

Programmable controllers TMM[®] xxxx, advanced line for brushed motors (Ver. 2.10 and more)

Controllers TMM[®] xxxx, advanced line are outstanding programmable controllers for brushed motors. They are manufactured with the use of surface mounting from high-end components and are controlled by a very powerful processor. Controllers are ready for immediate use, no programming necessary. However, if you wish to set some parameters you may do so through a very simple process. These parameters are then saved permanently. The revolution regulation is extremely fine - 1024 steps all the way to the full throttle. The Mega BEC circuit (applies to versions with BEC) is also extremely powerful. The power components of the controller together with thick aluminum cooling plates are placed only on one side of controller for better heat removal (that means no inner boards with power components).

Thanks to the high-tech TMM[®] technology of MGM compro controllers feature number of outstanding properties which considerably eliminate the possibility of unwanted damage or destroy of motor, the batteries and the controller itself. Controllers also ensure the maximal efficiency with different kinds of motors.

Maximum attention is paid to development which is in continuous progress. To make our newest knowledge available to our customers the upgrade of SW is free (only shipping costs are charged).

The quality of products is under constant supervision in manufacture. Every controller goes through numerous tests. The final test of each controller is done under the controller's full load.

Protective and safety mechanisms of TMM[®] controllers:

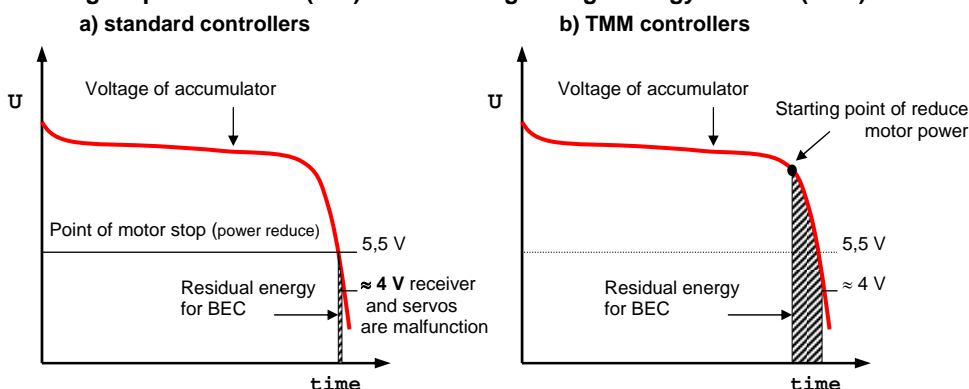
Accumulators are protected in three ways. Firstly, due to the use of automatic current fuse (ACF) the current overload of accumulators (and their possible damage) even at crisis points can be avoided. Secondly, the used system of intelligent power reduce (IPR) always ensures through measurements of number of cells, voltage, currents, accumulator condition and calculations an optimal point of starting continuous reduction of motor performance (it is applied when accumulators become heavily discharged) so that accumulator cells do not get extremely discharged. This, not mentioning other advantages, reduces the possibility of reversal of poles of lower cells.

This system at the same time **enables retaining defined energy for BEC (perfect RPC)** in controllers that have BEC which is of great significance for flying models (a crash due to running out of energy for receiver and servos can be avoided) Thirdly, it is the automatic current reduce (ACR) due to which a drop in voltage for BEC under extremely big current load (for every given controller) while motor starts does not occur.

The controllers efficiently **mask interference and drop-outs** up to 1,5 sec. When long-lasting drop-outs or interference occur the controller slowly reduces motor revolutions. After the signal is resumed the controller continuously gets to the requested power. Without the proper signal from the transmitter (e.g. transmitter is turned off), the motor neither jerks nor runs but is at standstill.

Thermal fuse of the controller is set to 90°C when performance is reduced to ca 60% After switching on, the temperature above 70°C is monitored; if the temperature is higher the controller does not start. New start is possible only after the controller temperature falls. Take notice that the controller warms up not only due to losses on switching transistor but also due to loss on BEC.

