VPEB Van Perlo Elektronica & Besturingstechniek

SP04A

Manual

Smart electronics for your miniature world

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Release management

This manual applies to:

- Module
  - SP04A Rev00

Contents

1 SP04A

1.1 Introduction

The OC32 offers the possibility to control servo motors, up to 32 pieces per OC32 module. A servo motor shall be powered by a supply voltage between 4.5V and 6V. A servo can draw so much current that it is unwise to obtain this supply voltage from the (internal 5V of the) OC32. That is why the manual of the OC32 also advises to stabilize the power supply for the servos separately.

The SP04A is a compact module, intended to provide 4 servo motors with the correct supply voltage and thus easily connect them to (among others) the OC32(/NG). The SP04A is powered from a not necessarily stabilized DC voltage of at least 7.5 Volt. The SP04A also ensures a (certain degree of) noise-suppression on the control signal.

If you want to connect more than 4 servos to an OC32, use multiple SP04A modules.

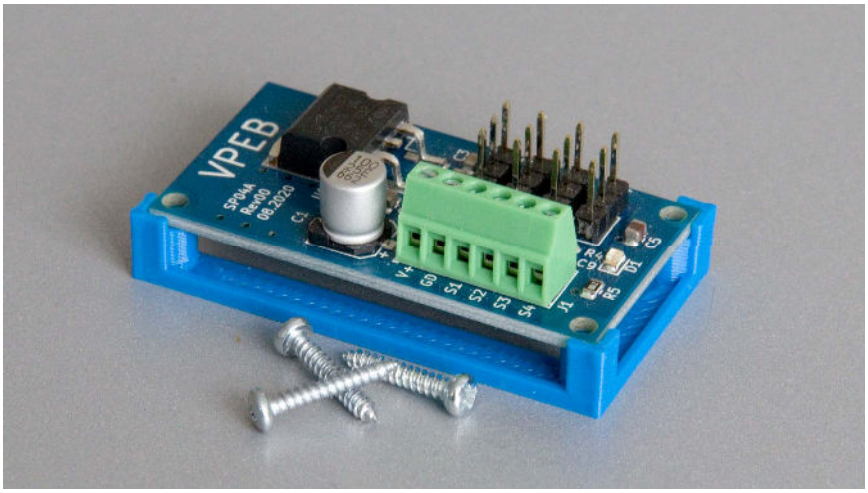

Figure 1: The SP04A

1.2 SP04A vs SP04(R)

The SP04A is functionally identical to the SP04R. The difference is that the SP04A is mainly produced in SMD technology. Partly for this reason, SP04 modules for self-assembly are no longer offered. Furthermore, the SP04A is equipped with an LED that indicates that the supply voltage is present.

The predecessor of the SP04A was delivered in SP04 and SP04R versions. The “R” version has pull-up resistors to suppress uncontrolled movements on most servos when powering-up. Since there is no known case where the pull-up resistors have a negative effect, the SP04A is equipped with these resistors as standard and a version without pull-up resistors is no longer offered by VPEB.

