

Code #LikeABosch

Hardware development challenge

Who are we?

Bosch has the second-largest innovation center in Budapest, Hungary where the engineers are focused on driving innovation, research, and development in emerging technologies and strategic areas. This center is a hub of creativity and technological advancement where experts collaborate to explore cutting-edge solutions for the future. **We invite you to be our next innovator!** Keeping the “Invented for life” slogan in mind you can now innovate on one of our products.

Introduction to the challenge

Bosch offers a comprehensive range of power tools designed for both professionals and DIY enthusiasts. Your task will be to come up with an innovative idea that adds an external component, module, service or other solution to the existing EasyDrill 12 drill/screwdriver. This can benefit the customers by enhancing their already existing drill and Bosch by gaining potential customers, or sales. The extension you are designing can be an add-on hardware element on the drill itself (accelerometer, display, distance meter, power consumption indicator, mode selector, etc.), or an external solution using the drill (RFID based station that counts the returned drills, but you can have extraordinary ideas such as an apple peeler extension, etc.). Since this is a HW challenge, minimum one electronic module added to the drill is a must!

During the course of the 24 hours your team needs to:

- Brainstorm and decide on an idea **that can enhance the Bosch 12 screwdriver**
- Business model of your solution
 - o Customer need for your extension – how many new customers could be acquired with the new extension
 - o Value added for the customer – comfort, safety, efficiency, versatility
 - o Feasibility – is this can be really realized?
 - o Costs – development, BOM, sale price

- Overview of the proposed solution – block diagram, infographics, etc.
- Schematic of the proposed solution – the real connection between the components, modules, can be done in CAD, or in paint.
- Simulations and calculations of the main component, or part of the hardware (if applicable)
- Documentation of your idea and solution
- Firmware block diagram (only if applicable to your idea)
- Firmware code, or segment of your algorithm (only if applicable to your idea)
- Explain your idea and introduce your team in a video
- **Optional for additional points:** start prototyping and bring your idea to life with the provided tools, hardware components on site (HW + firmware)

What we will provide

Experienced mentors, Q&A availability throughout the whole event who can help you in any aspect of the challenge.

If your team decides to create the hardware for additional points then you will get a Bosch EasyDrill 12 Cordless Drill/Driver and you can choose from the provided add-on boards. Your team can get the following: 1 type of microcontroller; 1 type of display board; 1 type of button or actuator and 4 types of sensor maximum.

Besides these hardware elements we will provide you with tools: screwdrivers, files, pliers, pinchers, etc.

Measurement devices: Oscilloscopes, Digital multimeters, Power supply units.

Soldering iron, solder, prototype boards, etc.

Evaluation criteria

Your submission will be graded based on the following guidelines:

- Your innovation idea can give up to a maximum of **25 points**, these are the most important aspects we are looking for:
 - Novelty of the idea
 - Value added to the customer

- o Feasibility of the product
 - o Market potential
 - o Scalability
 - o Impact on the current market
- The created video demonstrating the realization of the idea, and introducing the team: **15 points**
 - o Storytelling
 - o Visual and audio quality
 - o Creativity and originality
- The documentation of the idea and the realization gives you maximum **35 points**
 - o System block diagram
 - o Bill of materials
 - o Schematic sheet
 - o Calculations, simulations
 - o Working principle
 - o Firmware block diagram
 - o Firmware code
 - o Business model description
- Demonstrating the functional innovation idea, firmware code: **25 points**
 - o Giving a clear innovation objective to the audience
 - o Quality of the presentation
 - o Keeping the time
 - o Demonstration of the key features
 - o Q&A session

Appendix

EasyDrill 12: <https://www.bosch-diy.com/gb/en/p/easydrill-12-06039b3071>

Microcontroller boards:

- Arduino nano: <https://store.arduino.cc/products/arduino-nano>
- XIAO ESP32C3: https://wiki.seeedstudio.com/XIAO_ESP32C3_Getting_Started
- FireBeetle ESP8266: <https://www.dfrobot.com/product-1634.html>
- Raspberry Pi Pico: <https://www.okdo.com/p/okdo-raspberry-pi-pico-kit/>

Sensor, module boards:

- Seed Studio Acceleration: <https://www.seeedstudio.com/Grove-3-Axis-Digital-Accelerometer-LIS3DHTR-p-4533.html>
- Gas Sensor: https://wiki.dfrobot.com/Analog_Gas_Sensor_SKU_SEN0127
- Current Sensor <https://www.conrad.com/p/iduino-tc-9520256-current-sensor-1-pcs-compatible-with-development-kits-arduino-2380064>
- IR Distance Sensor: https://wiki.dfrobot.com/DFRobot_Infrared_sensor_breakout_SKU_SEN0042
- Pressure Sensor: <https://www.conrad.com/p/iduino-tc-9520292-sensor-module-1-pcs-compatible-with-development-kits-arduino-2380073>
- Force Sensitive Resistor: <https://www.digikey.com/en/products/detail/ohmite/FSR07BE/10127625>
- Gesture Sensor: <https://www.seeedstudio.com/Grove-Gesture-PAJ7620U2.html>
- Temp and Humidity Sensor: https://wiki.dfrobot.com/DHT11_Temperature_and_Humidity_Sensor_SKU_DFR0067
- Environmental Sensor: https://wiki.dfrobot.com/Gravity_I2C_BME280_Environmental_Sensor_Temperature,_Humidity,_Barometer_SKU_SEN0236
- Microphone Module: https://wiki.dfrobot.com/Fermion_MEMS_Microphone_Sensor_SKU_SEN0487

- PIR Sensor: [https://wiki.dfrobot.com/Digital Infrared motion sensor SKU SEN0018](https://wiki.dfrobot.com/Digital+Infrared+motion+sensor+SKU+SEN0018)
- Piezo Vibration Sensor: <https://www.seeedstudio.com/Grove-Piezo-Vibration-Sensor.html>
- Touch Sensor: <https://www.conrad.com/p/joy-it-lk-touch-linker-kit-expansion-board-1-pcs-1267863>
- Ultrasonic Distance Sensor: <https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/>
- RFID Kit: <https://www.conrad.com/p/joy-it-sbc-rfid-rc522-rfid-set-1-pcs-1503746>
- RTC Module: <https://www.seeedstudio.com/Pi-RTC-DS1307.html>

Display, feedback boards:

- RGB LED Ring: <https://www.seeedstudio.com/Grove-RGB-LED-Ring-16-WS2813-Mini-p-4201.html>
- Digital Buzzer: [https://wiki.dfrobot.com/Digital Buzzer Module SKU DFR0032](https://wiki.dfrobot.com/Digital+Buzzer+Module+SKU+DFR0032)
- Haptic Motor: <https://www.seeedstudio.com/Grove-Haptic-Motor-p-2546.html>
- OLED Display board 1: <https://www.seeedstudio.com/Grove-OLED-Display-0-66-SSD1306-v1-0-p-5096.html>
- OLED Display board 2: <https://www.seeedstudio.com/Grove-OLED-Yellow-Blue-Display-0-96-SSD1315-V1-0-p-5010.html>

Buttons, actuator boards:

- Push button: https://wiki.dfrobot.com/DFRobot_Digital_Push_Button_SKU_DFR0029
- Thumb Joystick: <https://www.seeedstudio.com/Grove-Thumb-Joystick.html>
- Motor Driver Board: <https://www.seeedstudio.com/Grove-I2C-Motor-Driver-with-L298.html>
- Relay Module: [https://wiki.dfrobot.com/Relay Module Arduino Compatible SKU DFR0017](https://wiki.dfrobot.com/Relay+Module+Arduino+Compatible+SKU+DFR0017)