Intelligent power reduce (IPR) and retaining enough energy for BEC (RPC)



The controller's behavior at the point of exhausted batteries (or closely before that) is very significant from both the controlling point of view and economical use of remaining energy point of view.

When switching (reducing power) the motor off at solid boundary **(a)** there is only very little energy remaining for BEC, particularly for 8 or more cells in accu pack. The better accumulators are used the less energy (time) is left to land (standard ESC).

Comparing to this, TMM **(b)** ensures the remaining energy to be big enough; it is also possible to modify its size in some types (bigger for gliders). This energy is certainly insignificant as long as duration of running the motor is concerned, but it is very significant for feeding BEC.

Operating data:

| | | | |
|---------------------------------|--|-----------------------------|----------------------|
| Temperature of the environment: | 0°C to 40°C | Number of regulation steps: | 1024 / full throttle |
| Motor controlling: | PWM 4 kHz | | |
| Control signal: | positive pulses 1,5 ± 0,5 ms, period 10 ÷ 30 ms | | |
| User set parameters | brake on – off / NiCd, NiMH or Li-Ion, Li-Pol batteries / min and max throttle positions | | |
| Automatically set parameters | number and quality of cells, controlling signal from transmitter | | |
| MEGA BEC: | 5V / max. 4,0 A (power losses 5W continuous, 10W / 40 sec., 15W / 5 sec., max. 20W, see graph) | | |
| Suitable for motors: | Mega, Model motors, Potensky, Corally, Mabuchi, Speed, Trinity, | | |

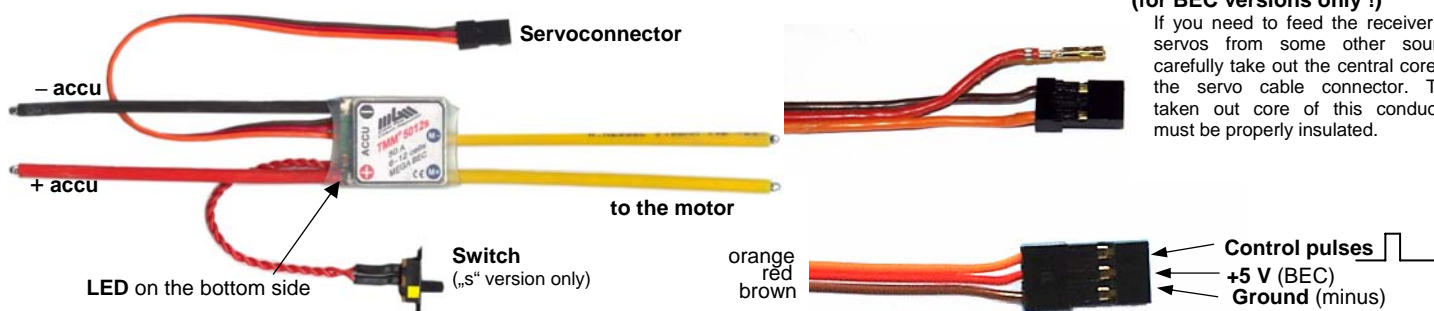
| | TMM [®] | | | |
|---|----------------------|----------------------|----------------------|----------------------|
| | 1812 | 2512 | 3512 | 5012 |
| Dimensions [mm]: | 29x24x5 | 29x24x5 | 29x24x5 | 29x24x5 |
| No. of feeding NiCd/NiMH cells: | 6 až 12 | 6 až 12 | 6 až 12 | 6 až 12 |
| No. of feeding Li-Ion / Li-Pol cells: | 2 to 4 | 2 to 4 | 2 to 4 | 2 to 4 |
| Model: | BEC | BEC | BEC | BEC |
| Max. current (for full throttle): | 18 A | 25 A | 35 A | 50 A |
| Max. current for 5 sec.: | 23 A | 31 A | 42 A | 60 A |
| On-state switch resistance at 25 °C: | 5 mΩ | 3,5 mΩ | 2,5 mΩ | 1,8 mΩ |
| Power conductors lenth/cross-section: | 1,0 mm ² | 1,5 mm ² | 2,5 mm ² | 2,5 mm ² |
| JR gold connector, cables: | 0,25 mm ² | 0,25 mm ² | 0,25 mm ² | 0,25 mm ² |
| Weight incl. all conductors ("s" version): | 13 (15) g | 15(17) g | 19 (21) g | 19 (21) g |
| Weight without power conductors ("s" ver.): | 9 (11) g | 9 (11) g | 9 (11) g | 9 (11) g |

