

1. The technical data:

	SL 10	SL 20	SL 30	SL 45	SL 80	SL 110
Max. continuous current, Amps	10	20	30	45	80	110
Max. peak current, Amps	15	25	35	60	110	150
Voltage, V	5,5 - 28 (5 - 18 NiMH / 2 - 6 LiPo)					
Cable cross-section, mm ²	0,5	1,0	1,5	2,0	3,34	3,34
BEC: Voltage, V	5					
Continuous current, Amps	1,2	2	2	2	2	2
Weight (include all cables), g	8	16	21	32	48	57

2. Features:

- The settings of controller allow the user to get a maximum performance from all types of brushless motors
- Instant throttle response and accuracy of acceleration is especially important qualities for 3D flying
- Smooth, comfortable and safe helicopter rotor speed. Excellent governor modes for any type of helicopter. Rotor RPM is accurately maintained during extreme 3D flying when flight loads will decrease the battery voltage
- The five settings of brake type that allows minimal time to stop motors rotation. It is especially important at use of folding propellers on powered gliders
- Ability to use pistol style surface vehicle transmitter, for example; an installation on a boat
- There are many settings of controllers
- Returning to defaults settings.
- Change rotation direction
- Support of all types battery packs
- Auto shut down motor when signal is lost or radio interference becomes severe
- Audible and LED signal
- Choice of switching on-off built in starting melody or loading of the users starting melody.
- Alarm notifies of signal lose.
- Switching of the built in or editing/loading of a user's throttle curves
- Convenient navigation at viewing and change of settings of controller by means of the transmitter

You may change the settings of Markus SL controller with your transmitter and receiver or with the Markus USB-Cable (sold separately) and your PC. There are more programmable options available with the Markus USB-cable and also programming the controller using a PC will make the process of setting parameters easier and clearer. When using Markus USB-cable you will be able to have access to the latest software updates as they become available!

3. Installing and connecting the controller:

The motor is connected to the side of the controller that has three power wires. The three speed controller wires should be soldered directly to the three motor wires. The connection is also possible by using appropriate connectors, ensuring a reliable contact and designed for the appropriate current. **These connections must be insulated to ensure they are isolated from contacting any conductive material!** To change the rotation direction, change the setting of your controller or swap any two motor wire connections. Connect the speed controller receiver connector (the three color wires with a connector) to the proper channel on your receiver (usually channel 3). The battery pack is attached to the side of the controller that has only two power wires (red "+" and black "-") and also has the radio connector. Attach the wires of battery pack to the wires of controller (the red "+" controller wire to the red "+" battery wire, the black "-" controller wire to the black "-" battery wire).



You must be sure that the polarity is correct when connecting the speed controller! Incorrect polarity could permanently damage the controller! We recommend using polarized connectors, ensuring that the polarity is correct! Install the speed controller in the model so that it is isolated from, vibration and shock using double sided foam tape. Allow space around the speed controller for cooling. Make sure that there is sufficient cooling of the motor and speed controller by the directing adequate cooling air from the outside airflow.



If you are not using the model, always disconnect the battery, because the small current of controller can drain batteries below allowed voltage.

4. A choice of number of servos for your model

The most part of speed controllers has a built-in linear BEC for powering of a receiver and servos. The built-in linear BEC of controller can hold currents up to 2 A (for SL10 up to 1.2 A) therefore we recommend use of the following table for a choice of number of servos:

	5-6 NiXX	7-8 NiXX / 2 LiXX	9-10 NiXX / 3 LiXX	>10 NiXX / >3 LiXX
Micro servos	5-6	4	3-4	X
Standard servos	4-5	3-4	2	X



BEC input voltage is possible up to 12.6V (3 Lipol). If you want to use 4 LiPo battery packs, you must remove central tap (red wire) from servo connector. And also you need to isolate this tap properly. For higher voltages you can use an external battery or an external Markus pulse BEC for receiver and servos supply.

5. Recommendation to Auto-LiPo mode

The voltage of full charge LiPo battery is from 4,1 to 4,2 V per cell and a voltage of discharge LiPo battery from 2,9 to 3,1 V per cell. Please take care when using Auto-LiPo mode so if you use discharge 4 cell LiPo battery the Auto-LiPo mode it will see it as a 3 cell LiPo battery and your 4 cell pack will be allowed to discharge below its minimum voltage. This is not malfunction or a defect of a software of the controller it is normal and please be use caution when in Auto-lipo mode.

Number of cells in a battery pack	Voltage of a discharge battery pack	Voltage of a full battery pack
2S LiPo	5.8 - 6.2 V	8.2 - 8.4 V
3S LiPo	8.7 - 9.3 V	12.3 - 12.6 V
4S LiPo	11.6 - 12.4 V	16.4 - 16.8 V



The mode "Auto Li-xx" is used only for 2-4 cells LiPo packs! If you use more than 4 cell LiPo battery packs, so you must set cut-off voltage to 12,0 V! Always use only fresh charged LiPo batteries for "Auto Li-xx" mode! Correct number setting is possible only for full or partial charge battery.

6. WARRANTY:

All Markus products are accompanied by an one-year manufacturer warranty against defects in materials and workmanship. This warranty does not cover damage due to misuse, abuse, neglect, or incorrect wiring. Do not connect the speed controller to just "any" kind of power source. Take care to ensure the right polarity of NiCd/NiMH or LiPo power packs only. Do not connect the motor battery to the wrong polarity, the speed controller will be severely damaged. Controllers must have original packing and label!

WARNING: Controllers WILL NOT be covered under the warranty for:

- connecting more battery cells to the controller than the max. number specified in the technical data
- reversing connections to the accumulator
- overloading
- overloading of the BEC with bigger currents or bigger power loss than is specified in technical data
- water in the controller
- mechanical damages