1.3 Connections and functions

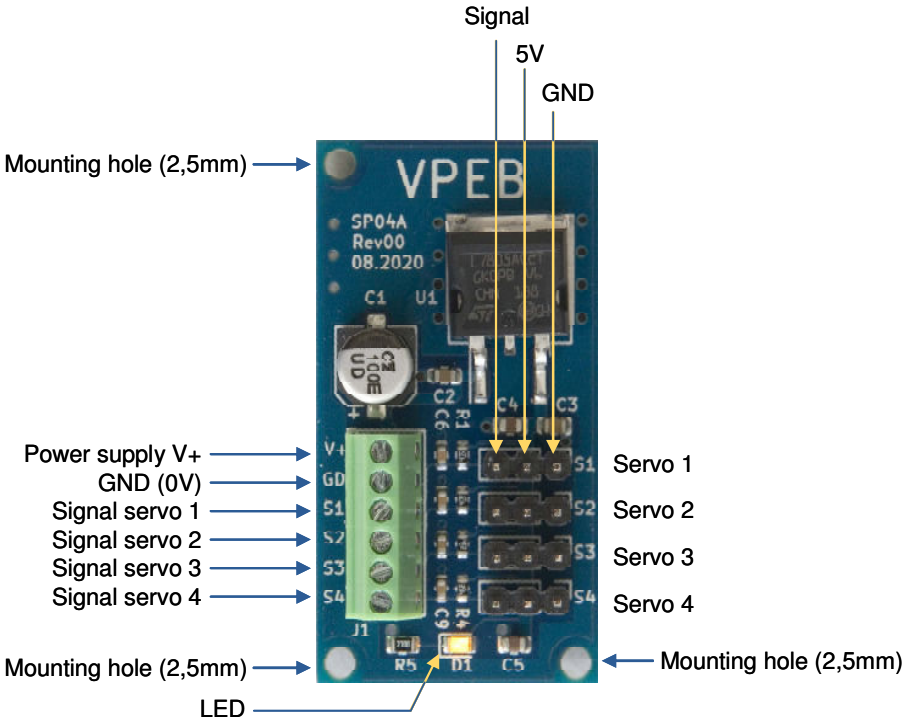

Figure 2: SP04A overview of connections and functions

On the SP04A you will find the following connections and functions:

- 4 pin-headers for connecting 4 servomotors;
- A 6-way screw terminal for connecting the power supply and the signals from the OC32;
- 3 mounting holes (2.5mm)
- Indication LED for the supply voltage

2 Mounting and connecting

2.1 Power supply, mounting and heat-dissipation

The SP04A supplies a current of up to 1.5A to up to 4 servos. The SP04A is current limited.

The supply voltage for the SP04A must be between 7.5V and 20V DC. The difference between the supplied voltage and the 5V required for the servos is converted into heat. The higher the voltage you supply, the more energy you throw away and the hotter the SP04A gets. Therefore, choose the supplied supply voltage as low as possible to limit heat dissipation. The advice is not to use a voltage higher than 12V in practice, unless you e.g. connect only one servo that is under minimal load.

In most cases, servos will only use power for a short period of time, but if the servo moves a lot or has to keep supplying force to keep itself in position, power consumption and heat development can increase. The SP04A is provided with a copper layer on the back that distributes and dissipates the excess heat. The SP04A is (since the second half of 2022) always supplied with a mounting frame and screws. Mounting the SP04A on this frame ensures that space is left at the back for ventilation to dissipate the heat. Mounting the SP04A on a vertical surface is better for airflow than on a horizontal surface. Never fill up the space behind the SP04A and allow a little space around the mounted SP04A.

In some cases it can happen that several servos use so much power that the SP04A eventually (still) overheats. Then reduce the power consumption by, for example, switching on the suspend function on the OC32. Also make sure that the supply voltage you offer to the SP04A is as low as possible. If these measures do not provide a solution, you will have to divide the servos over several SP04As.

If the wires you connect the SP04A to are long (several meters), be aware that there will be voltage drop in the wires. The thinner the wire and the more current, the more the voltage at the end of the wire drops. With long wires and heavy loads, you may therefore need to use thicker wires for the power supply and GND than the standard 0.14mm^2 model-railroad wire (recommended at least 0.25mm^2 or 0.5mm^2 for GND and V+).

The supply voltage for your servos, so the voltage you supply to the SP04 to make it 5V, can be the same supply voltage you supply to the OC32, but you can also use a separate power supply for this. In the latter case, the GND (0V) of both power supplies must be connected.

Note: Connecting an AC voltage or incorrectly polarized DC voltage to the SP04 will irrevocably lead to a defect in the SP04 and possibly a defect in the OC32 and/or your servo motors. So be sure to which power supply you connect the SP04!!

2.2 Connecting servo's to the SP04A

A servo motor is (usually) equipped with a 3-pin plug. Normally the middle pin is the plus (4.5…6V), the right pin is the GND/0V and the left pin is the signal wire that tells the servo what position it should be in.
Please note: we cannot guarantee that this is the case for all servos, if in doubt consult the supplier's documentation!

