# AscTec Research

# AscTec Neo

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# Technical Data

- Dimensions: Ø72 x 24 cm (Ø80 x 24 cm with propeller protection)

- Propeller size: 9"

- Propeller Type: Folding propellers

- Motors: 6 x 150W

- Max. thrust: 54N

- Max. payload: 1000g

- Max. total weight: 3200g

- Max. airspeed: 10m/s

- Max. flight time: 22mins (without payload)

- Battery: 2x 4000mAh (LiPo, 4s)

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⊘ **Fuses**

DO NOT HOTPLUG FRONT PANEL CONNECTIONS!

The fuses for the current limitation are not mounted yet. Any connector hotplugging will lead to severe damage to the whole system!

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# Flight Time vs. Payload

The flight time chart includes a battery safety margin of 20%. It is not recommended to completely drain the batteries.

**Flight Time Chart /// AscTec Neo 6-9**
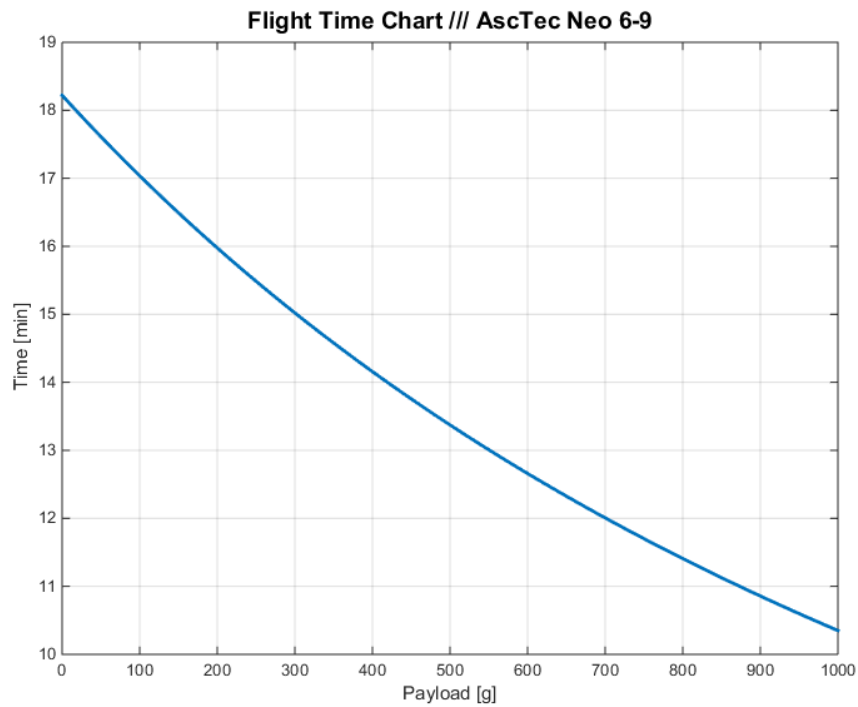


## ⓘ Payload power consumption

Any payload that draws current also reduces the flight time. The above chart is computed without additional current-drawing payload.

# User Manual - AscTec Neo

## Batteries

> ⚠ **Fuses**
>
> The batteries are not fused! A short circuit will lead to severe damage and eventually a LiPo fire.

**AscTec Powerpack with Power Supply**



AscTec Powerpack and Power Supply

## Technical Data

- Lithium-Polymer battery
- Integrated charger and balancer
- Cells: 4 (configuration 4S1P)
- Nominal Voltage: 14.8V
- Voltage Range: 14V - 16.8V
- Capacity: 4000mAh
- Current Rating: 20C (40C peak)

## Level Check

To do a level check of the battery, simply press to button on the battery while it is turned off (no LEDs on).

