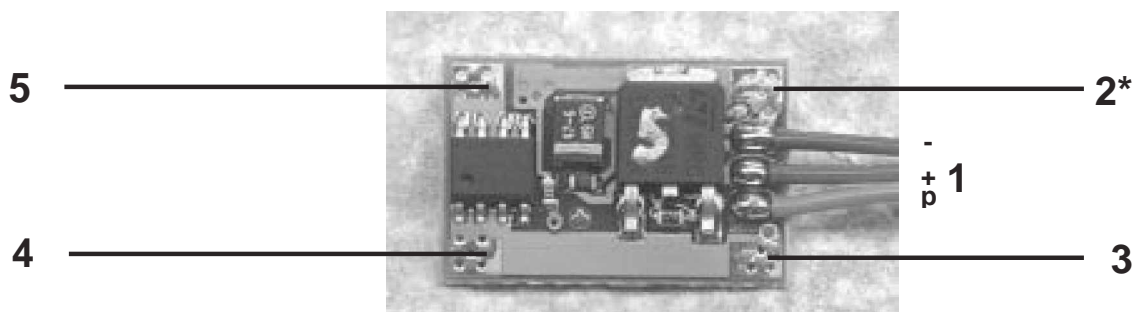
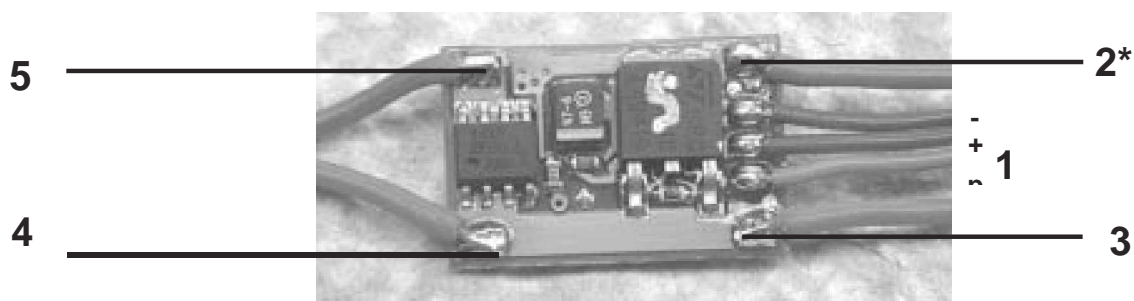


slim-05be, -10be, -10Ce, -105be



slim-05bek, -10bek, -10Cek, -105bek



Key to illustration:

- 1 Receiver cable, 3-pin:
- = negative (black or brown),
+ = positive (red),
p = pulse (white or orange)
- 2 Battery connection, neg. (-), black
- 3 Battery connection, pos. (+), red
- 4 Motor connection, pos. (+), (red)
- 5 Motor connection, neg. (-), (blue, yellow)

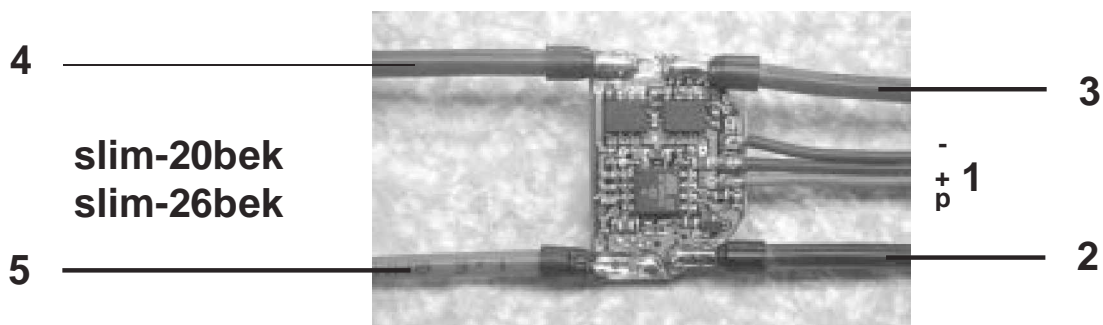
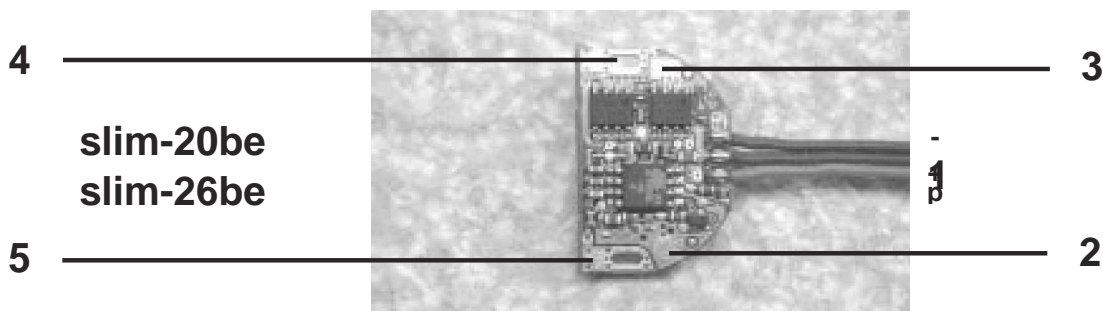
[*] Durch Anlöten einer 1,5mm² Minus-Akkuanschlußleitung (Die Leitung # 2 wirkt dann als Kühlfahne) kann die BEC-Verlustleistung auf ca. 1,5 W erhöht werden - sinnvoll dann, wenn hohe Zellenzahlen verwendet werden. **Max.** 4 Spezial-Slowflyer Servos mit einer max. Stromaufnahme von 250 mA dürfen bei bis zu 7 Zellen Versorgungsspannung verwendet werden, ansonsten nur 3 Stück.

Condition as shipped: slim-05be, -10be, -10Ce, -105be: excl. battery and motor cables.

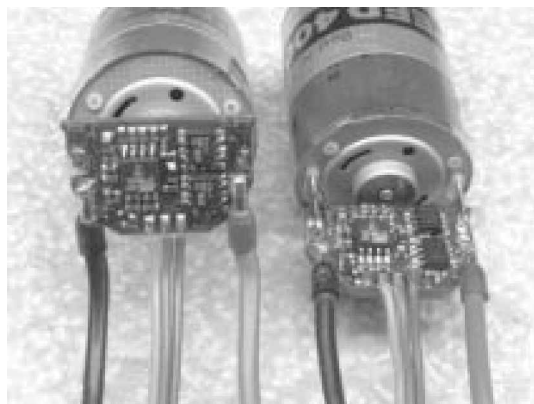
Notes:

When soldering cables to the controller use only electronic grade rosin-cored solder. Using a separate liquid or paste flux will wreck the **slim**, as these materials are both conductive and corrosive! No warranty!

