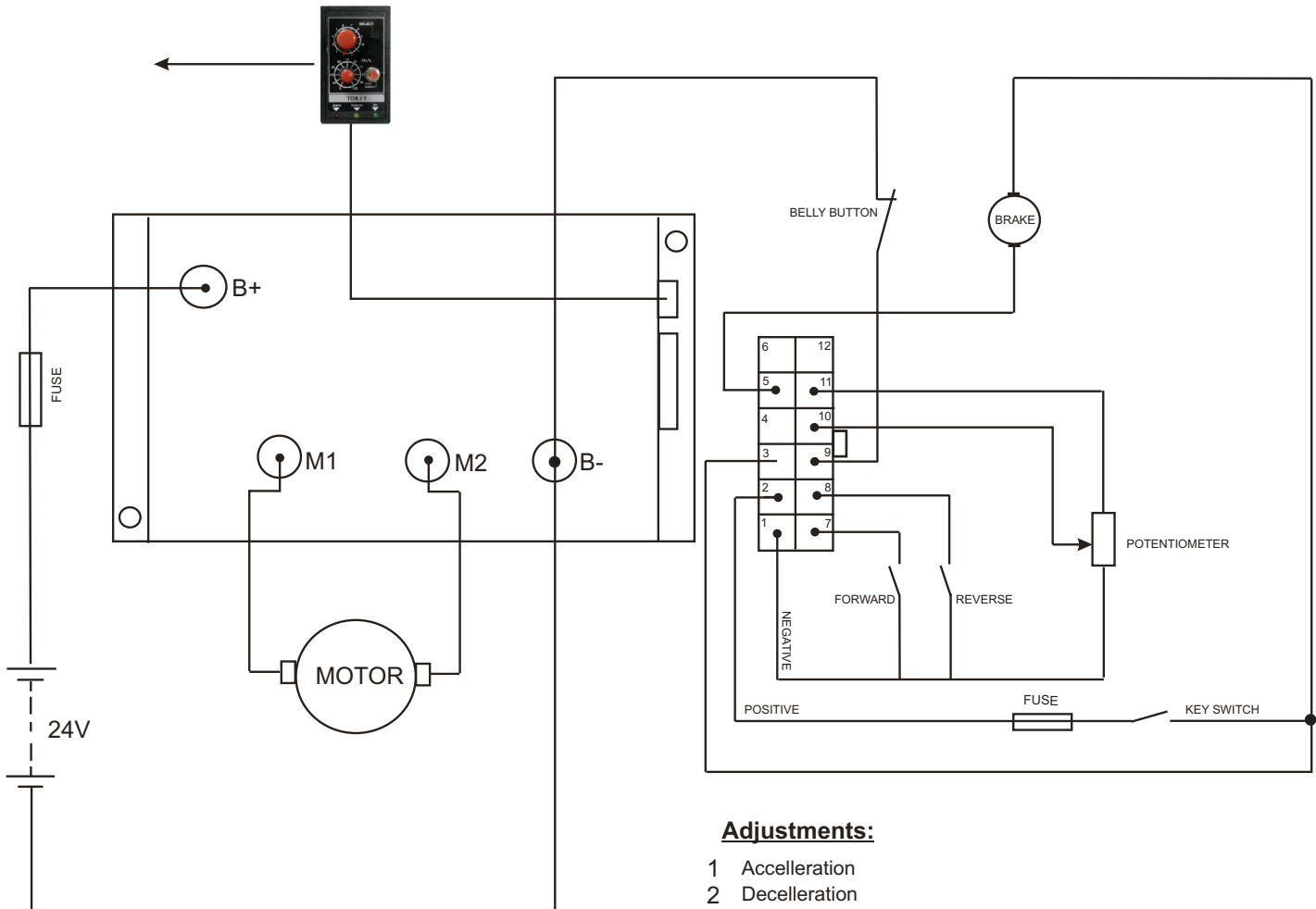
- Program procedure:**
- Select an adjustment through turning the function knob. Select the adjustment through turning the VAL (value) knob between 0-100%.
  - To save this adjustment in the processor, press the DATA ENTER knob for 1 sec. minimum. Once the adjustment is accepted the red led will flash for a short moment. Now the adjustment is saved in the processor to start with a new adjustment.

- Warning:**
- The adjustments can be saved in the processor directly during working. In this case the new adjustment is immediate active.
  - The calibrator is active when connected and the key-switch is turned On.
  - To remove the calibrator: first turn off the key-switch to avoid any damage on the controller or calibrator.
  - The I-max measurement is not active during adjusting the controller. Therefore it is important that you don't drive full gas when the calibrator is connected, this to avoid damage on the calibrator.
  - During driving or plugging or during auto plugging the calibrator is not active because the microprocessor has to check the safety circuit.
  - Do not turn off the key-switch while pressing the DATA ENTER knob or else the microprocessor can save the wrong adjustment.

**Function red led:** every fault that is located by the controller, is shown by a number of flashes of the red led.

- |   |   |  |
|---|---|--|
| 1 | x | Fail of micro switch correct start sequence. This generally happens if at start (key inserted) one of the direction micro switch is already closed.  |
| 2 | x | Battery under voltage or discharged. This alerts that the voltage isn't enough for a correct operation of the vehicle.   |
| 3 | x | Diagnostic code not used   |
| 4 | x | Electric motor circuit is sensed to be opened.   |
| 5 | x | Speed controller internal fault or electric motor has a fault to ground (insufficient insulation level).   |
| 6 | x | Potentiometer fault. This code is not active in case of a 2 wire connected potentiometer.  |
| 7 | x | High power on power MOSFET unit. This alarm is active every time there is a temperature of $75^{\circ}\text{C} \pm 5\%$ on the MOSFET. The alarm is active till the temperature returns below $75^{\circ}\text{C}$ . During alarm the max. current is reduced to safety level for the equipment reliability. |
| 8 | x | The motor is sensed to be already in rotation when equipment started (key- insertion). This happens, for example, when the equipment is started during descending a slope.   |
| 9 | x | Software has a fault.  |





**Adjustments:**

- 1 Accelleration
- 2 Decelleration
- 3 Max speed FW
- 4 Max speed RV
- 5 Not in use
- 6 Brake delay time
- 7 Not in use
- 8 Rapid reversal speed

\*\* When the Belly Button is not used ; connect Pin nr. 9 directly to Battery negative \*\*