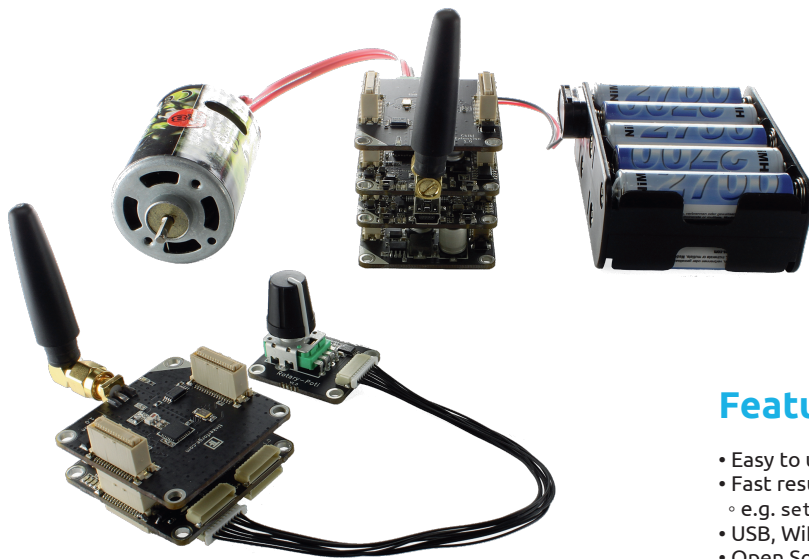
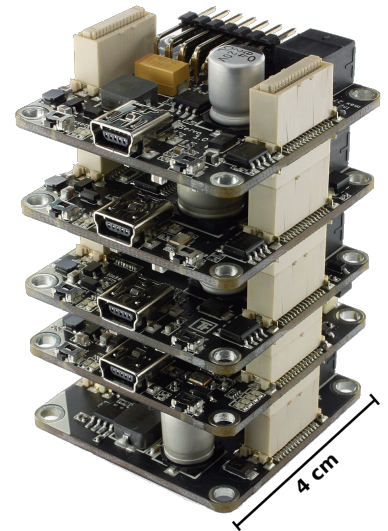


# Tinkerforge

## Electronic Construction Kit

### Product Overview

Tinkerforge is a system of open source hardware building blocks that allows to combine sensor and actor modules by plug and play. The building blocks can be used to realize a wide range of embedded projects without prior knowledge in hardware programming. Typical applications are robotics, environmental sensing, home automation and rapid prototyping. With the Tinkerforge hardware, it is surprisingly easy to create complex systems.



### Product of the Year 2012

Tinkerforge is winner of the CHIP Award "Product of the Year 2012"

### Features

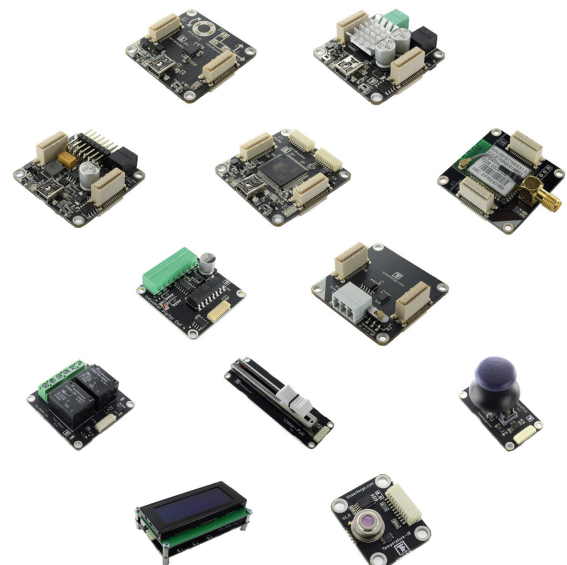
- Easy to use, assembly by plug and play, no soldering required
- Fast results with powerful API
  - e.g. `setVelocity()` in m/s or `getTemperature()` in °C
- USB, WiFi (802.11b/g/n) and RS485 interfaces
- Open Source and Open Hardware
- C/C++, C#, Delphi, Java, PHP, Python and Ruby support
- Support for other languages under development
- Linux, Mac OS X and Windows support
- Mobile device support for Android, iOS and Windows Phone

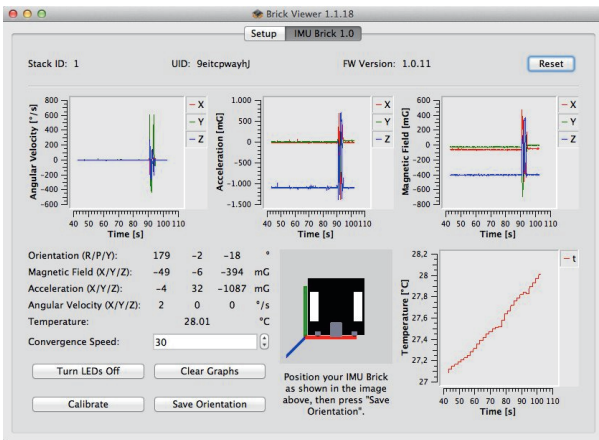
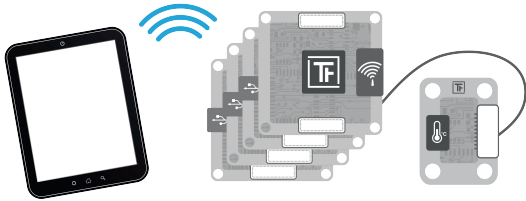
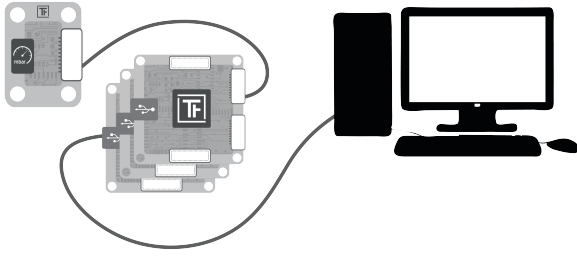
### Building Blocks

