

Programmable Controllers for Industrial Applications

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Final Exam Assignment, 04b

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1 General information

This is the first page of the document describing the industrial automation project assigned to each Candidate taking the final exam of the Programmable Controller for Industrial Automation course of the academic year 2020/2021.

The examination consists in the discussion of the solution proposed by the Student to the control project described in the following page or to a work-related, PLC programming project proposed by the Candidate and previously agreed upon with the instructors.

All the assigned or self-proposed projects are and must be related with an industrial PLC programming problem. All the assignments must be completed using the CodeSys IDE.

Note that during the oral exam, the Candidate will be asked to demonstrate the correctness of his/her proposed solution. This can be done using the debugger or implementing an interactive virtual panel interface like those shown during the course. The students are warmly encouraged to implement the interactive virtual panel.

Moreover, the Candidate must prepare a short presentation about the design of the solution, including an hardware proposal for the PLC unit (manufacturer and model, number and type of inputs and outputs, external IO modules if needed), and be prepared to discuss all the relevant hardware and software choices performed during the development of the proposed solution.

2 Exam assignment 04b: Series of conveyor belts

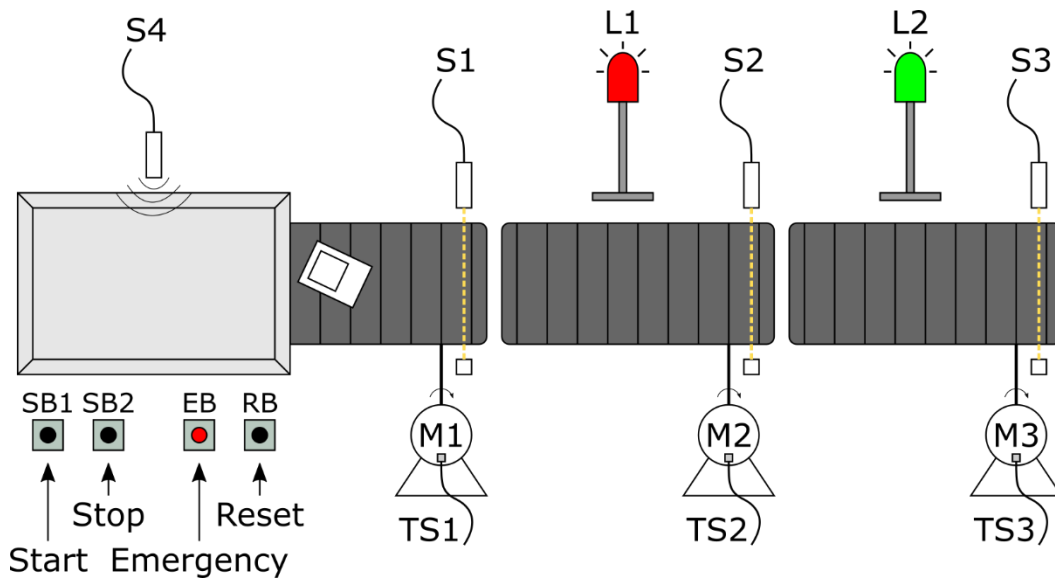


Figure 1: Illustration of the conveyor belt exercise (04b).

The task is to design and implement, using the CodeSys IDE, the control system of the three sections conveyor belt illustrated in Figure 1. The conveyor belts will be moved by three electrical motors M1, M2 and M3, each of them embedding a thermostat (temperature-controlled switch) that can be used to detect overheating (TS1, TS2, TS3). The presence of objects is detected by photocells S1, S2 and S3, and inductive sensor S4. The human-machine interface consists of 3 pushbuttons, start, SB1, stop, SB2, and reset, RB, one emergency button, EB, and two lamps, L1 and L2, for signalling operations.

All the motors M1, M2 and M3 are started when a certain sensor detects an object. For M1 this sensor is S4, for M2 and M3 they are S1 and S2. Each belt must stop if there are no packets on it (condition which can be deduced using S1, S2 and S3, respectively). The stop button lets the machine to complete the delivery operation of packets already on the belt. When the machine is in operation, the L2 light must be constantly turned on. In case of problem with any of the motor, all belts are stopped and the alarm light L1 blinks. Also, when the emergency button is pressed, all the motors are stopped and L1 is turned on constantly. The reset button is supposed to reset the alarms and the machine internal state.

The candidate must prepare a design document including the PLC solution (manufacturer and model of the PLC, number and type of inputs and outputs, external IO modules if needed) and be ready to discuss it.

Note that during the oral exam, the candidate must perform a live presentation of how the code works using a virtual panel visualization, proving that the code works correctly.