The appearance and operating data may be changed without prior notice

Note:

(for BEC versions only !)

If you need to feed the receiver or servos from some other source carefully take out the central core of the servo cable connector. The taken out core of this conductor must be properly insulated.



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(II) PROGRAMMING and operation:

All programming is done through transmitter and receiver with which the controller will run. After programming the data will be saved together with the min and max throttle positions (until possible next programming). It is necessary to switch the controller off afterwards to end the programming. When the controller is programmed it is ready for use immediately after switch on. **If after switching on, the throttle stick is not in the min position the controller waits for it to get there (safety precaution) – if the throttle is in its min position you may take off immediately.**

Description of parameters in the programming mode:

Parameter A – mode choice: enables to set "Basic" mode option or user set parameters option

Parameter B – brake: enables to set the brake off and the strength of brake (intensity of braking) in 5 steps. Set according to your needs.

Parameter C – type of cells: enables to set battery type which will use, Set according to your needs.

How to program the desired "value" in parameter you are setting (basic procedure in each parameter):

Move the throttle to ½ throttle, green LED will be switched off 2x (twice) and motor beeps 2x. Move throttle back to min position, green LED will be switched off once and motor beeps once. Repeat this procedure (½ throttle – min throttle) as many times as is the number of parameter (according to the table) you wish to set. **For example:** for setting the **number 2** in parameter "B" (light brake) repeat the whole procedure (½ throttle – min throttle) **2x** (you certainly have to be in parameter "B").

The programming of each parameter will be finished when you move the throttle from min position to the full throttle – green LED will be turned off 3x and motor will beep 3x, then move the throttle back to min position, Green LED will be turned off 1x and motor will beep once – the parameter is programmed to the value you have chosen and saved (**this sequence is marked as "ENTER"**). This also automatically gets you to next parameter. After the last programmed parameter the controller must be turned off.

If you do not wish to change some parameter (you wish to preserve its last value) you directly set full throttle when programming it (no ½ throttle – minimum procedure, but directly ENTER). The parameter value stay as it was before and the controller will get to the next parameter programming. The exception to this is the "A" parameter.

The programming itself:

- 1) Turn the transmitter on **with throttle stick in max position !**
- 2) Turn on **the controller**. After 10 seconds (**++**) the controller will beep 3x and LED will blink and stay turned on. Now you have 3 seconds to move the throttle back to zero. If in this time limit you do not put the throttle in min position the programming process will end and the controller will be turned off. Its next operation is possible after turning it off with the switch and then turning on with switch (disconnecting and connecting of batteries).

If you put the throttle to zero in this time limit, the motor will beep 1x and the green LED will be turned off 1x. Now you are in the programming mode and may start to program parameters according to the procedure described above.

(++) If before this programming the "BASIC" mode was set, the motor will beep 2x after switching on the controller, do not take care of this and wait for the 3x beeps.

