



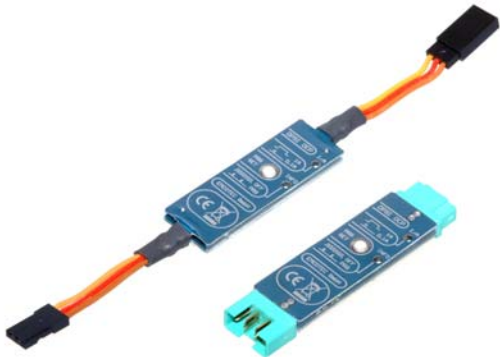
EMCOTEC®
embedded controller technologies



English

OCP 'Over Current Protector'

**Electronic overload protection
and protection against voltage peaks**



Operating Instructions

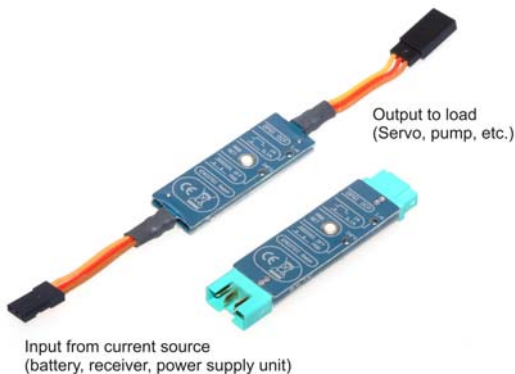
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1. Preface

With the **DPSI OCP** you have purchased a high quality and reliable protection system against shorts and over voltage peaks. We thank you for your faith in EMCOTEC GmbH and assure you that you have made the right decision! Years of experience in design and manufacturing of electronic systems as well as the knowledge of world's best model pilots influenced the development of the **DPSI OCP**. All products are manufactured completely in house at EMCOTEC GmbH in Germany. In-house manufacturing and careful quality assurance including 100% testing of all shipped systems assure you of the highest reliability and functionality.

Please read this operating manual carefully in order to use all functions the **DPSI OCP** has to offer optimally. We wish you success and enjoyment with this high quality product!



2. Features

The EMCOTEC **DPSI OCP (OverCurrentProtector)** protects the current source (battery, receiver, battery switch) against shorts in consumers (servos, pumps, etc.) and turns off the consumer at a too high a current.

The **DPSI OCP** is simply put between the current source (i.e. receiver) and the consumer (i.e. servo). This usage is reasonable for servos which are exposed to high mechanical forces (e.g. ailerons, elevator and yaw rudder). Therefore, one **DPSI OCP** is recommended for each such servo. In addition to featuring an electronically fuse, the **DPSI OCP** blocks voltage peaks generated by some servos which can lead to system malfunctions in the receiver.

Electronic Fuse:

Now for the first time, blocked or defective servos will not lead to short circuits, discharging of batteries or damaging cables or connectors (e.g. cable fire). The **DPSI OCP "Over Current Protector"** interrupts the current flow if a certain threshold is exceeded, and therefore protects the whole system.

Especially for LiPo voltage regulators, which only provide limited current due to their thermal loading capacity, the **DPSI OCP** can be a life-saver.

Blocked or jammed landing gear doors, defective servos, shorts in input leads, blocked drives in pumps: the maximum allowable current in the system is never exceeded.

This current limiting even prevents malfunctions in weakly dimensioned heat sinks of so called Power-Battery-Switches. Current measurement takes place through a modern microcontroller. For monitoring purposes, the current is displayed by blink codes using an LED. The system is self learning, i.e. the highest current of the consumer is automatically remembered. Hence, even small servos with low currents can be reliably monitored.

It “remembers” the highest current drawn by the consumer and adds a reserve of 50%. Only when this limit is exceeded (for 500 milliseconds or more), the consumer is turned off. Therefore it can reliably monitor small servos drawing little current or large servos drawing a lot.

Optionally, a reactivation can be conducted, i.e. after 5 seconds the consumer can be turned on again. Thus, a servo, which was turned off due to excessive current in case of a jamming or blocking rudder, can be “reactivated”.

Protection from “Dynamo Effect”:

The **DPSI OCP** filters, besides others, peak voltage occurrences caused by the dynamo effect (feedback voltage from the servo) of high performance servos and inhibits those dangerous current disturbances from reaching the receiver or other components. In this case, no voltage drop occurs, i.e. the servo is still supplied with the full voltage.