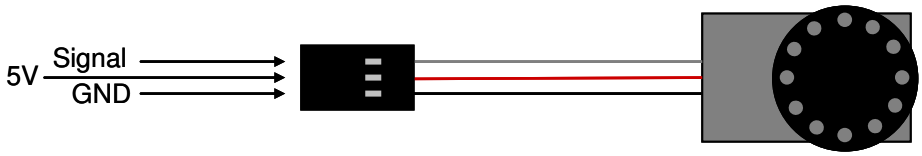

Figure 3: Servo connections

On the SP04A you will find four 3-pin pin headers labeled S1..S4. Plug the servo's 3-pin plug onto one of the pin headers. The signal wire must be on the side of the green screw terminal. Don't worry, if you put it the wrong way around, nothing will break, it just won't work, so in that case turn the plug around.

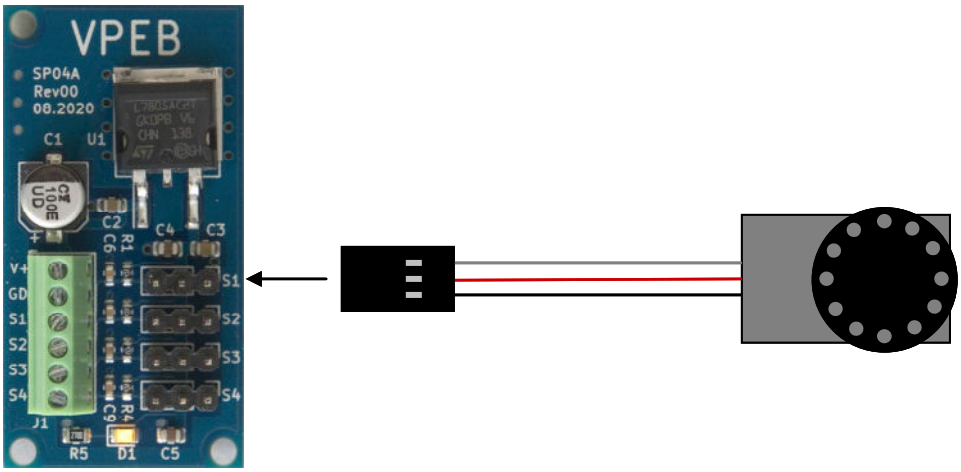

Figure 4: Connecting the servo to the SP04

2.3 Connecting micro-servo's using the SP53

There are micro servos on the market that are made for a voltage of approximately 3.3V. In most cases, these servos operate between a voltage of 3.0 to about 4.2V. An adapter module (SP53) is available for such servos that reduces both the supply voltage and the signal voltage by approximately 1.5V.

Note: The SP53 only works correctly if a 220 Ohm resistor is included in the signal wire, as is recommended as standard for the OC32 controlling servos!

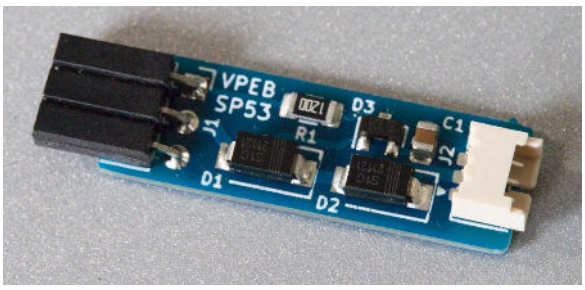

Figure 5: SP53

The SP53 has a standard 3-pin plug on one side that fits directly into the SP04A. The other side is equipped with a micro-servo connector. Due to its physical size, two SP53 adapters will fit directly onto the SP04A. If you want to use more than two on one SP04A, it "tightens" a bit. It is best to use a servo extension cable between SP04A and SP53 with the other SP53(s).

