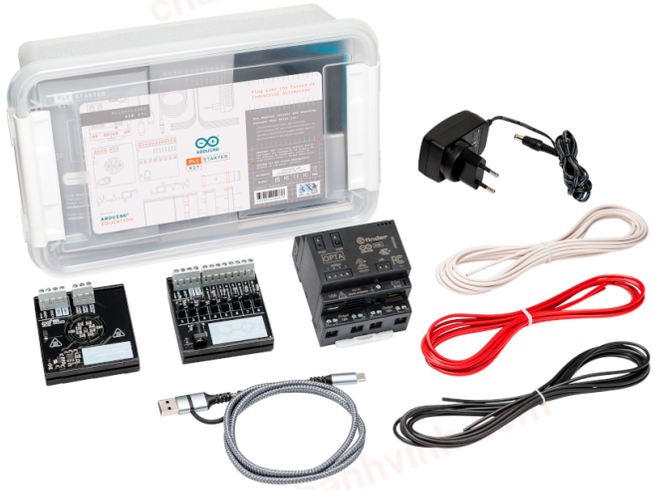
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Product Reference Manual
SKU: AKX00051



Description

Programmable Logic Controller (PLC) technology is vital for industrial automation; however, gaps still exist between the current PLC education and industry's needs. To cultivate a robust industrial knowledge Arduino introduces the educational Arduino® PLC Starter Kit.

Target Areas:

Pro, PLC projects, Education, Industry Ready, Building automation

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1 Content of the kit

1.1 Arduino Opta® WiFi

Arduino Opta® WiFi (SKU: AFX00002) is a secure, easy-to-use micro PLC with Industrial IoT capabilities fully certified to be used in industrial environments. Designed in partnership with Finder®, Opta® allows professionals to scale up automation projects while leveraging the Arduino ecosystem.



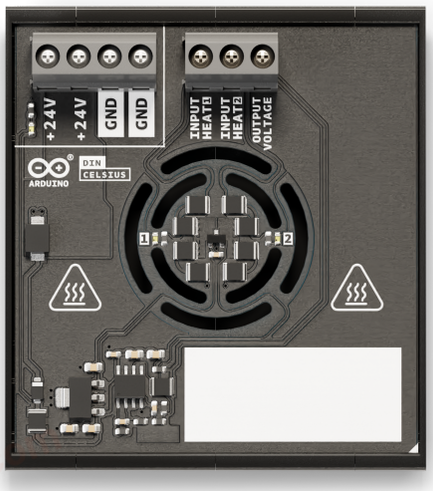
Arduino Opta® WiFi

The Opta® family Arduino sketches and standard IEC-61131-3 PLC languages using the Arduino PLC IDE were designed with PLC engineers in mind. To know more about this PLC check its official datasheet.

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1.2 Arduino® DIN Celsius

The output simulator (DIN Celsius) (SKU: ABX00098) features a heater resistor array and a temperature sensor. It allows you to experiment with actuators and sensors, and it is ideal to be integrated into different control systems. Check the Arduino DIN Celsius section to know more.

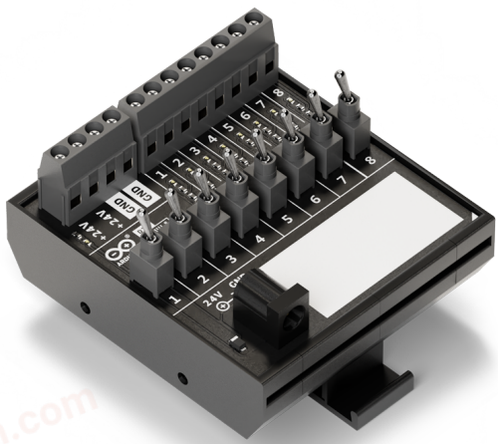


Arduino® DIN Celsius

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1.3 Arduino® DIN Simul8

The input simulator (DIN Simul8) (SKU: ABX00097) includes 8x switches and power control. It is suitable for interfacing the power of your PLC application and the inputs channels with 8x SPST toggle switches as an industrial-like user interface. Check section the Arduino DIN Simu8 section to know more.



Arduino® DIN Celsius

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1.4 USB Cable

The official Arduino USB cable features a USB-C® to USB-C® with a USB-A adapter connection. This data USB cable can easily connect your Arduino boards with your chosen programming device.



