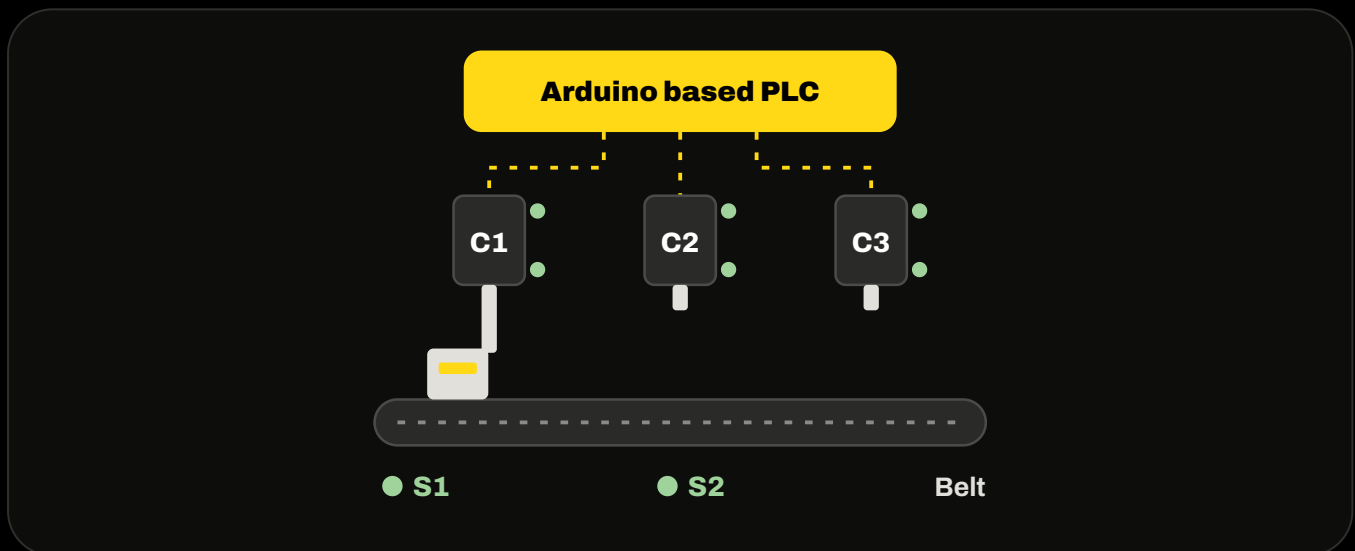


TEST BENCH · ARDUINO BASED PLC

Prove a pneumatic sequence on a bench first.

A belt, 3 cylinders, 8 sensors and one Arduino based PLC.

[Read the interactive case study online ›](#)


3

pneumatic cylinders,
moved by 3 solenoid
valves

8

digital inputs: 2 capacitive
and 6 inductive sensors

4

digital outputs: 3 valves
and the belt motor

8

GRAFCET steps, from
step 0 to step 7

THE CHALLENGE

Check the sequence before it moves a real box.

A labelling line looks simple: feed a box, put a label on it, take it out. The control logic has to run every step in the right order and wait for the right sensor each time. The bench lets you see each step happen.

01

Eight steps, one order

C1 places the box, C2 puts the label, C3 takes the box out. Each cylinder must finish its stroke before the next one moves. From step 1 to step 7, the PLC waits for a sensor before it moves on.

02

Twelve signals to wire

Eight inputs and four outputs, with two types of sensor. Each signal must reach the right terminal and the right variable in the program.

03

Real air, real motion

Three cylinders move with compressed air through three solenoid valves. A motor runs the belt. These are real actuators with real end-of-stroke sensors.



Built for testing and learning

You see the cylinder move and the sensor switch. That makes the bench a direct way to test a sequence and to teach sequential logic to a team.

HOW IT WORKS

Run the GRAFCET. Then break it on purpose.

Test 1 · Sequence

Eight GRAFCET steps. Steps 1 to 7 wait for a sensor.

Step 0 starts the belt. In step 1 the PLC waits for a box at S1. Then C1 places the box on the belt, and the belt carries it to S2. C2 moves down and back to put the label. C3 takes the box out of the labelling area. The cycle closes when C3 is back (micro 6) and S2 sees no box.

- Steps 1 to 7 end on a sensor, never on a fixed time
- Two end-of-stroke sensors per cylinder: one forward, one back
- C2 only moves when C1 is back (micro 2) and the box is at S2

Test 2 · Sensor fault

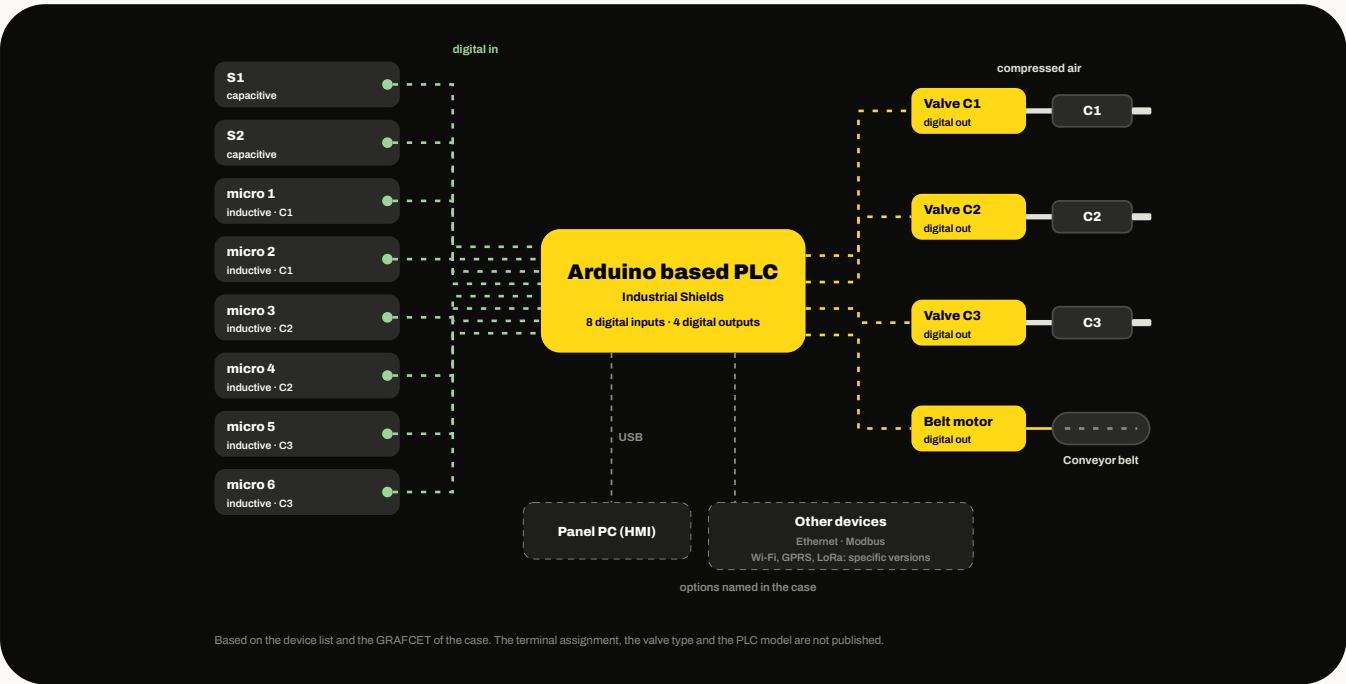
Make a sensor fail. See where the sequence stops.

In a GRAFCET, a step ends only when its transition is true. If a sensor never switches, the sequence waits in that step for ever. On a bench you find this with a cable you unplug, not on a running line. A typical way to make it visible: a timer per step. If a step lasts longer than expected, the PLC switches the outputs off and reports the missing signal. The case does not publish its fault handling.

- The waiting step tells you which device to check
- A step timer turns a silent stop into a clear alarm
- You test the fault handling before the machine needs it

How does one Arduino based PLC run a pneumatic labelling bench?

Eight sensors go to digital inputs of the PLC: two capacitive sensors for the box and six inductive sensors for the ends of stroke. Four digital outputs drive the three solenoid valves and the belt motor. The case also names a USB link to a Panel PC (HMI). Industrial Shields PLCs connect to other devices over Ethernet and Modbus. Wi-Fi, GPRS and LoRa are available in specific versions.



— Sensor signals, digital inputs — Digital outputs — Compressed air — Options named in the case

Signals

Signal	Between	Type	Role in the GRAFCET
S1, capacitive	Sensor → PLC	Digital input	Box present: step 1 to 2
S2, capacitive	Sensor → PLC	Digital input	Box at the labelling station (3 to 4). OFF when it has left (7 to 0)
micro 1 and 2, inductive	C1 → PLC	Digital input	C1 forward (2 to 3) and back (3 to 4, with S2)
micro 3 and 4, inductive	C2 → PLC	Digital input	C2 forward, label applied (4 to 5) and back (5 to 6)
micro 5 and 6, inductive	C3 → PLC	Digital input	C3 forward, box out (6 to 7) and back (7 to 0, with S2 OFF)
Valves C1, C2, C3	PLC → solenoid valves	Digital output	Move C1 (steps 2, 3), C2 (4, 5) and C3 (6, 7)
Belt motor	PLC → motor	Digital output	Runs the conveyor belt from step 0
HMI link	PLC ↔ Panel PC	USB	Option named in the case. Not part of the sequence

One Arduino based PLC for the whole bench.



M-DUINO ETHERNET PLC ARDUINO 42

An industrial PLC built around an original Arduino Mega 2560. On this bench it reads the 8 sensors, drives the 3 solenoid valves and the belt motor, and runs the GRAFCET. You program it with the Arduino IDE.

Inputs	26: 14 digital optoisolated, 12 analog/digital (0-10 V)
Outputs	16: 10 digital optoisolated, 6 analog/digital/PWM (0-10 V), 5 to 24 Vdc
Ethernet	W5500, 10/100 Mbit, RJ45
Serial and buses	RS-485, RS-232, TTL, I2C, SPI
Power supply	12 to 24 Vdc
Mounting	DIN rail TS35, IP20

The case names an Arduino based PLC from Industrial Shields and does not publish the exact model. The original PDF shows an M-Duino. The image shows the M-DUINO ETHERNET PLC ARDUINO 42: its 14 digital inputs and 10 digital outputs cover the 8 inputs and 4 outputs of this sequence, with spare I/O. Its outputs are optoisolated, without relays: the belt motor needs a contactor or an interface relay. Check the current of your valve coils in the family datasheet.

[See the M-Duino 42 ›](#)

You own the application

You write the program in the Arduino IDE, which is free. You know every line of the code, so you can change the sequence, add a step or reuse it on another machine.

Industrial hardware on the bench

The bench runs on an industrial Arduino based PLC for the DIN rail. A sequence you prove on the bench runs on the same family of controllers in a cabinet.

Ready to connect

Industrial Shields PLCs connect to a Panel PC (HMI) over USB and to other devices over Ethernet and Modbus. Wi-Fi, GPRS and LoRa are available in specific versions. You can add a screen or a link to a line controller later.

SIMILAR PROJECT?

Tell us your sequence. An engineer will answer.

Send us your steps or your GRAFCET, your sensors and your actuators. Bench, training rig or real machine: we will tell you which controller fits and how to map the I/O.

READ IT ONLINE

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