**Bricks** are 4 × 4 cm boards with 32-bit ARM Cortex M3 microcontroller, mini-USB port, stacking connectors and up to four Bricklet connectors. Bricks perform complex sensor tasks (e.g. IMU Brick), communicate (e.g. Master Brick) and drive motors (e.g. DC Brick). Bricks can be stacked. A Master Brick at the bottom of a stack is responsible for the communication among all stack members. For the user, the stack behaves as if all Bricks were connected independently.

**Master Extensions** are 4 × 4 cm boards which can be utilized to extend the communication interfaces of a Master Brick. With these extensions, multiple stacks can be interconnected by RS485 or controlled over WiFi (802.11b/g/n).

**Bricklets** can be used to extend the features of Bricks. There are Bricklets that measure physical quantities such as rotation, voltage, current and ambient light as well as Bricklets for control purposes such as switching relays, digital input/output and alphanumeric output on LCDs. Unlike Bricks, Bricklets have no fixed size and use minimal space. Each Bricklet is equipped with an EEPROM that stores its firmware plugin. Those are loaded by the connected Brick on startup. This generic approach makes it possible to have compatibility between all Bricks and Bricklets, including future ones.





## Usage

Bricks and Bricklets can be controlled by (embedded-)PCs, mobile phones or tablets. The controlling device runs your program. To create it, an easy-to-use and powerful API is provided, implemented for many programming languages. The following C# example code retrieves the temperature from a Temperature Bricklet and displays it on a LCD 20x4 Bricklet:

```
using Tinkerforge;

class Example
{
    static void Main()
    {
        IPConnection ipcon = new IPConnection();
        BrickletTemperature temp = new BrickletTemperature("Xwe", ipcon);
        BrickletLCD20x4 lcd = new BrickletLCD20x4("W2a", ipcon);

        ipcon.Connect("192.168.0.42", 4223);

        short temperature = temp.GetTemperature();

        lcd.WriteLine(0, 0, temperature / 100.0 + " °C");
        lcd.BacklightOn();
    }
}
```

API calls use unique IDs ("Xwe" and "W2a" in the example) to address Bricks and Bricklets. It does not matter if Bricks are stacked or where Bricklets are connected. They can be controlled wirelessly or in a network, you can always use the same code.

For testing purposes, the Brick Viewer program is provided. You can use it to become familiar with the capabilities of the building blocks and to configure them.

## Open Source

All Tinkerforge hardware and software is completely open source. It is possible to examine the hardware schematics and design files and to modify the firmware files. Design files for all products are available.

## Product Overview

### Bricks

DC	Drives one brushed DC motor with max. 28 V and 5 A
Debug	For Firmware Developers: JTAG and serial console
IMU	Full fledged AHRS with 9 degrees of freedom
Master	Is the basis to build stacks and has 4 Bricklet Ports
Servo	Drives up to 7 RC Servos with max. 3 A
Stepper	Drives one bipolar stepper motor with max. 38 V and 2.5 A

### Extension

RS485	Cable based RS485 Master Extension
WIFI	Wireless 802.11b/g/n WIFI Master Extension

### Bricklets

Ambient Light	Measures ambient light up to 900 lux
Analog In	Measures voltages up to 45 V
Analog Out	Generates configurable voltages up to 5 V
Barometer	Measures air pressure and altitude changes
Breakout	Makes all Bricklet signals available
Distance IR	Measures distances up to 150 cm with IR light
Dual Relay	Two relays to switch AC/DC devices
GPS	Determines position, velocity and altitude
Humidity	Measures relative humidity
Industrial DI 4	Four galvanically isolated digital inputs
Industrial DO 4	Four galvanically isolated digital outputs
Ind. Quad Relay	Four galvanically isolated solid state relays
IO-16	16-channel digital input/output
IO-4	4-channel digital input/output
Joystick	2-axis joystick with push-button
LCD 20x4	20x4 character alphanumeric display with blue backlight
Linear Poti	59 mm linear potentiometer
Rotary Poti	300° rotary potentiometer
Temperature	Measures ambient temperature with 0.5 °C accuracy
Temperature IR	Measures contactless object temperature (-70 °C to 380 °C)
Voltage	Measures voltages up to 50 V
Voltage/Current	Measures power, voltage and current up to 720 W/36 V/20 A