Please be sure to insulate the slim with the heat-shrink sleeve supplied once you have soldered the cables to the controller.



Mounting sample
slim-20...26be



Key to illustration:

- 1 Receiver cable, 3-pin:
- = negative (black or brown),
+ = positive (red),
p = pulse (white or orange)
- 2 Battery connection, neg. (-), black
- 3 Battery connection, pos. (+), red
- 4 Motor connection, pos. (+), (red)
- 5 Motor connection, neg. (-), (blue, yellow)

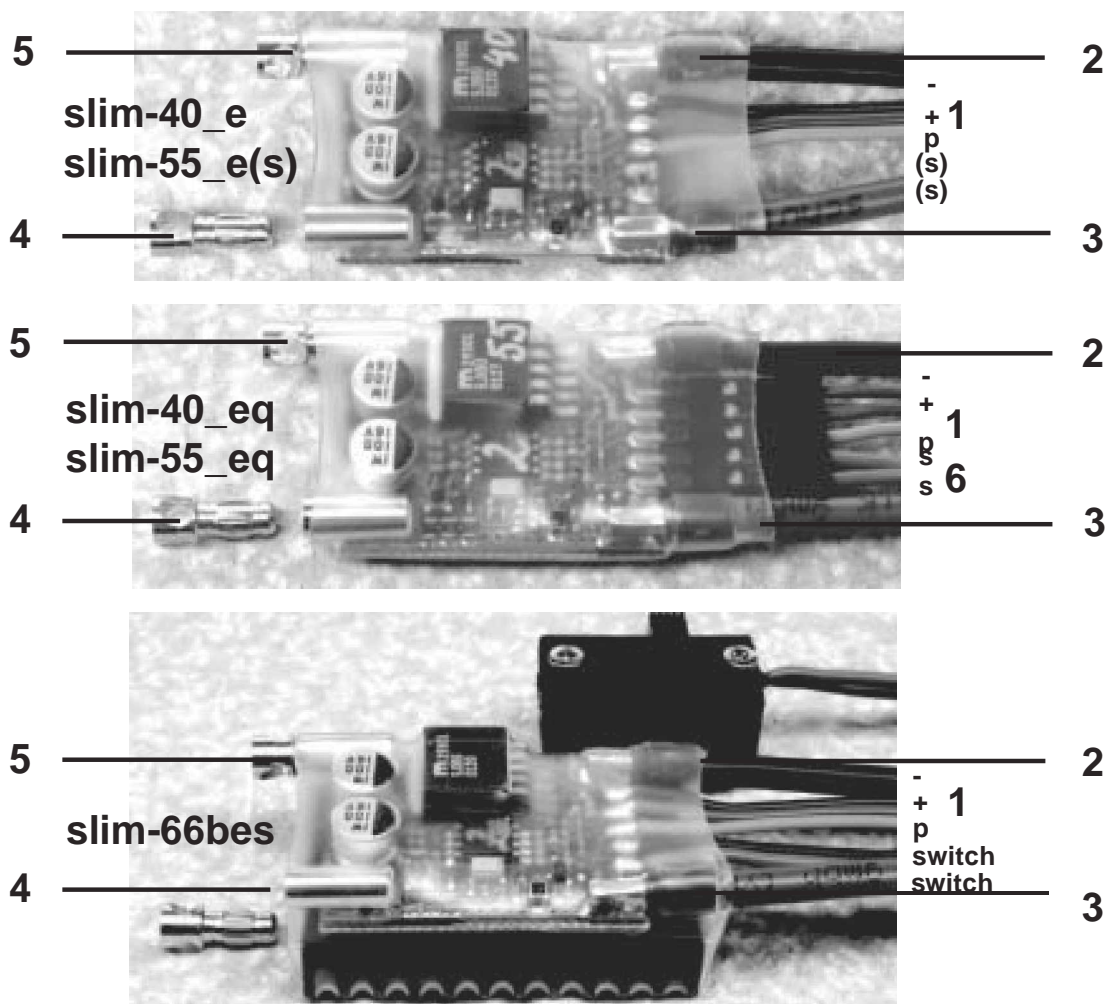
Notes:

slim-20be, slim-26be are shipped without battery and motor cables.

When soldering cables to the controller use only electronic grade rosin-cored solder. Otherwise no warranty! Using a separate liquid or paste flux will wreck the **slim**, cable and contacts, as these materials are both conductive and corrosive!

A short circuit between cables #2 and #5 will damage the brake. no warranty!

Insulate slims before use with heat shrinking tubes (enclosed).



Key to illustration:

- 1 Receiver cable, 3-pin:
- = negative (black or brown),
+ = positive (red),
p = pulse (white or orange)
- 2 Battery connection, neg. (-), black
- 3 Battery connection, pos. (+), red
- 4 Motor connection, pos. (+), (red)
- 5 Motor connection, neg. (-), (blue, yellow)
- 6 Switch socket (2 pins: s, s - bridged at delivered state)

Note:

When soldering cables to the controller use only electronic grade rosin-cored solder. Otherwise no warranty! Using a separate liquid or paste flux will wreck the **slim**, cable and contacts, as these materials are both conductive and corrosive!

Dear customer,

the slim which you have purchased is a micro-computer controlled speed controller for electric motors, developed and manufactured entirely in Germany.

All versions of the **slim** are amongst the world's smallest, lightest and most powerful speed controllers.

The slim's ips (intelligent programming system) makes it as simple as possible to configure the controller to suit any radio control system.

The qpi-system (quick plug in) fitted to the **slims** ending with a "q" enables you to leave the power and receiver system wiring in the model undisturbed if you wish to install the controller in a different model, or if you have to send the **slim** to us for servicing.

The integral EMF brake fitted to the **slims** means that it can also be used to control motors with folding propellers.

Contents

Chapter	Subject	Page
1	Warning notes, cautions	5
2	Ensuring safe, trouble free operation	6
3	Intended applications	7
4	Protective circuits	8
5	Monitor displays	9
6	Installing and connecting the unit	9
7	Legal matters	10
8	Connector systems and mounting instructions, servos	11
9	Using the controller for the first time	13
9.1	ips - the intelligent programming system	13
9.2	Symbols and terminology	13
9.3.1	Normal operation - propeller brake mode	14
9.3.2	No - brake mode	15
9.3.3	Gearbox mode, brake enabled	16
9.3.4	slim-45He (controller for helicopters)	17
9.3.5	slim-45Ce - car mode (proportional brake)	18
9.3.6	slim-45Ce - boat mode (unbraked)	19
10	Specifications	20

1 Warning notes, cautions

Electric motors fitted with propellers are dangerous and require proper care for safe operation. Keep well clear of the propeller at all times when the battery pack is connected.

Technical defects of an electrical or mechanical nature may result in unintended motor runs; loose parts may cause serious personal injury and/or property damage.

The CE-certificate on the speed controller does not absolve you from taking proper care when handling the system!

Speed controllers and soft-switches are exclusively for use in RC models. Their use in man-carrying aircraft is prohibited.

Please ensure that the **slim-40 ... 55's** plug-in receiver cable and switch harness are connected as described in the instructions on page 1 (i.e. in accordance with the colour code on the sticker).

Speed controllers and softswitches are not protected against reverse polarity (+ terminal and - terminal reversed). Connecting the **battery pack** to the **motor leads** of the controller or soft-switch will almost certainly cause irreparable damage. No warranty!

Electronic equipment is sensitive to humidity. Speed controllers and soft-switches which have got wet may not function properly even after thorough drying. You should send them back to us for cleaning and testing.

Do not use speed controllers in conjunction with a power supply connected to the mains. Energy reversal can occur when the motor slows down and stops, and this may damage the power supply or cause an over-voltage condition which could damage the controller.

Never disconnect the flight pack while the motor is running, as this could cause damage on a speed controller or a soft-switch.

On no account connect a separate receiver battery or an electronic battery switch (two receiver batteries), as this may cause damage to the speed controller and could cause current to flow from the receiver battery to the motor.

If you want to use a separate receiver battery cut through the + wire in the receiver cable, or pull it out of the connector if possible.

However, for greater protection against motor-induced interference it is always better to use a speed controller with an opto-coupler.

Protect the speed controller or soft-switch from mechanical loads, vibration, dirt and contamination.

Keep the cables to the battery and to the motor as short as possible.

Never leave the flight battery connected when ...

... the model is not in use and/or

... the battery pack is being charged.

Although some speed controllers feature a separate On/Off switch, this does not isolate it completely from the battery.

Note the limited capacity of the BEC system when used with high current load and/or a high number of cells in the flight pack (see Section 4 and 10).

Speed controllers and soft-switches can only function properly if they are in full working condition. The protective and monitoring circuits can also only work if the speed controller is in good operating condition.

In the case of motor failure (e.g. short circuits in the windings) the over-temperature sensor in the controllers may react too slowly to prevent damage. Switch the motor off immediately to prevent permanent damage to the speed controller.

If a transistor fails in the throttle stage, neither a "stop" signal from the transmitter nor the temperature monitor nor the current limiter will be able to throttle back or stop the motor.

Note: Please remember that the monitoring circuits are unable to detect every abnormal operating condition, such as a short between the motor cables. Note also that a stalled motor will only trip the current limiter if the motor's stall current is well above the controller's peak current. For example, if you are using an 80 A controller in conjunction with a 20 A motor, the current monitor will not detect an excessive current even when the motor is stalled.

2 Ensuring safe, trouble-free operation

Use only compatible connectors. A 2 mm pin cannot provide reliable contact in a 2.5 mm socket. The same applies with 2mm gold-contact pins and 2 mm tin-plated sockets.

Please also remember that ...

... the wiring of your RC-components must be checked regularly for loose wires, oxidation, or damaged insulation, especially when using a BEC system.

... your motor is suppressed by at least two, better: three, ceramic capacitors of 10 to 100nF / 63 to 100V. Extra suppression can also be achieved using filters with coils.

... your receiver and the aerial must be at least 3 cm (>1") away from motor, speed controller and high-current cables. For example, the magnetic fields around the high-current cables can cause interference to the receiver.

... all high-current cables must be as short as possible. Maximum length between flight pack and speed controller have never exceed 20 cm (7"), between speed controller and motor should not exceed 12 cm (4").

... all high-current cables longer than 5 cm (2") must be twisted together. This applies in particular to the motor power cables, which are very powerful sources of radiated interference.

... in rc-cars the aerial must never be fitted in a tube which is pushed into a metal holder. If you do not use a short aerial, make some windings close to the receiver.

... in model aircraft: half of the receiver aerial's length should be routed along the fuselage, the other half should be allowed to trail freely (take care not to tread on it). Do not attach the end of the aerial to the fin!

... in model boats: half of the receiver aerial's length should be deployed inside the hull above the waterline, the other half should be threaded into a small tube mounted upright.

Every time you intend to use the power system - before you turn on the receiver - make sure that ...

... no one else is using the same frequency (identical channel number).

... your transmitter is switched on and the throttle stick is (as a rule) in the STOP position (exceptions see Section 9).

Carry out a range check before each flight. Ask an assistant to hold the model aircraft and set the throttle stick to the half throttle position (full throttle if using a soft-switch). Collapse the transmitter aerial. Walk away from the model to the distance stated by the RC system manufacturer (this might be a distance of about 50-60 m = 200'). Make sure that you still have full control of the system at this range.

As a general rule: receiver interference is more likely to occur when using a controller or governor with BEC system, as these units do not feature an opto-coupler with its optical link.

When Ni-Cd batteries approach the end of their charge, voltage falls drastically and quickly. The **slim** detects this and reduces power to the motor automatically. This should leave sufficient energy to bring your model safely back home. However, if you use a small number of cells of high internal resistance and operate at high motor currents, the controller may reduce power before the pack is discharged. You can eliminate this problem by using low resistance straps to connect the cells, or use the direct cell-to-cell soldering technique ("sticks") and short, heavy-gauge wire if you assemble your own batteries.

Your receiver also benefits from the stability of the voltage supplied from the battery. If the BEC voltage is stable, the receiver is less liable to suffer interference.

You may find that there is a slight delay in your slim controller's response to a start or stop command or variations of stick positions and/or you may have slight variations of revolutions at certain stick positions and/or **slim** run for a few milliseconds when the BEC system is switched off. This is due to the micro-processor's characteristics and it is quite normal.

The CE symbol is your guarantee that the unit meets all the relevant interference emission and rejection regulations when it is in use.

If you encounter problems operating the **slim** controller, please note that many problems are due to an unsuitable combination of receiving system components, or an inadequate installation in the model.

3 Intended applications:

slim-05be(k): The controller for the smallest models: Slowflyers / Halfflyers. Motor currents up to 5 A, BEC 5 V / 1 A for up to 4 special slowflyer servos; (5)6-10 Ni-Cd/MH cells. Minimum discharge voltage 4,8 V (5 cells may not be completely discharged).

slim-105be(k): As above, however 100 kHz switching frequency for coreless motors. Better than 250-step resolution over the whole control range for extremely fine speed control.

slim-10be(k): The controller for parkflyers. A smaller unit with this power rating would be virtually impossible: Motor currents up to 10 A, i. e. even for a "normal" Speed 400; BEC 5 V / 1 A; (5)6-10 Ni-Cd/MH cells. Minimum discharge voltage 4,8 V (5 cells may not be completely discharged).

slim-10Ce(k): Designed for boats or 24th scale cars. Special start-up process (ips-car/boat) to activate proportional brake or no brake.

slim-20be(k): The controller for small models. Can be soldered directly to the terminals of a speed 280...400 motor. High capacity BEC circuit 5 V / 2,0 A; 6-10 Ni-Cd/MH cells.

slim-26be(k): As above, can be used however with Speed 600, Speed 480 and AP 29.

slim-40be(q): This speed controller covers a very wide range of applications, and can be used with 6 to 12 Ni-Cd cells. The BEC system is rated at 5 V / 3,0 A and handles (depending on cell count and servo type) up to 4-6 servos (aircraft with 2 aileron servos, rudder and elevator servos).

slim-40Heq: The special version of the slim-40 especially for helicopters with 4 servos and a Gyro. No brake. Load compensation mode. Fixed stick positions for idle and full throttle = fixed throttle travel. Please use servo travel adjust and 3- or 5-point throttle curve to suit motor power to your helicopter.

slim-40CWe/-55CWes: The perfect unit for boats and cars (for 7,2 V motoren with 13 resp. 10 turns). Waterprotective sealing. Can be used with 6 to 12 Ni-Cd/MH cells. BEC 5 V / 3,0 A. Special start-up process (ips-car/boat) to activate proportional brake or no brake. - 55CWes with on/off switch.

slim-55beq: identical with the **slim-40be(q)**, however for higher motor currents or less losses at identical motor currents.

slim-66bes: Can be used up to 12 Ni-Cd/MH cells from those, who want save the weight of a receiver battery also in medium sized aircraft. The 5 V / 5 A high-current BEC circuit can easily handle the highest peak currents likely to be encountered, this means that the **slim-66bes** can be used in models with flaps.

Highlights common to all units:

Ultra-small, ultra-light units due to absence of cooling fins. A crucial point for all modellers who require maximum performance combined with minimum weight.

Better than 200-step resolution over the whole control range for extremely fine speed control.

Controllers work reliably right down to the last scrap of energy in the battery pack.

"**Auto-arm**" function and "power on reset".

High 1 kHz pulse frequency, keeping the motor and controller cool and shielding the receiver system from interference.

"**ips**" (intelligent programming system) with no pots! The speed controller automatically configures itself every time to the stick travel when you switch your receiver on respectively you connect your battery pack. The brake can also be disabled in the same way if required.

"ips" Also includes a special setup variant for geared motor systems. Fixed stick travel between braking point and full-throttle point, soft-start for throttle and brake. It is normally essential to apply full-throttle at the start of the flight. This variant only learns one stick position (brake point) when in use. Fine-tuning the system to match the transmitter's stick travel is still possible, but must be done by adjusting the travel at the transmitter.

"**ips-car**" only learns neutral point. Fixed stick travel between braking point, neutral and full throttle. Proportional brake / no brake mode.

During the configuration process the motor acts as a loudspeaker to give you audible confirmation of the procedure.

"**qpi**" system (quick plug in for the four largest slim controllers) features integral high-current sockets (for pp35 plugs) and receiver cable socket (including an optional On / Off switch) to allow motor or speed controller to be changed quickly and easily when moving the unit from one model to another. It also means, that all the "cable spaghetti" can be left in the model if the controller needs a repair.

4 Protective circuits

Note: the monitor circuits are effective, but they cannot detect every possible operating condition.

Temperature monitor (except slim-08e):

The temperature monitor switches off the motor. You can reset the unit using the "auto-arm" function (throttle stick to stop for about 2 sec.)



If the motor windings are short-circuited the temperature monitor reacts too slowly to prevent damage. Switch the motor off immediately to avoid permanent damage to the speed controller.

Voltage monitor:

As soon as the voltage of the drive battery falls back to the 5V threshold the motor is throttled back. The **slim-25...50** also throttles back if BEC voltage falls below 5 volts due to excessive current, as this will cause a thermal overload condition in the BEC circuit.

If the situation which caused the controller to throttle back continues for more than a short time, the unit switches the motor off.

Of course, you can re-start the motor again briefly by moving the throttle stick back to "stop" for about 2 seconds to re-arm the system. The speed controller - and your model aircraft - remain fully controllable until the last drop of usable energy is exhausted. We can not predict how long you can still control your model with the residual battery charge as this depends on many parameters such as the number of cells in the pack, the cell type, actual motor current and the way you control your model. The only solution is for you to time the period yourself with the model on the ground. If the voltage monitor trips, i.e. the motor starts to throttle back without your intervention, you should stop the motor at once with the throttle stick in any case so that you have the maximum possible reserve of power.

Caution: overloading the BEC system usually occurs due to excessive servo current drain caused by too many servos and/or stiff linkages. This situation is dangerous, as it can cause the BEC-generated voltage for the receiver to collapse. If the voltage recovers, the **slim** then automatically re-configures itself. However, it will then adopt the wrong parameters, based on whatever position the transmitter's throttle stick happens to be in.

Current monitor:

Our **slim** controllers feature a current monitor circuit which trips when the current rises highly above the specified maximum value. If the motor is stalled, the motor is throttled back. This means, that a motor which draws an excessive current will never reach full-throttle, and the current may stay below the specified maximum value. If **slim** is some seconds in current limiting mode, it will disarm itself (switching off the motor).

Receiver signal monitor:

If the receiver signal fails, or the signal is longer or shorter than the usual range of values, the smart controller reverts to hold mode for few seconds before switching to disarmed mode.

Reverse polarity protection:



These speed controllers are not protected against reversed polarity!

Watchdog:

If this circuit is tripped the speed controller stops working briefly and then reverts to normal operation.

If you are using a mechanical gyro:

Always disconnect the flight pack before turning off the receiver. As the gyro runs down it may produce sufficient voltage for the receiver to send an unwanted signal to the controller, and this could cause the motor to burst into life!

5 Monitor displays

The slim is not fitted with LEDs to indicate its operating status.

However, when the unit is being configured the set stick end-points are (in dependence

of the used slim-type or ips-mode) confirmed by a beep from the motor or a barely perceptible "blip" in full-throttle position when normal using with activated brake.

6 Installation, connections

Installing in the fuselage (slim-25...50be):

Velcro (hoop and loop) tape is the ideal method of mounting the controller in the fuselage. Do not pack the **slim** in foam as this may lead to a heat build-up in the controller.

Receiver connection:

Connect the receiver cable attached to the **slim** to the receiver servo output corresponding to the throttle stick on the transmitter (or a switch if that is your preference).

The **slim** receives its control signal via this receiver socket, and at the same time supplies the operating voltage to the receiver.

Check regularly that the receiver cable and - if existing - the switch harness are undamaged and firmly seated at the **slim**.

On no account connect a separate receiver battery or an electronic battery switch (two receiver batteries), as this may cause damage to the speed controller.

If you want to use a separate receiver battery cut through the + wire in the receiver cable, or pull it out of the connector if possible.

However, for greater protection against motor-induced interference it is always better to use a speed controller with an opto-coupler.

More "important tips" you can read on our **homepage**.

Length of connecting cables:

The cables to the flight battery and - in particular to the motor - should be kept as short as possible. Long cables tend to act as aerials and radiate interference; they also add unnecessary weight. See also section 2.

Power-connection battery <--> slim:

It is essential to use **polarized** gold-plated-contact connectors - fitting any other type of connector invalidates the warranty.

Connectors which do not have a polarised insulator can be made safe (i.e. polarised) by soldering the **slim**'s positive battery wire to a socket, and the **slim**'s negative wire to a plug.

We recommend that you choose your connectors from our selection in Section 8.

Power-connection slim <--> motor:

slim-5...10: Solder the motor to the **slim** either directly or with very short cables.

slim-20...26: Solder the blade contacts on the Speed 400 directly on/into the belonging slots of the **slim**. There must be some space between the printed circuit board and motor. The blade contacts of a Speed 600 can directly be soldered from the left and the right to the contact pads of the **slim**.

slim-40...66: Solder one blue (or yellow) and one red cable (length max. 5 cm = 2") directly to the motor terminals, or shorten the existing motor cables to a length of max. 5 cm (2"). Solder the cables to the **pp35** plugs supplied (plugged into the **slim**).

Hints to slim-05 ... slim-26:

Be sure that you only solder on the contact pads and do not make any short circuits to the neighbouring electronic parts.

When soldering cables to the controller use only electronic grade rosin-cored solder. Using a separate liquid or paste flux will wreck the slim, as these materials are both conductive and corrosive! No warranty!

7 Legal matters

7.1 Warranty conditions

All **schulze** products are 100% dynamically tested by using a battery and a motor. We do not simulate tests.

If your unit develops a problem, please return it to **schulze** or to the importer. Include a description of the problem. Please be careful and precise, and list the battery voltage and capacity, motor type, conditions under which failure occurred etc. A note saying "doesn't work" does not help us much, and it may lead to wasted time in trouble-shooting. Before returning the unit for repair, please test it "one more time" carefully. If we find that the controller is operating correctly, whether it is under warranty or not, we will make a charge for our lost time.

Warranty claims are processed according to our current General Conditions of Business, which are enclosed in our price list or our web page. The warranty does not cover consequent damage or damage due to incompetent usage, such as: damage caused by moisture, by soldering cables using an acid-based flux (especially relating to speed controllers), or due to the use of non-polarised connectors. This means that you have to ship your controllers to us originally as used (particularly do not remove the plug system on the leads!). The warranty does also not cover those controllers which are not used with those connectors (of the fitting current) shown in our operating instructions and/or those connectors which can not serve the reliable function e.g. by dirt.

One further note:

If a problem arises with a schulze device, send it straight back to us or our authorized representative (see catalogue); don't attempt to repair it!

This allows us to repair it as quickly as possible, as we can detect warranty defects without any doubt and thus keep costs low. You can also be certain that we will fit genuine replacement parts which are a perfect match to your device. (Very few hobby shops are equipped to analyze and repair surface-mount printed circuit boards.)

We reserve the right to refuse repair to units which have been modified or "improved" by unauthorized "experts".

You also have the comfort of a properly repaired unit with a renewed warranty. The warranty period of repaired devices is applicable only to the repair. This period is shorter than the warranty period of a new product (See general conditions of business).

7.2 Liability limits / compensation

We at Schulze Elektronik GmbH are unable to monitor methods of installation and operation, and have no control over how you fit, use and maintain the devices we produce. For this reason we accept no liability for loss, damage or costs which arise from the incorrect or incompetent use of our products, or are connected with that use in any way.

In so far as the law allows, our obligation in respect of compensation, regardless of the legal grounds, is limited to the invoice value of that quantity of goods which was immediately involved in the event which caused the damage. This does not apply if legally binding regulations oblige us to accept unlimited liability in a particular case, or if deliberate or gross negligence can be proved on our part.

7.3 CE certification

The products described in this manual are manufactured in accordance with all specific and mandatory European CE guidelines:

EMI 89/336/EEC, 91/263/EEC and 92/31/EEC.

The products have been tested according to the following norms:

EMI-emissions:	EN 50 081-1:1992
EMI-resistance:	EN 50 082-1:1992 or EN 50 082-2:1995

The design and construction of our products comply with the requirements for safe operation. EMI emissions were tested under realistic conditions, i.e. using suitable motors close to the maximum allowed currents. The use of resistors instead of motors do not create maximum emission levels.

Further testing is carried out to ensure adequate EMI resistance against emissions from other apparatus. The RF signals used for these tests are similar to those produced by mobile telephones and RC transmitters.

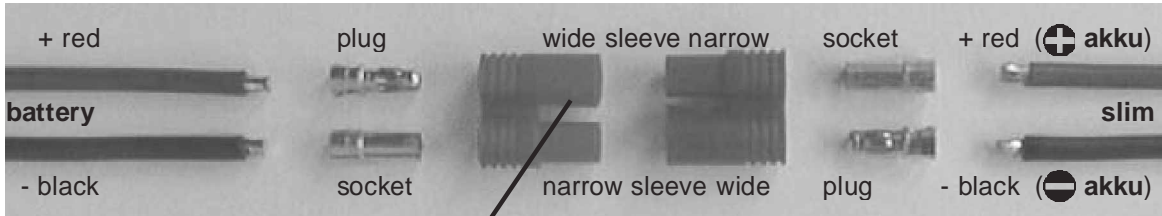
We wish to point out again that our products are tested under realistic conditions for the most dangerous scenario: exposed to the field of a powerful transmitter, the motor must not start while you are working on the model.

Hint: slim-08e and -18be must be insulated in heat shrinking tube.

Problems involving our products are most likely caused by unsuitable combinations of radio components or improper installations.

8 Connector systems and mounting instructions; servos

8.1 3.5 mm gold-contact connector system (pp35); max. load > 80A



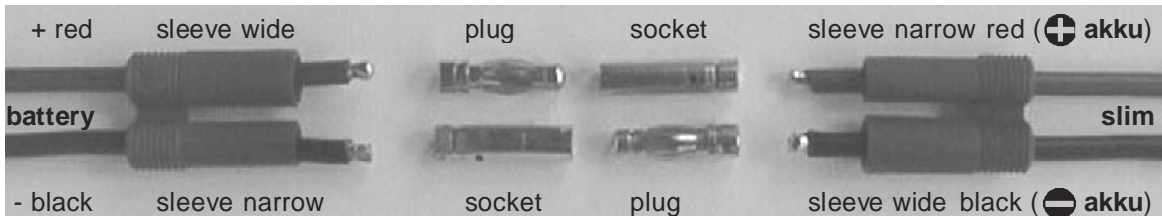
Caution: remove locating lug from battery cable. Do not remove lug from any cables attached to controllers or charge leads!

Manufacturer's information: the pp35 plug is very short, and this presents the danger that the spring contact could lose its resilience due to excessive heat build-up during the soldering process. You can side-step the problem by keeping the temperature below 200°C as follows: either remove the contact carefully before soldering, or simply push the plug into a piece of wet fine-grain sponge for soldering, or plug it in a 3.5 mm hole of a copper-block.

Fit the connectors in the order shown above; the contacts are pressed in as follows:

- Place plastic sleeve vertically on table, grip end up.
- Push contact down into sleeve.
- Place 2.5mm wide screwdriver blade on top of cable solder joint inside sleeve.
- Tap screwdriver to press contact into sleeve until latch engages.

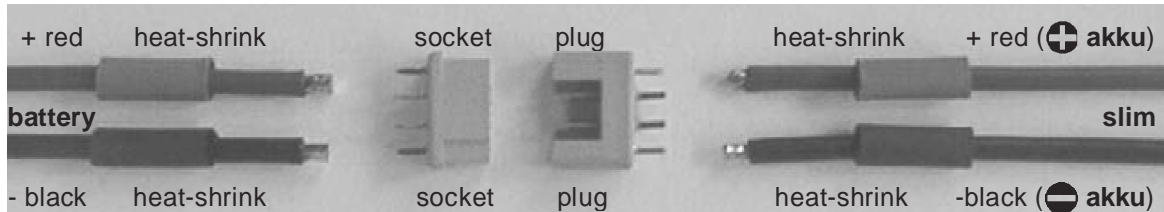
8.2 4 mm gold-contact connector system (CT 4, also CT 2); max. load > 80A



Fit the connectors in the order shown above; the contacts are pressed in as follows:

- Rest plastic sleeve on vice jaws with cables hanging down.
- Close vice jaws until cables are just free to move.
- Fit plug into socket and tap into sleeve until latch engages.
- Fit socket onto plug and tap into sleeve until latch engages.

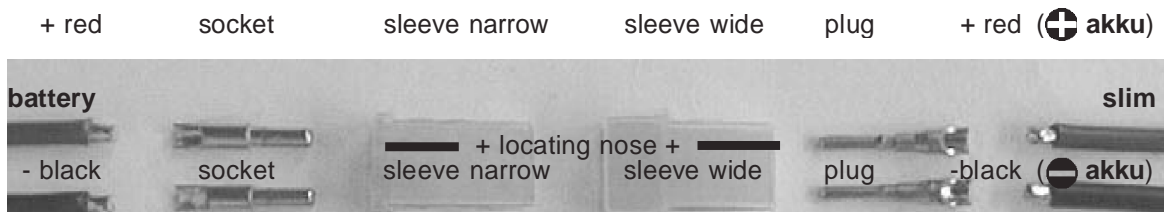
8.3 MPX gold-contact connector system (green or red); max. load ~30A



Fit the connectors in the order shown above; the contacts are soldered as follows:

- To center the contacts fit plug and socket together before soldering.
- Tin all 6 exposed contacts of plug or socket.
- Fit cable end into triangle of contacts, solder to all three contacts.
- Position heat-shrink sleeve and shrink over joint.

8.4 2,0 / 2,5 mm gold-contact connector system; max. load ~30A



Fit the connectors in the order shown above; the contacts are pressed in as follows:

- Place plastic sleeve vertically on table, grip end up.
- Push contact down into sleeve.
- Place 2.5mm wide screwdriver blade on top of cable solder joint inside sleeve.
- Tap screwdriver to press contact into sleeve until latch engages.

8.5 Suitable servos for BEC operation (selection)

DYMOND	D 60
FUTABA	5102
GRAUPNER	C261, C341, C351, C3041, C3321
MEGATECH	MTC FX200
ROBBE	FS40 #8433
VOLZ	Microstar, Wingstar, Zip

9 Initial use

9.1 ips, the intelligent programming system

for configuring the **slim** to suit your application

The **ips** reflects the initial set-up procedure used with our speed controllers until recently, i.e. the process of adjusting the braking point with the help of a trim pot. For any normal application with an EMF brake (for a folding propeller) the start-up procedure is entirely conventional: throttle stick to "motor stopped", switch first transmitter-, then receiver on, hold model in launch position, apply full throttle, launch.

The controller has to be adjusted to match the stick travel of your transmitter - a procedure we term "configuration" - and with these units the process is fully automatic. The brake point and the full throttle point must be configured in such a way that full stick travel is always available to operate the motor, as this provides the finest possible level of control. If you wish to use the controller in a model which does not require a propeller brake, or you are using the Car-versions or the Helicopter-version, the procedure is slightly different (see below).

If you have a transmitter with adjustable servo travel we recommend that you set throttle-servo to normal full travel, i.e. +/- 100%. Adjust Multiplex servo center pulse width to 1.5 ms (= -22% center).

A single beep mostly indicates that the controller is armed! When you next move the throttle stick, the motor will start running. If the **slim** beeps twice when the transmitter stick is at the brake position (double beep = full-throttle position), you must disconnect the controller and operate the servo reverse facility on your transmitter, otherwise the controller would arm itself (single beep) at the full-throttle setting of your transmitter and would run at full throttle with the stick at the "stopped" position - the exact opposite of what is required.

9.2 Symbols and terminology

Stick: The throttle stick on the transmitter

Neutral position (self neutralising stick)

Idle position (position where the motor just barely runs) or stop position (brake).



Brake position or idle position

Position of the throttle stick where the motor stops or just barely runs.



Full-throttle position

100% voltage passed to the motor.



Wait (0.5 seconds)



Audible indicators:

These indicators are only audible when a motor is attached, as the motor itself acts as the loudspeaker.

Single beep

Double beep

Momentary interruption in running (inverse beep)

9.3.1 Propeller brake mode (slim-__be)

a Receiver off (flight battery disconnected)

b Set throttle stick to brake position



c Switch transmitter on

TXon

d Switch receiver on (connect flight battery)

RXon

e **slim** confirms brake position with a single beep, and is now armed!

f Hold model in launch position, keep clear of danger area around propeller!



g Move throttle quickly to full-throttle position and ...



...leave it there for about 1/2 second. Motor is already running - as with a conventional speed controller



h **slim** confirms full-throttle position by interrupting the motor run very briefly - a barely perceptible "blip"

i The **slim** is completely configured and the model can be flown



The configured data is retained in the **slim** until you disconnect the flight pack or switch off the BEC system.

9.3.2 No-brake mode (slim-__be)

a Receiver off (flight battery disconnected)

b Set throttle stick to full-throttle position



c Switch transmitter on

TXon

d Switch receiver on (connect flight battery)

RXon

e **slim** confirms full-throttle position with a double beep

f Move throttle quickly to idle position and ...



... leave it there for about 1/2 second



g **slim** confirms idle position with a single beep, and is now armed!

h The **slim** is completely configured



i Place the model in the launch position. Keep clear of danger area around propeller. Open throttle in the normal way to start the flight.



The configured data is retained in the **slim** until you disconnect the flight pack or switch off the BEC system.

9.3.3 Gearbox mode (brake enabled, slim-__be)

Setting the unit for a longer soft-start when throttle and brake are applied.

Full stick travel

- a Receiver off (flight battery disconnected)
- b Set transmitter stick to centre position
(technically: 1.5 +/- 0.15 ms pulse width)
- c Switch transmitter on
- d Switch receiver on (connect flight battery)
- e **slim** detects "gearbox mode", confirms with triple beep
- b Move transmitter stick quickly to brake position and ...
... leave it there for half a second.
(technically: pulse width less than 1.35 ms)
- e **slim** learns brake position, calculates full-throttle position
(brake position + 0.6 ms), confirms with single beep and
is now armed!
- f The **slim** is completely configured and is ready for use.
- g Moving the transmitter stick towards full throttle starts the
motor running. The model can be launched.



TXon

RXon



The configured data is stored in the **slim** until you disconnect the flight battery or switch off the BEC system.

9.3.4 slim-50He - controller for helicopters (no brake)

Fixed stick positions: idle = 1.2 ms, full throttle = 1.8 ms

Excess current and low voltage cause motor to be throttled back, but not immediately shut off.

1 - Normal helicopter speed controller mode

a1 Receiver off (flight battery disconnected)

b1 Set transmitter stick to idle position
(technically: pulse width less than 1.2 ms)

c1 Switch transmitter on

d1 Switch receiver on (connect flight battery)

e1 continue at position **g**



TXon

RXon

2 - Load compensation mode (nearly stable rpm at decreasing battery voltage)

a2 Receiver off (flight battery disconnected)

b2 Set transmitter stick to full throttle position
(technically: pulse width more than 1.5 ms)

c2 Switch transmitter on

d2 Switch receiver on (connect flight battery)

e2 The **slim** detects "load compensation mode", confirms with double beep

f2 Set transmitter stick to idle position
(technically: pulse width less than 1.2 ms)

g The **slim** detects idle position, confirms with single beep, and is now armed!

h The **slim** is completely configured and is ready for use

i Moving the transmitter stick towards full throttle starts the motor running

j The helicopter can be taken off



TXon

RXon



9.3.5 slim-Ce/CWe(s) - car mode proportional brake half stick travel, self neutralising

Splashproof design. Min. motor turns: 12 (with 6 cells)
Excess current and low voltage cause motor to be throttled back, but not immediately shut off.

Recommendation: Schottky diodes can be used to reduce controller temperature when run under part-load conditions or in multi-motor configurations by smoothing out the current flow.

- a Receiver off (drive battery disconnected)
- b Set transmitter stick to centre position (neutral)
(technically: 1.5 +/- 0.15 ms pulse width)
- c Switch transmitter on
- d Switch receiver on (connect drive battery)
- e **slim** learns neutral position,
calculates full-throttle position (neutral position + 0.3 ms)
and brake position (neutral position - 0.3 ms) confirms
with single beep and is now armed!
- f The **slim** is completely configured, the model can be used
- g Moving the transmitter stick towards full throttle starts the motor running
- h Moving the transmitter stick towards full brake slows the model proportionally



TXon

RXon



The configured data is stored in the **slim** until you disconnect the drive battery or switch off the BEC system.

9.3.6 slim-Ce/CWe(s) - boat mode unbraked full stick travel, non self neutralising

Splashproof design

Min. motor turns: 12 (with 6 cells)

Excess current and low voltage cause motor to be throttled back, but not immediately shut off.

Recommendation: Schottky diodes can be used to reduce controller temperature when run under part-load conditions or in multi-motor configurations by smoothing out the current flow. These diodes should be soldered directly across the terminals of each motor. The cathode (ring on diode-body) must be connected to the positive terminal of the motor.

- a Receiver off (drive battery disconnected)
- b Set transmitter stick to centre position
(technically: pulse width less than 1.35 ms)
- c Switch transmitter on
- d Switch receiver on (connect drive battery)
- e **slim** learns neutral position, calculates full-throttle position (neutral position + 0.6 ms pulse width), confirms with double beep and is now armed!
- f The **slim** is completely configured, the model can be used
- g Moving the transmitter stick towards full throttle starts the motor running



TXon

RXon



The configured data is stored in the **slim** until you disconnect the drive battery or switch off the BEC system.

10 Specifications

Type	Current	Ni-Cd/Ni-MH	Dimensions	Weight	Cable	Thrott	Brake	BEC	BEC
Unit	[A]	[cell count]	[mm]	[g]	[mm ²]	[m]	[m]	[V / A]	[W]
slim-05be	5 / 7	(5)6 - 10	20x13 x 5	3	(0.34)	13	20	5 / 1.0 peak	1-1,5*
slim-05bek	5 / 7	(5)6 - 10	21x14 x 6	6	0.34	13	20	5 / 1.0 peak	1-1,5*
slim-10be	10 / 15	(5)6 - 10	20x13 x 5	3	(0.5)	4	14	5 / 1.0 peak	1-1,5*
slim-10bek	10 / 15	(5)6 - 10	20x13 x 5	6	0.5	4	14	5 / 1.0 peak	1-1,5*
slim-10Ce	10 / 15	(5)6 - 10	20x13 x 5	3	(0.34)	4	14	5 / 1.0 peak	1-1,5*
slim-10Cek	10 / 15	(5)6 - 10	20x13 x 5	6	0.34	4	14	5 / 1.0 peak	1-1,5*
slim-105be	5 / 7	(5)6 - 10	20x13 x 5	3	(0.34)	13	20	5 / 1.0 peak	1-1,5*
slim-105bek	5 / 7	(5)6 - 10	21x14 x 6	6	0.34	13	20	5 / 1.0 peak	1-1,5*
slim-20be	20/26	(5)6 - 10	27 x 20 x 6	9	(1,5)	4	10	5 / 2,0 peak	2,5
slim-20bek	20/26	(5)6 - 10	28 x 20 x 8	10-17	1,5	4	10	5 / 2,0 peak	2,5
slim-26be	26/36	(5)6 - 10	27 x 20 x 6	9	(1,5)	2	7	5 / 2,0 peak	2,5
slim-26bek	26/36	(5)6 - 10	28 x 20 x 8	10-17	1,5	2	7	5 / 2,0 peak	2,5
slim-40be	40/52	6 - 12	33(36)*25*10	15-23	2,5	1,8	5	5 / 3,0 peak	3
slim-40beq	40/52	6 - 12	33(43)*25*10	16-24	2,5	1,8	5	5 / 3,0 peak	3
slim-40CWe	40/52	6 - 12	33(43)*25*10	16-24	2,5	1,8	5	5 / 3,0 peak	3
slim-40Heq	40/52	6 - 12	33(43)*25*10	16-24	2,5	1,8	5	5 / 3,0 peak	3
slim-55beq	55/72	6 - 12	33(43)*25*10	16-24	2,5	1	3,5	5 / 3,0 peak	3
slim-55CWes	55/72	6 - 12	33(43)*25*10	16-24+8	2,5	1	3,5	5 / 3,0 peak	3
slim-66bes	66/86	6 - 12	44*25*17	29-37+8	2,5	1	3,5	5 / 5,0 peak	5

Current rating: Maximum current / nominal current:

The excess current level lies above the maximum current value for each unit. The nominal current value is the continuous current at full throttle at which the smaller slims (slim-05 ... 10) can be operated when connected to a 10 V / 1 Ah battery resp. the larger slims (from 20 A) on a 2 Ah-battery at full throttle.

Hint: slim-40CWe: minimum 13 motorwindings, **slim-55CWes:** minimum 10 turns on 6 cells.

Weight: excluding - including cables.

Cable: Values in brackets: recommended conductor cross-section - unit supplied without power cables.

Throttle, brake: Internal resistance of FETs as stated in data sheet. Brake response time 8 sec.

Pulse times: allowed range: 0.8 ms...2.5 ms, cycle time: 10...30 ms.

Gearbox-mode: brake point <1.35 ms, fixed travel brake point <-> full throttle: ~0.6 ms.

slim-50He: fixed neutral point = 1.2 ms, fixed full throttle point = 1.8 ms.

ips-car, boat mode: neutral point < 1.35 ms; fixed travel neutral <-> full throttle ~0.6 ms.

ips-car, car mode: neutral point 1.5+/-0.15ms; full brake<->neutral ~0.3ms, neutral <-> full throttle ~0.3 ms. Tolerances: ~ + - 10%

Other features: Overtemperature threshold approximately 110°C. Switching frequency about 3 kHz.

BEC: The stated peak current is dictated by the maximum current value of the 5V voltage regulator; it can only flow for less than 0.33 seconds, followed by a cooling-off period. The stated continuous current is much lower and is determined by the maximum power dissipation of the voltage regulator used in the unit

$$P_{\text{loss}} = (U_{\text{loss}} = U_{\text{battery}} - 5 \text{ V BEC-voltage}) * \text{sum of servo currents.}$$

Pay attention when connecting micro-servos: the current consumption is mostly 2...3 times higher than the current of BEC suited servo! The BEC System can be overloaded by temperature. A table with servos which are suitable for BEC operation: **see section 8.5**

Important: Shottky diodes are essential in multi-motor configurations by smoothing out the current flow and can be used to reduce controller temperature when run under part-load conditions. These diodes must be soldered directly across the terminals of each motor. The cathode (ring on diode-body) must be connected to the positive terminal of the motor.

Practical maximum load with BEC-suitable servos

slim-05 ... slim-10, 1 A / 1 W

up to 6 cells max. 2 servos
up to 7 cells max. 2 servos
up to 8 cells max. 1.5 servos*
up to 9 cells max. 1.2 servos*
up to 10 cells max. 1 servo*
[*] 2 extremely current saving sloflyer servos or 2,5qmm neg. battery cable as a heatsink for the BEC system.

slim-20...slim-26, 2 A / 2,5 W

up to 6 cells max. 4 servos
up to 7 cells max. 4 servos
up to 8 cells max. 3.5 servos
up to 9 cells max. 3 servos
up to 10 cells max. 2.4 servos

slim-40...slim-55, 3 A / 3 W

up to 6 cells max. 6 servos
up to 7 cells max. 5.6 servos
up to 8 cells max. 4 servos
up to 9 cells max. 3.4 servos
up to 10 cells max. 3 servos
up to 11 cells max. 2.5 servos
up to 12 cells max. 2 servos

slim-66, 5 A / 5 W

up to 6 cells max. 10 servos
up to 7 cells max. 9 servos
up to 8 cells max. 7 servos
up to 9 cells max. 5.7 servos
up to 10 cells max. 5 servos
up to 11 cells max. 4 servos
up to 12 cells max.

3.6 servos

