

MEDIS – Module 2

Microcontroller based systems for controlling industrial processes

Lab 1.1: Introduction to microcontrollers - First steps

M. Seyfarth, Version 0.1



- 1.1 Objectives of the lab
- 1.2 Connecting Microcontroller to PC
- 1.3 Framework for applications
- 1.4 Work orders
- 1.5 Conclusion

Aims of the lab



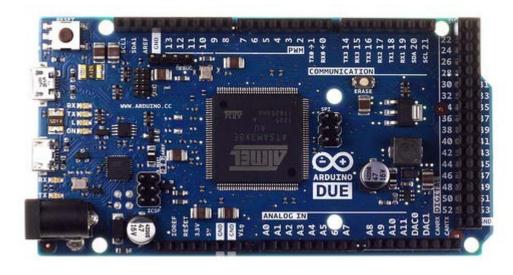
- Use of the Development Environment
- Connect the Microcontroller to the Personal Computer /Laptop

Program and transfer Applications

Microcontroller Board



Arduino DUE Microcontroller Board



- Atmel SAM3X8E ARM Cortex-M3 CPU (at 3.3 volts)
- 84 MHz Clock
- 512 Kbytes of Flash memory
- USB programming port



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Connecting Microcontroller to PC (1)

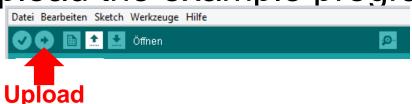


- Download Arduino Environment: http://arduino.cc/en/Main/Software (version 1.57!)
- 2. Unzip the downloaded file
- Connect the Microcontroller with the USB cable to the PC (use the USB-port next to the DC power jack)
- 4. Install the drivers (located in "Drivers" folder of the Arduino Environment
- 5. Launch the Arduino Environment

Connecting Microcontroller to PC (2)



- Open the LED blink example sketch:
 File > Examples > 1.Basics > Blink
- 7. Select the board: Sketch Tools Help o 0020 ЖT Auto Format Archive Sketch Tools > Board Fix Encoding & Reload Serial Monitor ΰ₩Μ (Arduino DUE (Programming port)) Board ✓ Arduino Uno Serial Port Arduino Duemilanove or Nano w/ ATmega328 Arduino Diecimila, Duemilanove, or Nano w/ ATmega168 8. Select the serial port: Burn Bootloader Arduino Mega 2560 Arduino Mega (ATmega1280) Arduino Mini Tools > Serial Port Arduino Fio Arduino BT w/ ATmega328
 - It's likely to be COM3 or higher
- 9. Upload the example program:



10. The onboard LED blinks with 1 Hertz

Arduino BT w/ ATmega168

LilyPad Arduino w/ ATmega328 LilyPad Arduino w/ ATmega168

Arduino NG or older w/ ATmega168

Arduino NG or older w/ ATmega8

Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328 Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168

Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328 Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168



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Framework for applications



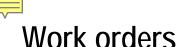
A sketch is built up by two functions

- Function setup()
 no return value; no calling parameters;
 called once, when microcontroller is
 powered up; for initialization purposes;
- Function 100p()
 no return value; no calling parameters;
 called repeatedly, after setup is ready;
 for main functionality of the application;

```
sketch_sep29a | Arduino 1.5.7
Datei Bearbeiten Sketch Werkzeuge Hilfe
  sketch sep29a
void setup() {
  // put your setup code here, to run once:
void loop() {
  // put your main code here, to run repeatedly:
                                                        Arduino Uno on COM1
```



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1. Write a sketch that prints "Hello World" to the serial monitor.

Date: Bearbeiten Sketch Werkzeuge Hilfe

- A language reference Monitor can be found on www.arduino.cc (Serial Communication)
- 2. Write a sketch that prints an integer number in decimal, binary and hexadecimal format to the serial monitor.
- 3. Write a sketch that parses characters from the PC-keyboard. For example: I 123.45; the value 123 is stored in an integer variable F 123.45; the value 123.45 is stored in a float variable Use print-statements for debugging purposes. Only I (integer) and F (float) must be supported.



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- Know the connection of microcontroller to PC
- Know the basic concepts of the use of the ARDUINO Environment
- Know how to program, transfer, start and monitor applications on the microcontroller
- 4. Know Serial library for communication