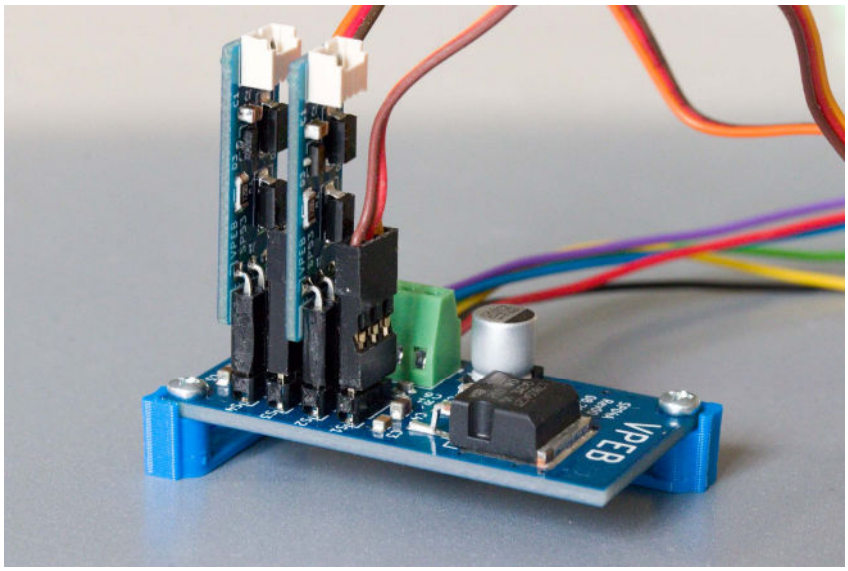

Figure 6: 2 x SP53 on SP04A

2.4 Connecting the SP04A to the OC32(/NG)

You connect the SP04A with a maximum of 6 wires. A 0V/GND, a positive supply voltage and one signal wire per servo used. In principle, the signal wires can have any cross-section, ordinary model wire of 0.14mm^2 is fine. It is better to take the power supply and GND a little thicker, especially if the wires become a bit longer (more than 1.5 meters). Use eg 0.25mm^2 or 0.5mm^2

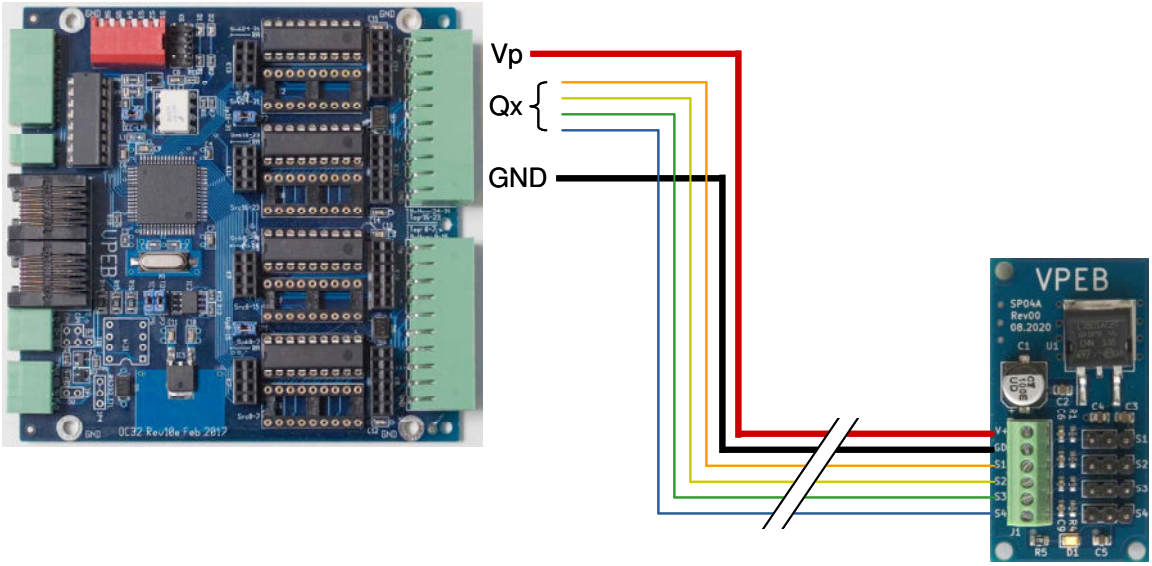

Figure 7: Connecting the SP04 to the OC32(/NG) and power supply

Connect the GND to (the same terminal as) the GND of the OC32. You can obtain the power supply from the Vp of the OC32, or you can use a separate power supply for this. Connect the (maximum) 4 signal wires to 4 outputs of the OC32. Of course, these outputs must be configured as servo outputs. Electrically the output should be a 5V output with resistor

bank (preferably 220Ω). For the record: it is not necessary that the outputs are 4 consecutive outputs, you can in principle use 4 arbitrary outputs, provided they are configured for servo control and are equipped with a resistor bank.

It is very wise to connect the GND and preferably also the power supply at the place where the signal for the servo is generated, i.e. when using the OC32 at the OC32. Bundle all wires to the SP04A (so as in figure 7 above). This ensures that external interference signals have the least influence, some servos appear to be somewhat sensitive to this.

For the record: The supply voltage for the SP04A does not have to come **OUT** of the OC32. The supply voltage (Vp) of the OC32 and that of the SP04A does not even have to be from the same power supply (the negatives of the power supplies must of course be connected). What matters is that the signal wires and the power wires between OC32 and SP04 all follow the same physical route.

Note: It is therefore **NOT** wise to get the power supply from a different location from e.g. a power circuit loop (so avoid wiring as in figure 8)!

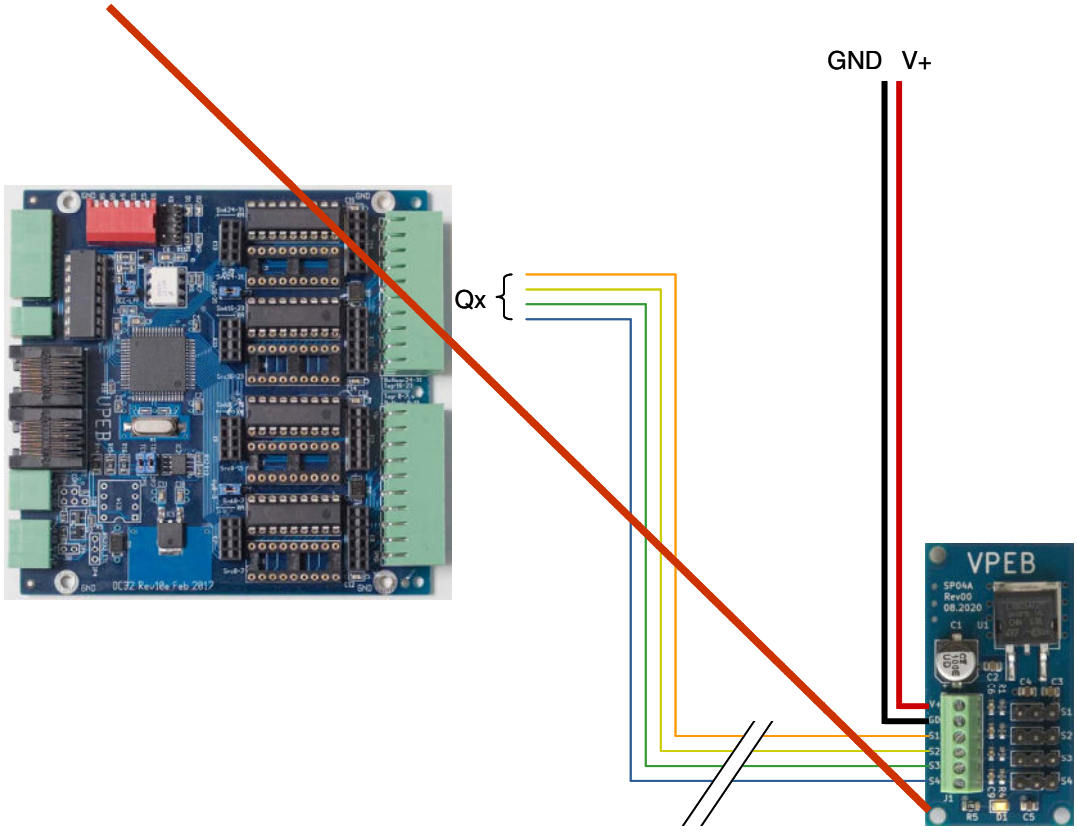

Figure 8: Not this way!

3 To conclude

Up-to-date manuals for VPEB products can be found on the VPEB website: **http://www.vpeb.nl**. Look in the "support" section.

If you have any questions about the use of the products, please visit the DinamoUsers forum at **https://www.dinamousers.net**. Registration is free! On this portal you will also find software updates and manuals for products that are no longer supplied new.

Enjoy!