Arduino® USB Cable compatible with USB-C® and USB-A connectors

1.5 Power Brick

The kit includes a 120/240 V to 24 VDC - 1 A power supply to power the kit through the DIN Simul8 barrel jack. It can deliver 24 W and ensures a sufficient and stable power source for your application. It includes different countries power plug adapters so you can use it anywhere in the world.

1.6 Wiring Cables

The kit includes three wiring cables (AWG 17) with a length of 20 cm in three colors: white, blank, and red to make the whole system connections. They can be cut into small cables depending on the project and are suitable to be used under the power specifications of the power brick: 24 VDC 1A.

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1.7 DIN Bar Mounts

The kit includes DIN bar mount plastic pieces to attach the DIN Celsius and DIN Simu8 to a DIN bar among the Arduino Opta® Wifi.

2 Arduino® DIN Celsius



Arduino® DIN Celsius

The Arduino® DIN Celsius offers you a mini temperature laboratory to test your PLC skills, with two independent heater circuits and one temperature sensor placed at the center of the board.

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2.1 Features

Note: This board needs the Arduino Opta® for full functionality.

- **Temperature sensor**
  - 1x TMP236, from -10 °C to 125 °C with an accuracy of +/- 2.5 °C
- **Heater circuits**
  - 2x independent heater circuits
- **Screw connectors**
  - 2x screw connectors exposing +24 VDC
  - 2x screw connectors exposing GND
  - 2x screw connectors for the two independent heater circuits (24 VDC)
  - 1x screw connector for the output voltage of the temperature sensor
- **DIN mounting**
  - RT-072 DIN Rail Modular PCB Board Holders - 72 mm

2.2 Compatible Products

The Arduino® DIN Celsius it is fully compatible with the following Arduino Products:

Product name	SKU	Min voltage	Max voltage
Arduino Opta® RS485	AFX00001	12 V	24 V
Arduino Opta® WiFi	AFX00002	12 V	24 V
Arduino Opta® Lite	AFX00003	12 V	24 V
Arduino® Portenta Machine Control	AKX00032	24 V	24 V
Arduino® DIN Simul8	ABX00097	24 V	24 V

Note: Please turn to each products's datasheet for further information about their technical specifications.

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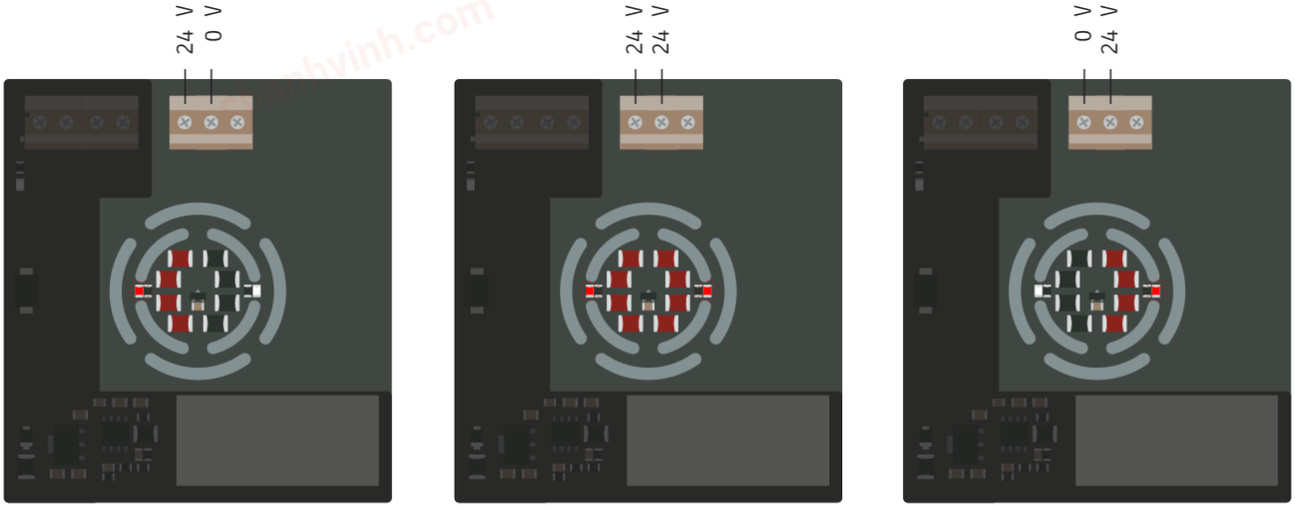
2.3 Functional Overview

These are the main components of the board, other secondary components, i.e. resistors or capacitors, are not listed.