Short circuit proof and available in different versions:

The **DPSI OCP** is short circuit proof* and handles loads of up to 8A continuous current. Two versions cover every application: a JR version for servos up to 7V supply voltage and an MPX version for consumers with up to 12.6V (3S LiPo batteries). The JR version (especially for servos) is also available as a quintet system.

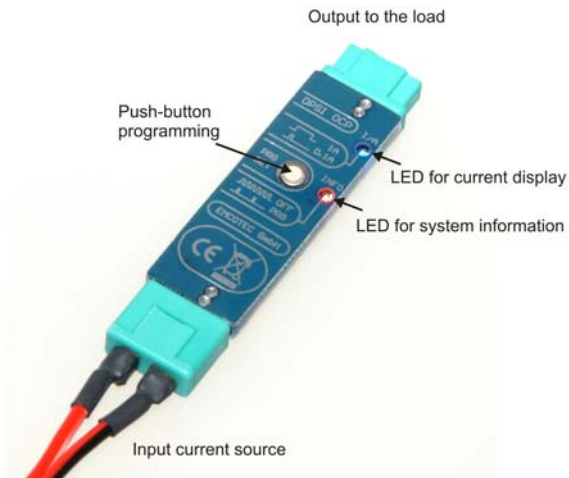
Hint:

The state of the **DPSI OCP** is displayed by two LED's: a red programming and error indicator LED as well as a blue LED, which indicates the maximum current of a connected consumer by blink codes.

* Short-Circuit-Proofness **directly at the output** of the DPSI OCP is only available for current sources with very low internal resistance! For current sources (batteries) with higher internal resistance, the voltage can break down far enough in the case of a short circuit, that a cut off can not occur anymore.

3. Assembly- and Connecting Instructions

Connectors of the **DPSI OCP** (here MPX)

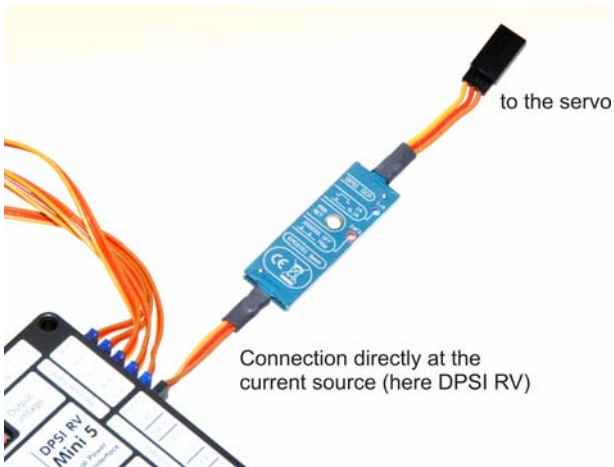


3.1. Assembly and Connection of the DPSI OCP

The **DPSI OCP** can be mounted to the fuselage's side wall or a frame using a hook and loop fastener (Velcro® fastener). The quintet system can also be screwed to a small board using 4 screws (e.g. with small silicon hoses) for shock absorbance.

In order to prevent the connectors from slipping out, our JR-Connector-Locks, available from our e-shop, can be used. When using the MPX version, please make sure, that the connectors do not loosen due to vibration.

The **DPSI OCP** is always put in between the current source and the consumer and must always be mounted **as close as possible to the current source**. This means: as close as possible at the battery or servo connector of the receiver or of a battery switch and **not directly at the servo**. In case of a short or a too high current, a loss of power in the wire can be avoided. Otherwise, a consumer wire or the **DPSI OCP** could be damaged.

**Hint:**

Always mount the **DPSI OCP** as close as possible to the current source (e.g. at the battery or the servo connector of the receiver or the battery switch)!

The JR-Version serves as a short “extension cord” between the servo output of the receiver or battery switch and the servo connection cable. Here, the maximum allowable supply voltage is limited to 7 volts!

The MPX-Version can be operated with up to 3S LiPo batteries, i.e. with up to 12.6 volts.

4. Initial Operation

At delivery, the **DPSI OCP** is not programmed. This means, a connected consumer is not turned off at 150% over current, but only by exceeding the maximum current of 8 amps (=> short circuit). In case of a short, (current > 8 amps) cut off occurs within 16 milliseconds. In order to adapt the **DPSI OCP** to the corresponding consumer, its maximum current must be evaluated (e.g. during operation or in flight). Reactivation is also turned off at delivery.