The number of LEDs turning on afterwards indicate the level of the battery. The LEDs will turn off automatically after a short time.
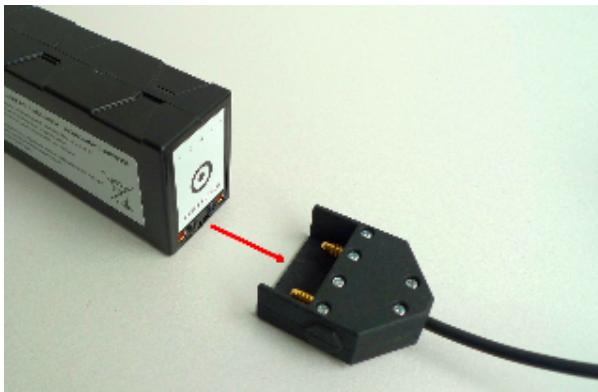
## Charging

> ⚠ **Beta Information**
>
> It is not yet possible to turn on the Powerpacks by the front panel button. Nevertheless, the batteries will be turned on by the flight system when attached.
>
> Connect the power supply to a wall outlet first, before attaching the battery.

The advanced AscTec Powerpack 4000 has an integrated charger and balancer circuit which simplifies handling and charging.

To charge your Powerpack, simply follow these steps:

1. Connect the power supply to a wall outlet and plug the battery in the supply socket.

2. The red LED above the number 1 indicates the charging process. As long as the red LED is on, the battery is charging!
   Blinking LEDs on the other numbers indicate that a cell is currently being balanced.



3. You can detach the battery as soon as the red LED starts flashing (this indicates a battery level of at least 80%) or wait until the LED turns off (battery full).
   After a few seconds the battery will enter normal operating mode and indicates this by a single LED being constantly on.



4. Now turn off the battery by pressing the front button. All LEDs should be off.

# UAV

## Insert batteries

ⓘ  Please always use two batteries when you intend to fly. A single battery cannot provide the required peak current.

1. Insert the two batteries firmly into their socket.



2. Make sure both clips snapped into place to secure the batteries.



## Remove batteries

> ⚠ **Beta Information**
>
> When you remove a battery from the UAV, please always check if it is still on (LED on). If this is the case, power it off manually. Automatic power off does not work yet on the batteries.

To remove a battery, simply pull the small handle next to each battery. You do not need to push down the securing clips, this happens automatically.



## Power On & Off

> ⓘ Please hold the power button for around 1 second to make sure the batteries are actually turned on.

- To power on your UAV, simply press the red button on top once.
- To power off your UAV, press the red button twice within 3 seconds.

## Exchanging Batteries

Sometimes it is useful to replace empty batteries with full ones without turning of the whole system. To do so, please follow this procedure:

- Take out one battery and turn it off manually
- Insert a new full battery in the slot
- Press the power button once to switch on the newly inserted battery
- Remove the second empty battery and switch if off
- Inser the second full battery
- Press the power button again to switch on the second battery

## Stationary Power Supply

> ⓘ **Supply Current**
>
> The current provided by the stationary power supply is much too low to let the UAV fly. Please do not attempt to do so. This is also a safety feature and effectively prohibits a flight with the stationary power supply.

For development on the onboard computer it is often adviseable to use the stationary power supply. This ensures a longer life of the batteries if they are only used when actually needed and you do not need to worry about checking the battery level from time to time. For safety reasons, please do not use a battery + power supply combination.

To switch from a battery powered system to a stationary supplied one, follow these steps:

- We assume the system is turned on
- Pull out one of the batteries and turn it off

- Insert the stationary power supply "dummy battery"

- Remove the second battery and power it off

To switch from a stationary power supply to the batteries, use this procedure:

- Insert the first battery next to the stationary power supply "dummy battery"

- Press the power button once to ensure the newly inserted battery is turned on

- Remove the stationary power supply

- Insert the second battery

- Press the power button again to also switch on the second battery

You may combine both procedures to replace the batteries of a system without the need of turning it off.

## Remote Control

> ⓘ **Battery Low Behaviour**
>
> The RC will give an audible warning message as soon as the battery level is below **14.2V**. This is an early warning. You still have around 1-2 minutes of flight time. Remain calm and land as soon as possible.

> ⚠ **Noisy Envrionment**
>
> In indoor situations the RC's battery low warning is hard to hear due to the UAV's noise. Please observe the battery level on the RC in such environments.

The RC's switch assignment is shown in the picture below. Here is a list of the main controls:

- Left stick: up/down -> Thrust, left/right -> Yaw

- Right stick: up/down -> Pitch, left/right -> Roll

- Switch B: flight mode.

    - Away from the pilot: manual mode

    - Middle position: height mode

    - To the pilot: GPS mode

- Switch F: safety pilot

    - Away from the pilot: disabled

    - To the pilot: "Armed". If a valid Vicon lock is available, the safety pilot will take over as soon as the vehicle exceeds certain limits.

- Switch G: start/stop, pull to the pilot to start/stop motors

- Switch H: serial interface

  - Away from the pilot: disabled

  - To the pilot: enabled



## Take Off & Landing

> ⓘ **Safety Feature**
>
> There is a built-in safety feature to turn off the motors in case of a crash. If you experience an emergency situation (and RC motor turn off does not work), try to turn the UAV head-down. The motors will stop automatically when the UAV is tilted more than 110°.

- To switch on the motors, pull down the thrust stick to minimum thrust and hold it there. Now pull switch G for one second to turn on the motors and release the switch again.

- The RC is configured in mode 2 with both sticks self-neutralizing. Keep in mind to keep the thrust stick down. If you release your finger, the stick will flip to center position and give 50% thrust!

- To take off by gently moving the thrust stick up

- As soon as the battery voltage reaches 14.2V, land as soon as possible. The remaining flight time is around 1-2 minutes.

- To turn off the motors, pull the thrust stick down again and pull switch G for one second.
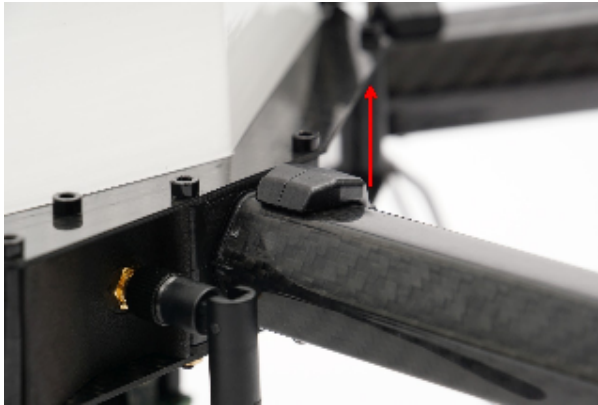
**ASCENDING TECHNOLOGIES**

## Boom replacement

> ⚠ **Beta Information**
>
> Dynamic reconfiguration of the booms does not work yet. Each boom is configured for a specific position, do not swap them!

The whole boom including motor, controller, and propeller can be exchanged as a unit. Follow these steps to remove a boom.

1. Lift the securing clip on the boom and remove it



2. Pull off the complete boom.



3. Done. To mount the arm again, just follow the steps in reverse order.
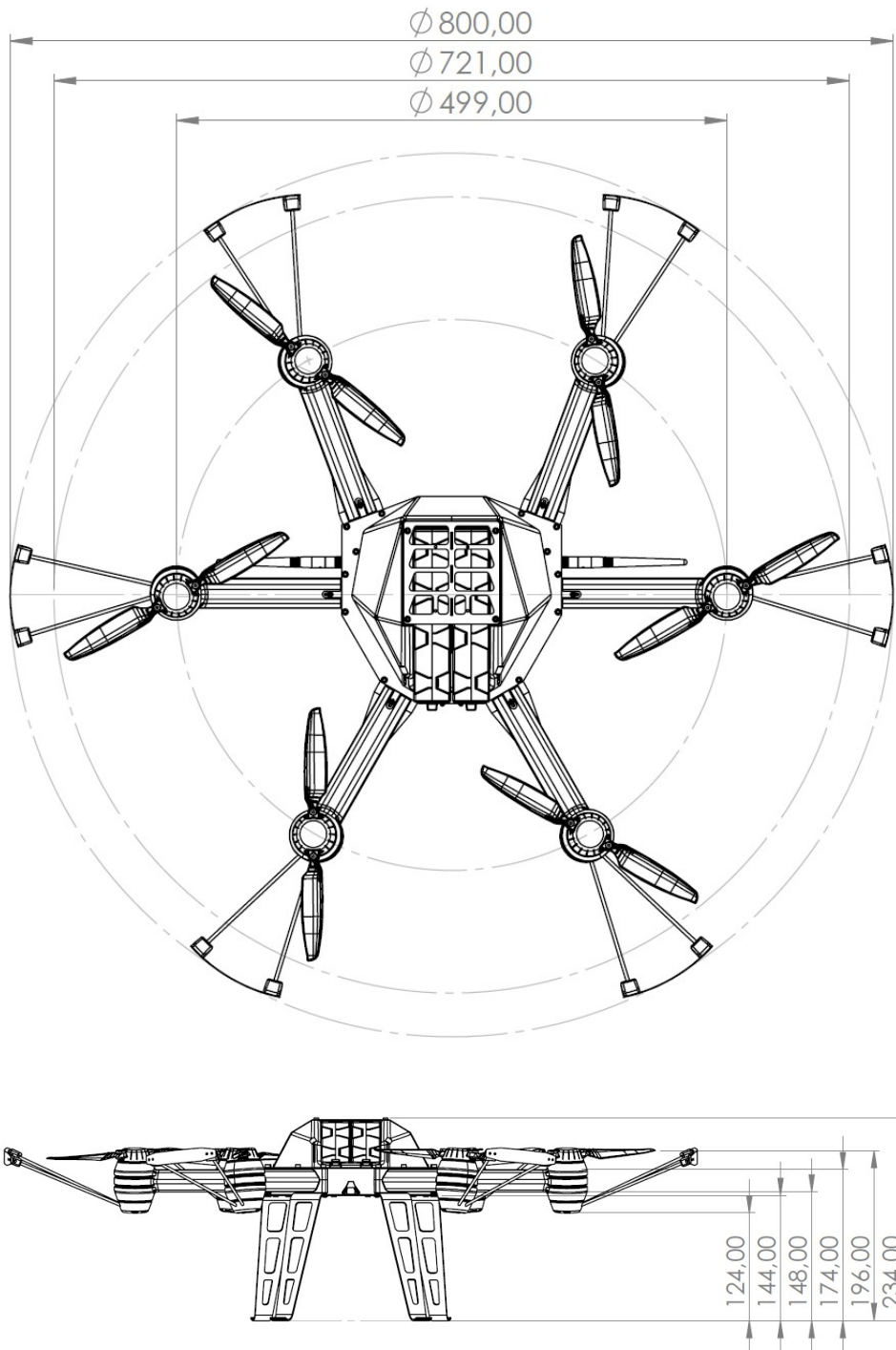
# Technical Documentation - AscTec Neo

## Mechanical

The UAV has a simple and standardized mechanical interface for all payloads. On the top and on the bottom are four mounting holes with a M3 thread spaced at 80mm.

# Electrical

The AscTec Neo features several IO ports on its front panel. The AscTec Trinity consists of three controllers, named NAV1, NAV2, and PER. NAV1 and NAV2 are closed-source and employ all important control tasks. PER is user-programmable with our SDK and can be used to interface custom sensors and actuators.

The most important interfaces are:

- NAV1uSD: microSD card slot to log flight information from NAV1. Can be used by AscTec to identify potential flight relevant issues

- PERIO1: Connected to PER processor. Can be configured as UART or I2C interface.

- PERIO2: Connected to PER processor. Can be configured as UART or I2C interface. Includes SWD programming interface to PER.

- PERIO3: Two PWM IOs connector to PER. Can be used to control servo motors.

- PERIO4: Connected to PER processor. Can be configured as SPI interface.

- PERUSB: Full-Speed USB connection to PER processor.

All other interfaces are only intended to be used by payloads/interfaces provided by AscTec. Do not use them.

## Pinout
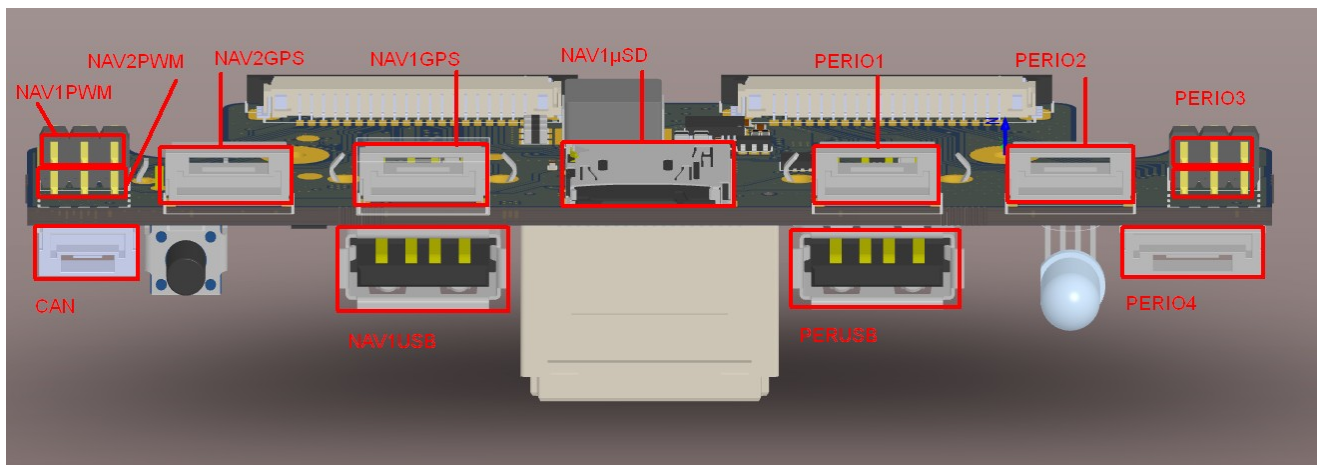


| NAV1/NAV2 Interfaces | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NAV1PWM | | | | | | | | | |
| GND | +5V | PWM | | | | | | | |
| NAV2PWM | | | | NAV2GPS | | | | | |
| GND | +5V | PWM | | **1** VBat | **2** RX | **3** TX | **4** IO1 | **5** IO2 | **6** GND |
| | | | | | | | | | |
| **4** GND | **3** CANL | **2** CANH | **1** VBat | | | | | | |
| CAN | | | | | | | | | |

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## NAV1/NAV2 Interfaces

### NAV1GPS

| 1 VBat | 2 RX | 3 TX | 4 IO1 | 5 IO2 | 6 GND |
|--------|------|------|-------|-------|-------|

### NAV1 microSD

### NAV1USB

## PER interfaces

### PERIO1

| 1 VBat | 2 RX | 3 TX | 4 IO1 | 5 - | 6 GND |
|--------|------|------|-------|-----|-------|

### PERIO2

| 1 VBat | 2 RX /SDA | 3 TX /SCL | 4 SWDIO | 5 SWCLK | 6 GND |
|--------|-----------|-----------|---------|---------|-------|

### PERUSB

## PER interfaces

### PERIO3

| GND | +5V | PWM |
|-----|-----|-----|
| GND | +5V | PWM |

| 7 GND | 6 GND | 5 IO6/NSS | 4 IO3/SCK | 3 IO5/MISO | 2 IO0/MOSI | 1 VBat |
|-------|-------|-----------|-----------|------------|------------|--------|

### PERIO4

## Signal Level

- Battery level is 14-16.8V (4S LiPo battery)
- All IO pins have 3.3V signal level and are 5V tolerant
- USB signal level: 5V
- CAN according to specifications (+-58V) + full ESD-protection

## Current Rating

> ⚠ **Beta Information**
>
> The fuses on all IOs and power outlets are missing. Consequently, the below listed ratings can be exceeded and lead to a potential damage if the ratings are not respected.

- Power outlets 2x left side: 2A together
- Power outlets 2x right side: 2A together
- PERIO1, PERIO2, PERIO4, NAV1GPS, NAV2GPS, CAN pins together: 2A
- USB ports: 1A each
- NAV1PWM + NAV2PWM: 1A
- PERIO3: 1A

## Connector Types

Digikey order numbers:

- 4 pin: GHR-04V-S
- 6 pin: GHR-06V-S
- 7 pin: GHR-07V-S
- Power outlets (inner diameter 2.1mm, outer diameter: 5.5mm): CP-2189-ND
- NAV1PWM, NAV2PWM, PERIO3: standard 2.54mm pin header