Qty	Element	Description
1	Temperature sensor	TMP236A2DBZR IC SENSOR
4	Left heating circuit	RES CHIP 1210 1k2 1% 1/2W
4	Right heating circuit	RES CHIP 1210 1k2 1% 1/2W
2	Heating status	LED SMD 0603 RED
1	Power status	LED SMD 0603 GREEN
1	Power connector	CONN SCREW TERMINAL, pitch 5mm, 4POS, 16A, 450V, 2.5mm^2
1	Input / output connectors	CONN SCREW TERMINAL, pitch 5mm, 3POS, 16A, 450V, 2.5mm^2
1	Protection from reverse polarity	DIODE SCHOTTKY SMD 2A 60V SOD123FL

2.4 Heating Circuits

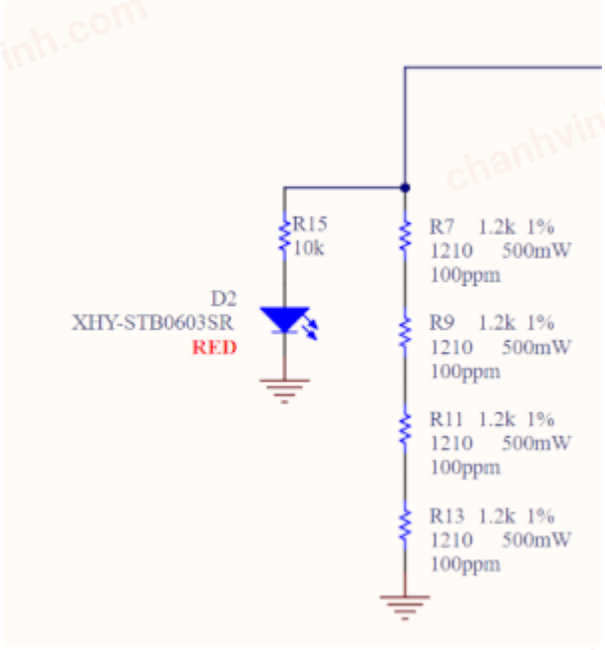
The board provides two independent heating circuits powered by 24 V through two different screw connectors, one placed on the left side of the temperature sensor and the other on the right side, as it can be seen in the following figure:



Arduino DIN Celsius heater zones mapping

The heat is generated by the current passing through four resistors in series being the power about 120 mW per each circuit.

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Toggle Switch Schematic Circuit

2.5 Temperature Sensor

The temperature sensor is the TMP236A2DBZR from Texas Instruments. Here you can see its main specifications:

- Analog out 19.5 mV/°C
- Voltage reference of 400 mV at 0 °C
- Maximum Accuracy: +-2.5 °C
- Temperature-Voltage range: -10 °C to 125 °C VDD 3.1 V to 5.5 V

In order to create an analog output signal (0-10 V) a 4.9 multiplier circuit has been added before the OUTPUT VOLTAGE screw connector pin.

The relation between the temperature, the voltage of the sensor and the output voltage of the board is summarized in the following table:

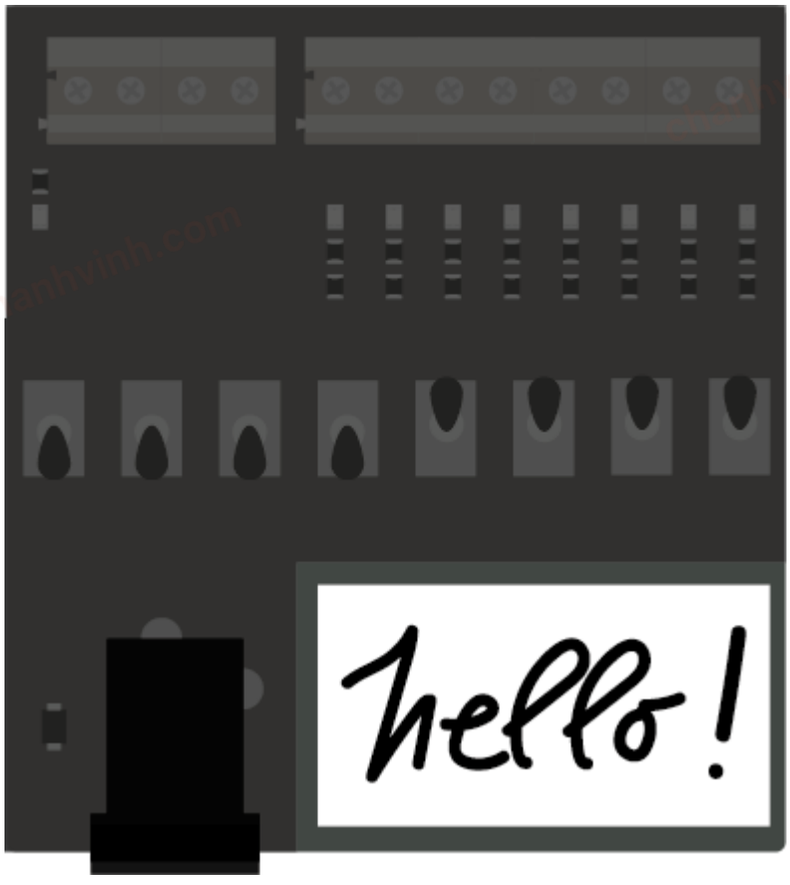
TEMPERATURE [°C]	SENSOR OUTPUT [V]	BOARD OUTPUT x4.9 [V]
-10	0.2	1.0
-5	0.3	1.5
0	0.4	2.0
5	0.5	2.4
10	0.6	2.9
15	0.7	3.4
20	0.8	3.9
25	0.9	4.4
30	1.0	4.8
35	1.1	5.3
40	1.2	5.8
45	1.3	6.3

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TEMPERATURE [°C]	SENSOR OUTPUT [V]	BOARD OUTPUT x4.9 [V]
50	1.4	6.7
55	1.5	7.2
60	1.6	7.7
65	1.7	8.2
70	1.8	8.6
75	1.9	9.1
80	2.0	9.6
85	2.1	1.,1

2.6 Custom Labelling

At the bottom right of the board a white rectangle on the silk layer offer a space to customize the board with your name.

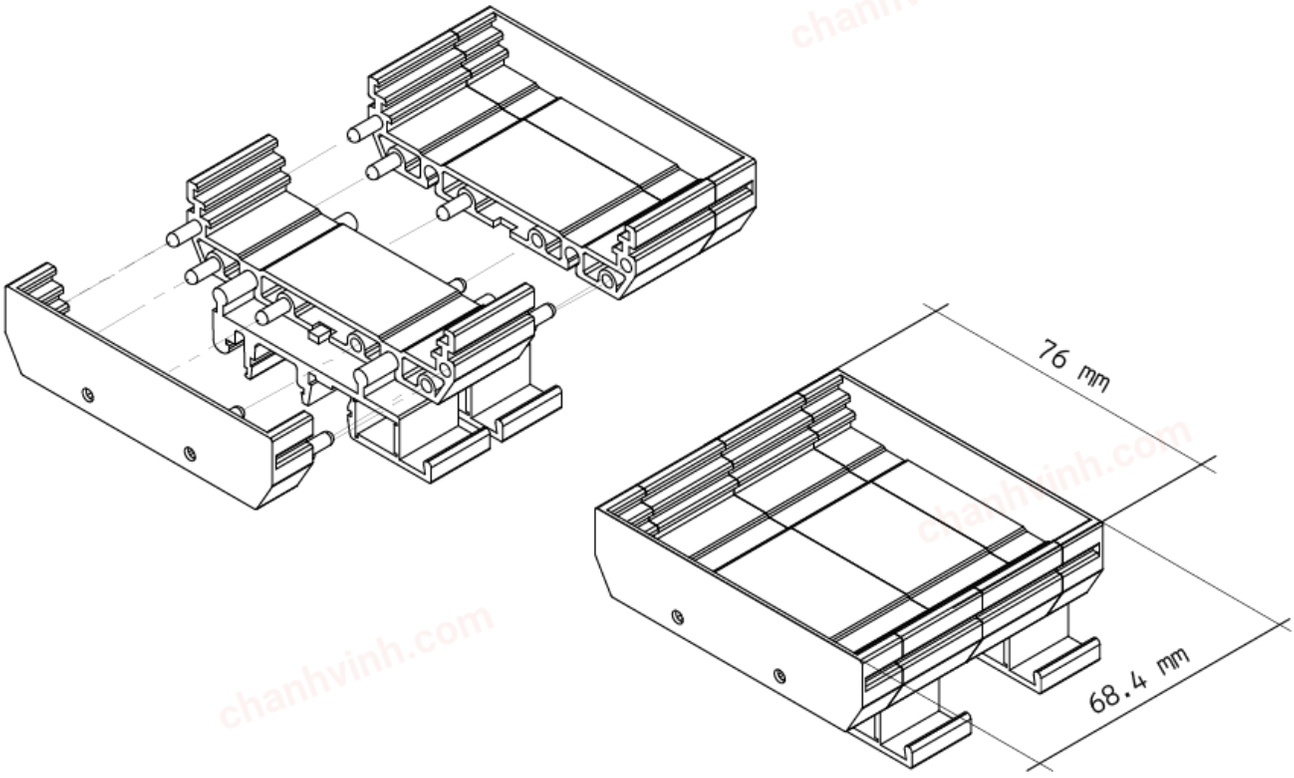


Custom Labelling space on the Celsius PCB

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2.7 Mechanical Information

2.7.1 Enclosure Dimensions

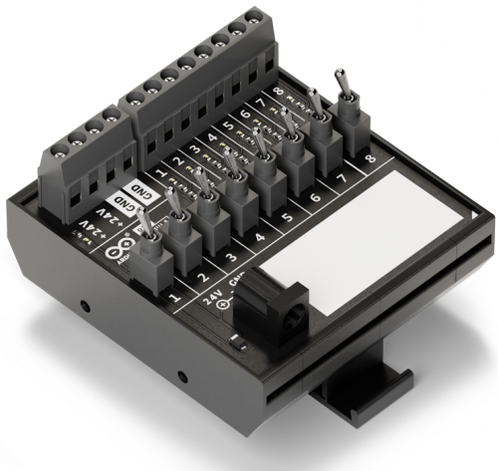


DIN enclosure

The enclosure is equipped with a DIN clip, as it can be seen here where you can find all the measure's information.

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3 Arduino® DIN Simul8



Arduino® DIN Simul8

Arduino® DIN Simul8 is a digital-input-simulator and power distribution board for the Arduino Opta® family and Arduino® PLC Starter Kit. It provides eight toggle switches (0-10 V output) and four screw terminal for bringing the 24 V and the ground easily to the PLC or other board.

3.1 Features

Note: This board needs the Arduino Opta® for full functionality.

- **Toggle Switches**
  - 8x toggle switch in the middle of the board
- **LEDs**
  - 8x LEDs showing the status of each toggle switch
- **Screw connectors**
  - 2x screw connectors exposing +24 VDC
  - 2x screw connectors exposing GND
  - 8x screw connectors link to the toggle switches output (0-10 V)
  - 1x barrel plug (+24 VDC)
- **DIN mounting**
  - RT-072 DIN Rail Modular PCB Board Holders - 72 mm

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3.2 Compatible Products

Product name	SKU	Min voltage	Max voltage
Arduino Opta® RS485	AFX00001	12 VDC	24 VDC
Arduino Opta® WiFi	AFX00002	12 VDC	24 VDC
Arduino Opta® Lite	AFX00003	12 VDC	24 VDC
Arduino® Portenta Machine Control	AKX00032	20 VDC	28 VDC
Arduino® DIN Celsius	ABX00098	20 VDC	28 VDC

Note: Please turn to each products' datasheet for further information about power and their capacity.

3.3 Functional Overview

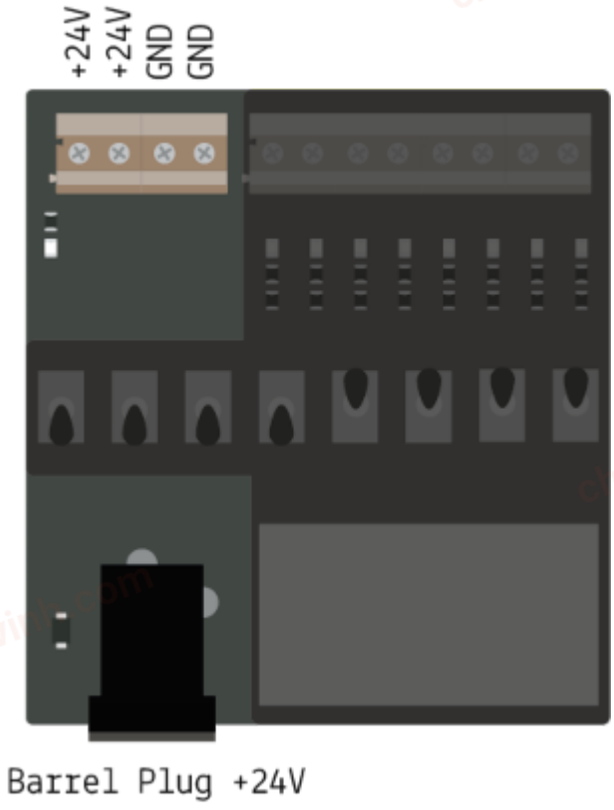
These are the main components of the board, other secondary components, i.e. resistors, are not listed.

Quantity	Function	Description
8	0-10 VDC signal output	Switch toggle SPST handle 6.1 mm bushing SPST terminal type M2 contact silver, color black
8	Show switch status	LED SMD 0603 GIA588 8mcd 120^
1	Power plug	CONN PWR JACK 2.1X5.5 mm SOLDER
1	Show main power status	LED SMD 0603 GREEN/568 15mcd 120^
1	Power connector	CONN SCREW TERMINAL, pitch 5 mm, 4POS, 16 A, 450 V, 2.5 mm^2 14AWG, dovetail, GREY, screw flat, housing 20x16.8x8.9 mm
1	Signal connector	CONN SCREW TERMINAL, pitch 5 mm, 8POS, 16 A, 450 V, 2.5 mm^2 14AWG, dovetail, GREY, screw flat, housing 40x16.8x8.9 mm
1	Protect from reverse polarity	DIODE SCHOTTKY SMD 2 A 60 V SOD123FL

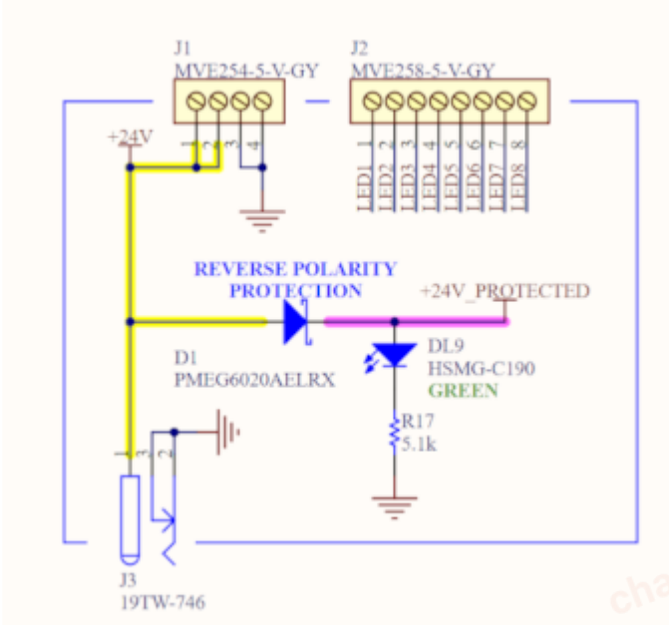
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3.4 Power Distribution

The board can be powered up from the barrel plug offering two couples of screw connectors to deliver power to the PLC and other board, i.e. the Arduino® DIN Celsius board of the PLC Starter Kit.



Power distribution on the Simu8 board



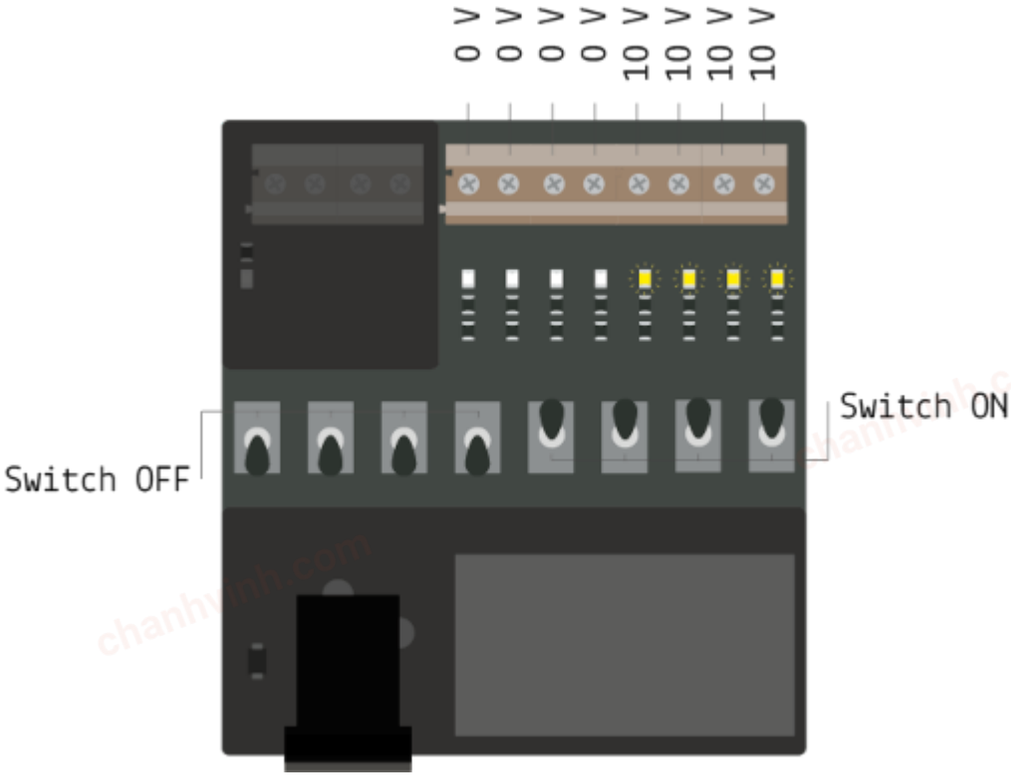
Power distribution on the Simu8 board

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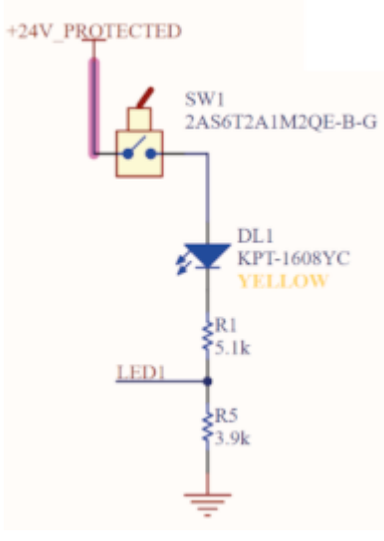
3.5 Toggle Switches

Once powered up, every toggle-switch drive a 0-10 VDC signal:

- 0 V when it is in is OFF position (toward the barrel plug)
- around 10 V when it's in its ON position (toward the screw connector)



toggle switch

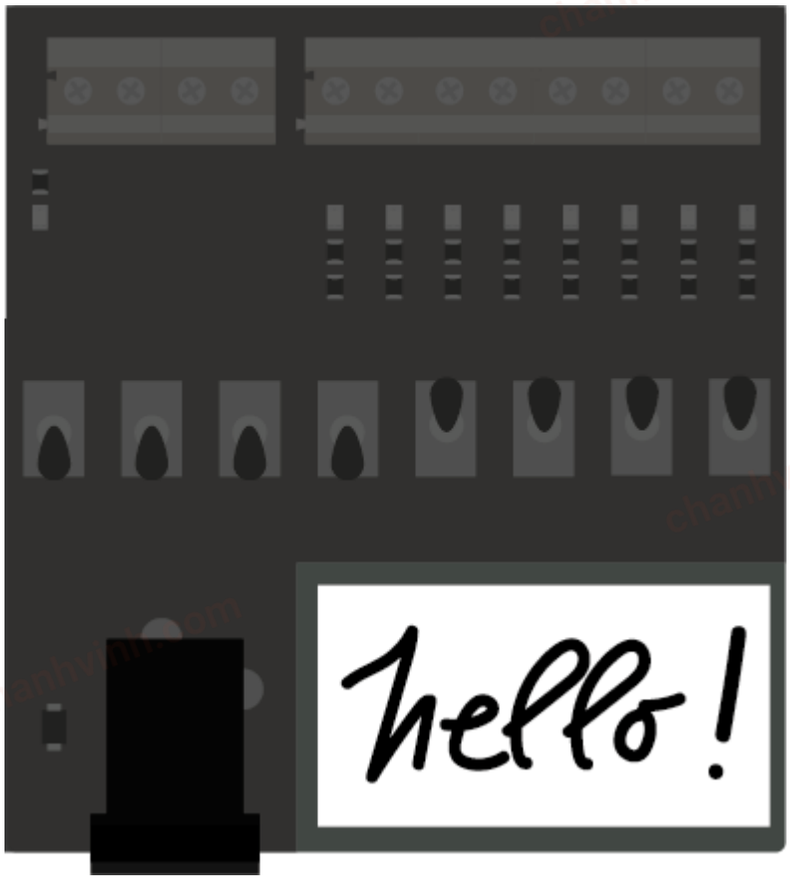


toggle switch scheme

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3.6 Custom Labelling

At the bottom right of the board a white rectangle on the silk layer offer a space to customize the board with your name.

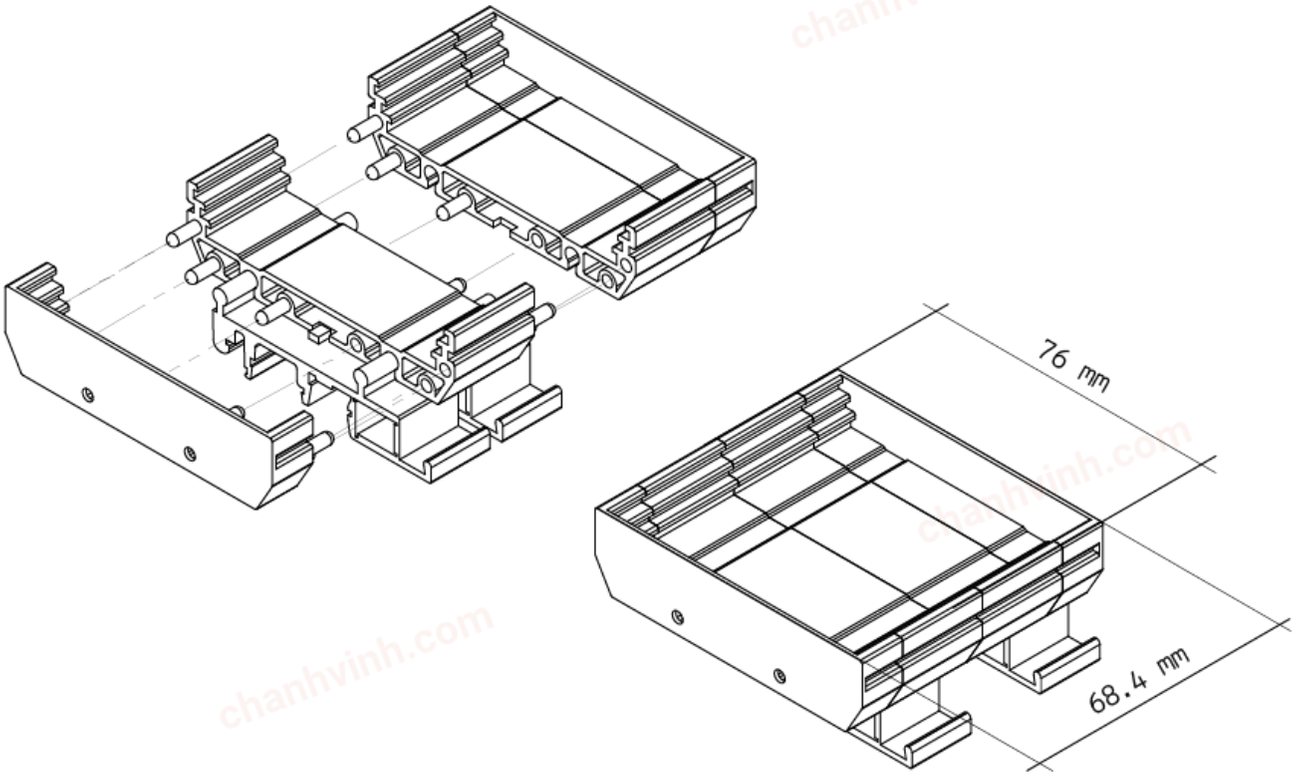


Custom labelling space on the Simu8 board

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3.7 Mechanical Information

3.7.1 Enclosure Dimensions



DIN enclosure

The enclosure is equipped with a DIN clip, in the image from above you can find all the other information and dimension of it.

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4 Certifications

4.1 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

4.2 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl) phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions : No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (https://echa.europa.eu/web/guest/candidate-list-table), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

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4.3 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations with regards to laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder, or as a component in metal alloys. As part of our reasonable due diligence Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

5 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference

(2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.
3. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l' appareil nedoit pas produire de brouillage

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC SAR Warning:

English: This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

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French: Lors de l’ installation et de l’ exploitation de ce dispositif, la distance entre le radiateur et le corps est d ’au moins 20 cm.

Important: The operating temperature of the EUT can’t exceed 85°C and shouldn’t be lower than -40°C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

6 Company Information

Company name	Arduino S.r.l
Company Address	Via Andrea Appiani, 25 - 20900 MONZA (Italy)

7 Revision History

Date	Revision	Changes
17/01/2025	1	First release