State of the DPSI OCP	Cut off current
New or not programmed	> 8A (within 16ms)
During Programming	> 8A (within 16ms)
After Programming	> 150% of the maximum current within 500ms or within 16ms at > 8A

Example:

- Servo current evaluated with a maximum of 2 amps during operation
- Cut off occurs at 3 amps (=> 2 amps + 50%), if **DPSI OCP** was programmed

If the **DPSI OCP** is correctly connected and the equipment is turned on, both LED's (red and blue) quickly blink 3 times in order to indicate that they are functioning.

If the blue LED is lit again for 2 seconds, the **DPSI OCP** is in “reactivation mode”, and a cut off of the consumer is reversible. In case of a cut off, the system turns on again after 5 seconds to measure and evaluate the current again.

The red LED always indicates the state of the **DPSI OCP**, while the blue LED indicates the maximum evaluated current during operation.

4.1. Meaning of the Blink Codes

Red LED	Blue LED	Meaning
Directly after turning on		
3 short blinks	3 short blinks	Functioning control of LED's
OFF	2 seconds ON	Reactivation released
OFF	OFF	Reactivation locked
During Programming		
Short flash	Maximum current by blink code	Programming mode active
10 seconds ON	Button not pressed Maximum current by blink code	=> Programming mode finished and no reactivation
10 seconds ON	Button shortly pressed Maximum current by blink code	=> Programming mode finished and reactivation
During normal Operation		
OFF	Maximum current by blink code	All ok! No error.
Symmetrical blinking	Maximum current by blink code	DPSI OCP turned off consumer.
Steady ON	Steady ON	Error in switch or current measurement. Send device in for repair.

4.2. Programming of the Activation Current Threshold

Always program the **DPSI OCP** if changes took place in the model which influences the current consumption (e.g. a different servo, rudder/ rod after repair, etc). A programmed value stays programmed in the **DPSI OCP** and can only be changed by reprogramming!

To start programming, turn on the equipment and press the programming button for 5 seconds. Programming is activated as soon as the red LED flashes in short intervals. Now, the current of the connected consumer is constantly measured.

In practice, it looks like this:

- turn the receiver set on
- bring the **DPSI OCP** into programming mode
- Move all control surfaces several times quickly ("stir sticks")
- Conduct a complete flight with the model (if possible "at limits", i.e. with big control movements to draw maximum current by the servos)
- End programming mode

Hint:

During the programming phase, the cut off current is always > 8 amps, thus the consumer can always draw the maximum current.

The programming mode is exited by pressing the button for at least 5 seconds. This is indicated by the red LED which is steadily lit for 10 seconds.

4.3. Programming of Reactivation

If, after ending the programming mode (within the 10 seconds on-phase of the red LED) the button is pressed shortly again, the **DPSI OCP** is programmed such that the consumer is turned on again 5 seconds after it is turned off due to over current. This is repeatable i.e. it repeats turning on, if turned off due to over current throughout the flight.

If the button is not pressed within the 10 seconds on-phase of the red LED, the reactivation stays turned off (until turning off the complete equipment).

Hint:

The function of the reactivation can only be changed through reprogramming of the cut off current. If a change is desired, the activation current threshold has to be programmed again.

4.4. Quick Reference for Programming

Action	What to do	Display
Start programming	Press button for 5 seconds	Red LED flashes shortly in intervals
Quit programming	Press button for 5 seconds	Red LED turns on for 10 seconds
Activate reactivation	Press button shortly while red LED is lit for the 10 seconds after programming	Blue LED turns on for 2 seconds after turning the DPSI OCP on
Deactivate reactivation	Don't press button while red LED is lit for 10 seconds after programming	Blue LED does not turn on after turning the DPSI OCP on

4.5. Shutdown

The **DPSI OCP** turns off a connected consumer if

- the maximum current of 8 amps is exceeded for 16 milliseconds
- the current of the consumer exceeds the 150% threshold for 500 milliseconds

Automatic turn on after 5 seconds occurs if reactivation was programmed. If reactivation was not programmed, the consumer stays off.

4.6. Current Indication using the blue LED

The blue LED serves to indicate the maximum current of a consumer. The display of the current value is restarted after every dark phase of 4 seconds. Here, a long phase of the blue LED (1 second) represents a value of 1 amp, a short phase (0.1 seconds) means 0.1 amp. Simply add the indicator values.

If a connected consumer (e.g. a servo) consumes a maximum current of 1.3 amps, this is indicated by one long and three short blinks of the blue LED. The actual value of the current is averaged through many single measurements within 500 milliseconds.

Display of 1.3A (1 long and 3 short)

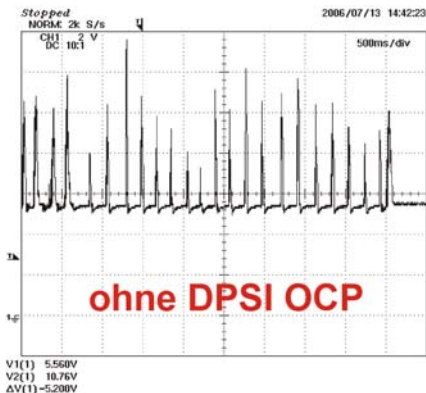


5. Protection against over voltages

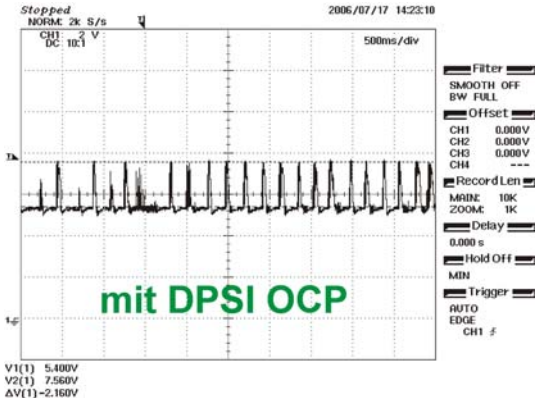
The **DPSI OCP** contains a highly effective over voltage protection. Some high performance digital servos display the unpleasant property of generating voltage peaks which can disturb the receiver or other components. This so called “dynamo effect” appears through counter electromotive force (servo current feed back) of the servo motors when these are reversed or rapidly stopped. Since the voltage peaks are up to 16 volts, this can harm the components of the receiver set under certain circumstances.

The **DPSI OCP** cuts these voltage peaks coming from such servos down to safe values of about 7.5 volts (this corresponds to approximately 5 fully charged NiCad cells). Because these peaks only last for a short period of time (approx. 50 milliseconds), they do not cause harm.

It is advantageous to the protective device that the servo or other consumer connected to the **DPSI OCP** is always supplied with the full voltage and not influenced negatively otherwise.



The first diagram shows the high voltage peaks which can cause the malfunctioning of the receiver.



Here, it is obvious, that the high voltage peaks are cut off at about 7.5 volts.

Another advantage of the protective device is that the generated voltage is not bounced back to the servo as would be the case in simple diode locking applications.

The MPX-Version also blocks voltage peaks (or cuts off at approx. 15 volts respectively). Herewith, the electronics in the **DPSI OCP** are protected from over voltage peaks as well.

6. Safety Instructions

- In general, all connection cables should not be installed in a way that they interfere with moveable or hot parts in the model (e.g. servos, servo wires or mufflers).
- Protect the **DPSI OCP** from wetness and humidity.
- Improper usage of the **DPSI OCP** can cause severe property damage or personal injury!
- Always double check all connections in your model before any usage! All connections must be of the correct polarity, have a clean contact and be secured. Loose cables pose a potential hazard!
- Under no circumstances use power sources which exceed the denoted voltages.
- Current leading contacts must not be shorted. Otherwise shorted cables can heat up or even melt.
- The **DPSI OCP** must not, under any circumstances, be taken apart or technically altered. There are no parts at all within the **DPSI OCP**, which could be maintained or repaired by the user.
- Do never attempt to use the **DPSI OCP** for purposes other than for RC modeling in the hobby area. Especially the application in manned machines is specifically prohibited.
- Operate the **DPSI OCP** exclusively with RC components for modeling.
- Always be sure to fully charge batteries when operating your model. Undercharged batteries inevitably lead to the breakdown of the RC components and therefore to the loss of the model.
- Do not expose the **DPSI OCP** to extremely hot or cold temperatures, wetness or humidity. Here, there is danger of malfunction, damage or reduced performance.
- Only use **DPSI OCP** in conjunction our accessories (e.g. on/off switch).

Hint:

Please keep in mind our other products for model airplanes and visit our e-shop! Here, you find many products to make our beautiful hobby safer under www.rc-electronic.com!