- 3) **Parameter A – mode choice: parameter setting or "BASIC" mode**

a) you do not wish to program and you wish to use the initial setting, "BASIC" mode:

Move the throttle to ½ throttle position, green LED will be turned off 2x and the motor will be beep 2x. Move throttle back to min position, green LED turned off 1x and motor will beep 1x. Repeat this procedure 3x. This choice will be confirmed by moving the throttle from min to full position – green LED will be turned off 3x and motor will beep 3x. then move back to min position and LED will be turned off 1x and motor will beep 1x. The default setting is set and min and max positions of throttle are saved. Now turn the controller off. The "Basic" mode is set.

b) You wish to program and set the controller according to your criteria:

Move the throttle directly to full throttle as if you wanted to skip the parameter. Green LED will blink 3x and motor will beep 3x. Move the throttle back to min position, green LED will be turned off once and motor will beep. Now you will set parameter "B" .

- 4) **parameter "B" – brake:**

set according to the "How to program the desired "value" in parameter you are setting" (see above) set the desired value and move to next parameter by "Enter" sequence – also described above

- 5) **parameter "C" – type of cells:**

set according to the "How to program the desired "value" in parameter you are setting" (see above) set the desired value
By sequence „ENTER“ (set full throttle – back to min. throttle) you terminate programming. **Turn controller off !**

| Parameter | Value of parameter → | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----------------------|--------------------|--------------------|---------------------------|---------------------------|---------------------------|------|------------|
| 1 | Mode choice | Parameters setup ↓ | | | <u>„BASIC mode“</u> | -- | -- | -- |
| 2 | Brake | next parameter | Brake off | light | <u>medium</u> | high | hard | extra hard |
| 3 | Type of cells | next parameter | <u>NiCd / NiMH</u> | Li-Ion, Li-Pol 2 cells | Li-Ion, Li-Pol 3 cells | Li-Ion, Li-Pol 4 cells | -- | -- |

Notice: - Default setting is **bold and underlined**

- „next parameter“ means skipping to the next parameter by directly setting „ full throttle“ in the parameter (the skipped parameter will not be changed)

WARNING:

You risk destroying the controller for:

- connecting more battery cells to the controller than the max. number specified in the technical data
- reversing connections to the accumulator
- shortcutting of wires to motor when batteries are connected
- changing motor and accumulator outlets
- overloading of the BEC with bigger currents or bigger power loss than is specified in technical data
- water in the controller (except for „hydro“ versions“)
- metal objects in the controller (screwdrivers, wires, etc.)
- disconnecting the controller from batteries or turning off the controller while motor is running (or still turning)

SECURITY WARNING:

Always disconnect the accumulators when not operating the model !!! Small current consumption occurs even when controller is switched off. Do not leave model with connected accumulators unattended ! Do not charge batteries when connected to the controller ! If the controller is connected to batteries do not stay in the reach of the propeller even when the controller is switched off ! Please notice that running motor with propeller is very dangerous !



