

# The T-Minus CanSat kit

## Science in a soda-can



The T-Minus CanSat kit is designed to get high-school students acquainted with the fascinating world of sensors, microcontrollers and data communication. It provides the basic means and guidelines to develop a simple soda-can sized satellite, a *CanSat*, while still keeping all options open for fabricating more complex electronic systems, the only limiting factor being the imagination of the students. With the T-Minus CanSat kit in hand, it is possible for the students to master the basics of microcontroller programming in just one day.

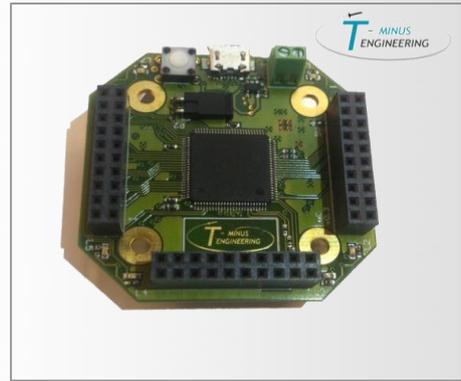
The CanSat kit is fully compatible with the easy-to-use and well-known Arduino software development environment, which has a large online user community, providing plenty of well-designed examples and tips. The sensors and transceivers supplied with the kit make it possible to fulfill a primary mission: determining the altitude of the CanSat in real-time. Finally, the mechanical components necessary to build the structure of a CanSat are provided in the kit.

## Kit contents

A standard T-Minus CanSat kit contains:

- Main Controller Unit (MCU)
- Sensor/experimentation board
- Transceivers
- Mechanical components
- USB stick with documentation and software

## MCU



The Main Control Unit (MCU) is a single printed circuit board (PCB) with a microcontroller, power supply and connections for peripherals. This board forms the heart of the CanSat and manages all operations. It can be powered via a USB port from a computer or via a battery. The USB connector also provides a direct data link with a computer, for easy programming of the MCU. The board provides 46 General Purpose Input/Output (GPIO) pins, to which peripherals can easily be connected using low insertion-force pinheaders. The pins can be programmed as simple high/low output or input, but special functions such as UART, I<sup>2</sup>C, interrupt or PWM output are also possible.

## Sensor/experimentation board

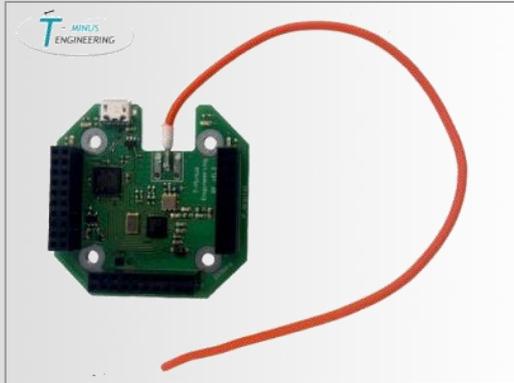
A real scientific satellite is equipped with sensors. Therefore, 3 types of sensors for air pressure and ambient temperature are included in the T-Minus CanSat kit. These can be soldered on the 2.54 mm experimentation PCB that is included.

The on-board analog-to-digital converter yields digitized measurement values, ready for readout in the computer.



## Transceivers

Of course, a satellite needs wireless communication. For this reason, a transmitter and a receiver are included, so that data can be sent by the CanSat and received on a computer in the ground station.



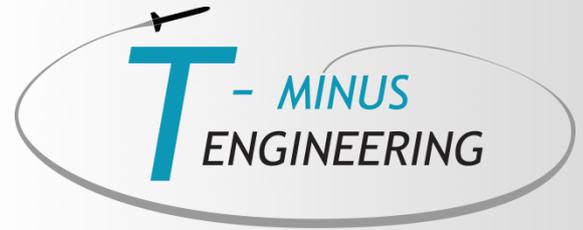
## Mechanical components

Various mechanical components such as threaded rods, nuts, washers and endplates are included in the kit, to build the physical structure of the CanSat.



## Documentation and software

Finally, the CanSat kit comes with a comprehensive set of documentation, datasheets and dedicated software for programming and data reception on a USB stick. Step-by-step guidelines for completing the CanSat are provided.



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