7. Technical Data of the DPSI OCP

DPSI OCP JR (Servos)	
Permissible Input Voltage	4.0V.... 7.5V
Operating Voltage Range	4.8V.... 7.0V
Current Consumption	approx. 10mA
Operating Indicators	red und blue LED
Maximum Continuous Current	8A
Cut off @ short circuit (> 8A)	within 16ms (0.016 seconds)
Cut off @ over load (150%)	within 500ms (0.500 seconds)
ESD protection (« Dynamo Effect »)	Starting approx. 7.5V
Microcontroller	8 Bit
Current Measurement Shunt	20mOhm, Resolution approx. 11mA
Dimensions (Length x Width x Thickness)	2.8" x 0.7" x 0.16" (+cable approx. 3.15")
Dimension (quintet system)	2.8" x 4" x 0.16" (+cable approx. 3.15")
DPSI OCP MPX	
Permissible Input Voltage	4.0V.... 14V
Operating Voltage Range	4.8V.... 12.6V
Current Consumption	approx. 10mA
Operating Indicators	red und blue LED
Maximum Continuous Current	8A
Cut off @ short circuit (> 8A)	within 16ms (0,016 seconds)
Cut off @ over load (150%)	within 500ms (0,500 seconds)
ESD protection (« Dynamo Effect »)	Starting approx. 15V
Microcontroller	8 Bit
Current Measurement Shunt	20mOhm, Resolution approx. 11mA
Dimensions (Length x Width x Thickness)	2.9" x 0.8" x 0.3"
DPSI OCP (total)	
Environmental Conditions (Operation)	+14°F.... +158°F
Permissible Temperature Range	-13°F.... +185°F
CE-Test	According to 89/336/EWG
Weight	Approx. 0.3 oz. (quintet JR approx. 1.75 oz.)
Warranty	24 month

8. Warranty

EMCOTEC shall issue a 24 month warranty on the "**DPSI OCP**". The guarantee period shall begin with delivery of the equipment by the retailer and shall be not extended by any guarantee repair or guarantee replacement.

During the period of guarantee, the warranty shall cover the repair or replacement of any proven manufacturing or material defects at no charge. There shall be no specific entitlement to repair work. In case of a guarantee claim, the manufacturer shall reserve the right to exchange the equipment for a product of equal value if repair of the item is not feasible for economic reasons. There shall be no assumption of liability for consequential damages that are brought about by a proven defect during operation of the "**DPSI OCP**". There shall be no extended claims for damages.

- All transportation, packaging and travel expenses are the responsibility of the purchaser.
- No liability shall be assumed for any damages during transport.
- If repair is needed, the equipment must be sent to the appropriate service center of the respective country or directly to EMCOTEC GmbH.
- The guarantee shall only be valid when the following conditions are met:

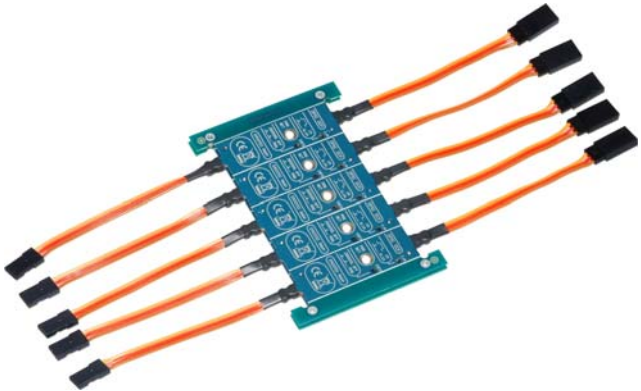
The guarantee document (original invoice) must include the delivery date, the Company stamp, the serial number and signature of the retailer.

No Intervention in the equipment may have been undertaken.

It must have been operated in accordance with our operating instructions.

Only the power sources and other accessory devices and components that were recommended by us may have been used.

- The guarantee document, the original invoice and other pertinent Information regarding the malfunction (a Short description of the defect) must be included with the transmittal.
 - The equipment must still be the property of the initial purchaser.
 - If equipment is sent in that later proves to be functional following an initial inspection, we shall impose a flat processing fee of € 15.
 - In all other respects, the general business terms and conditions of EMCOTEC embedded Controller technologies GmbH shall apply for any items not listed.
- (P) Version 1.1 from July, 2010 Robert Hussmann



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- EMCOTEC
- DPSI
- DPSI RV



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