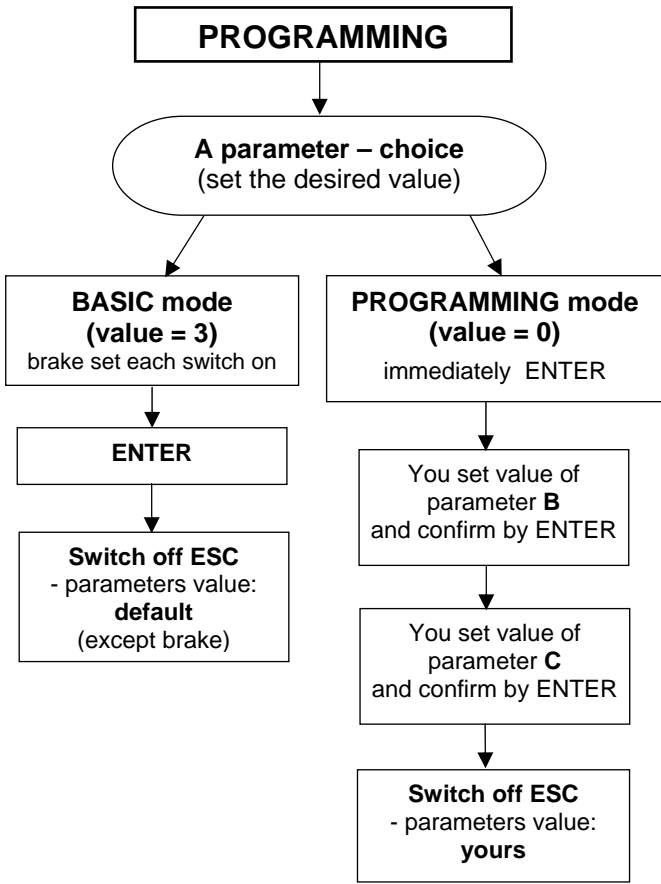
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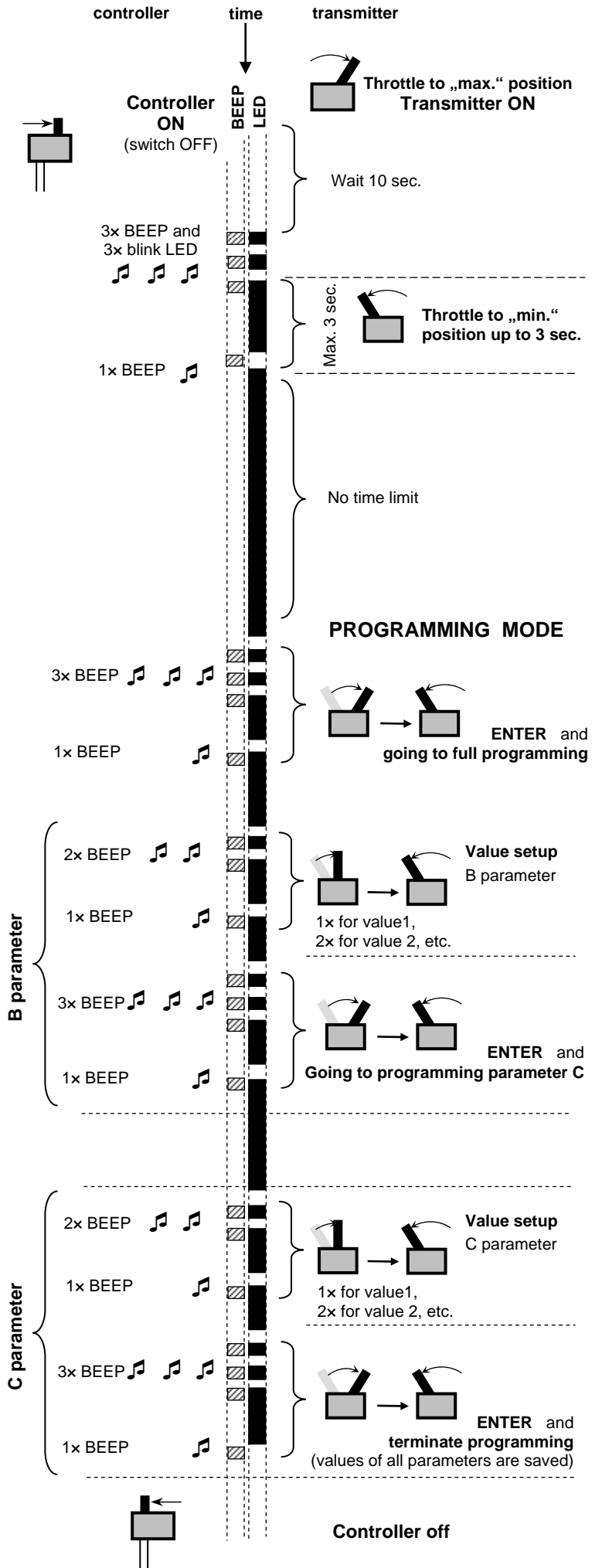
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PROGRAMMING TMM xxxx, advanced line



PARAMETERS SETUP



Legend:

