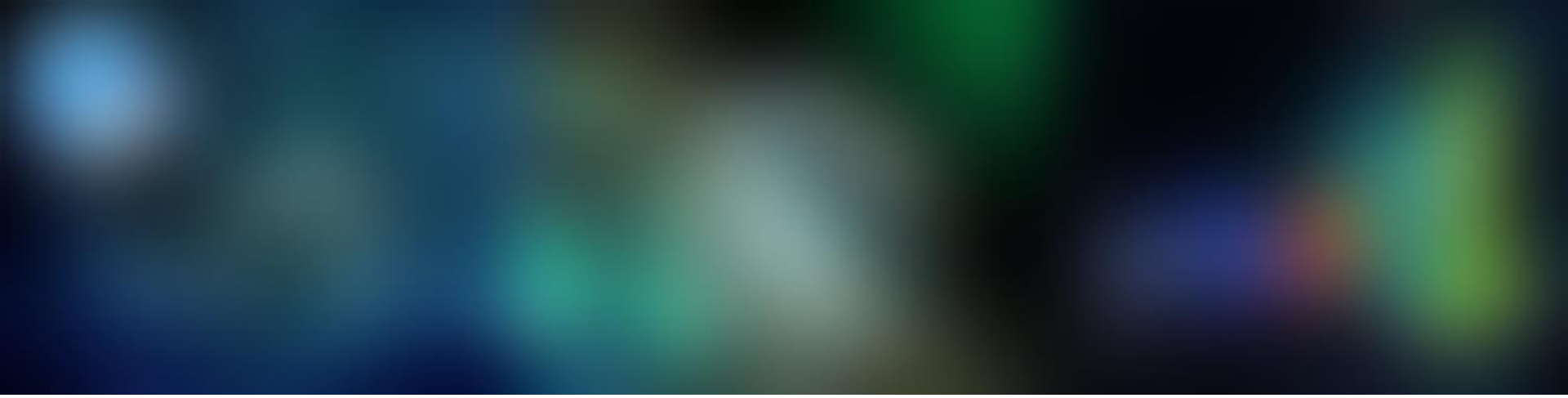


Hands-On PLC Programming

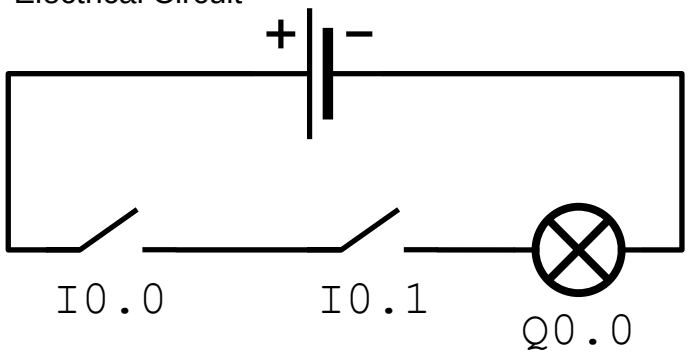
Hands-On Workshop according to the standard IEC 61131-3

Logical Operators
AND

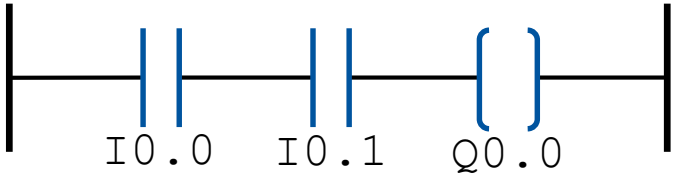
Example

Turn on the light (Q0.0), if, and only if, the two switches I0.0 and I0.1 are switched on.

Electrical Circuit



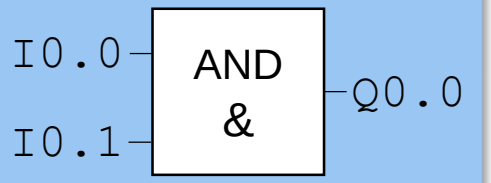
Ladder Diagram (LD)



Truth Table

I0.0	I0.1	Q0.0
0	0	0
0	1	0
1	0	0
1	1	1

Function Block Diagram (FBD)



Instruction List (IL)

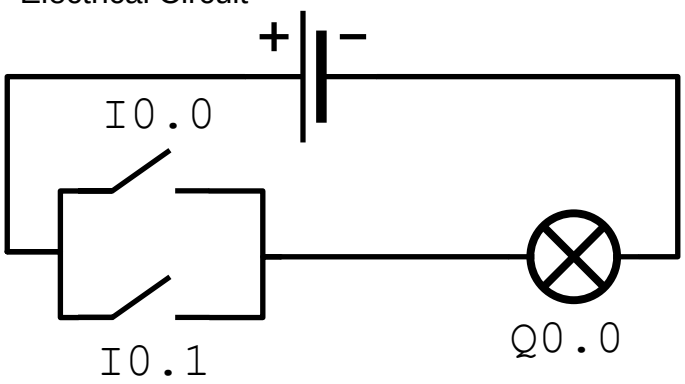
```
LD      I0.0
AND     I0.1
=       Q0.0
```

Logical Operators
OR

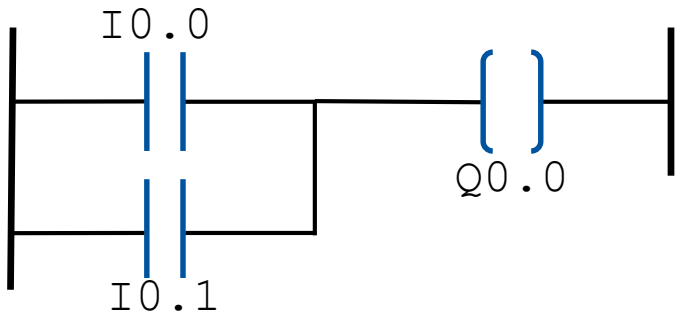
Example

Turn on the light (Q0.0), if either of the two switches I0.0 and I0.1 is switched on.

Electrical Circuit



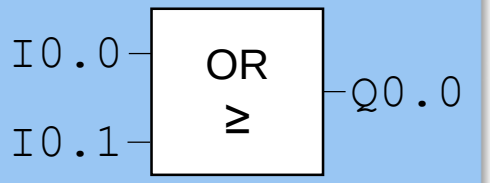
Ladder Diagram (LD)



Truth Table

I0.0	I0.1	Q0.0
0	0	0
0	1	1
1	0	1
1	1	1

Function Block Diagram (FBD)



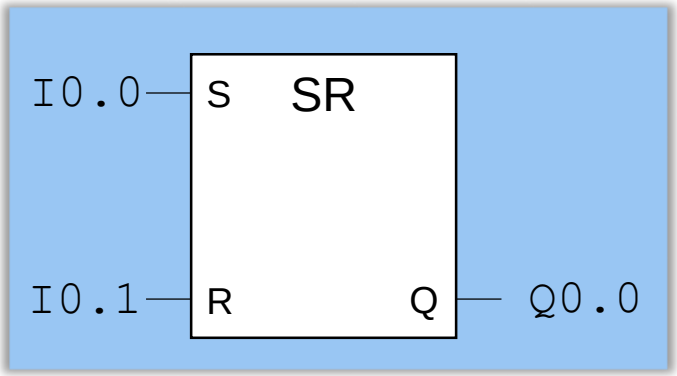
Instruction List (IL)

```
LD    I0.0
OR    I0.1
=     Q0.0
```

Flip Flops
RS, SR

Example

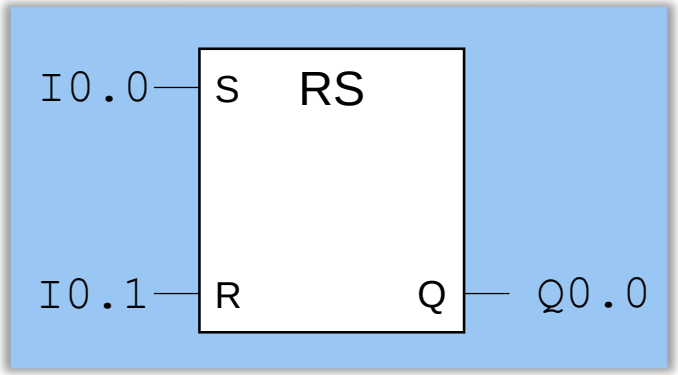
Permanently switch a light on with a single button press



dominant set

if both set and reset are true, Q will also be true

I0.0	I0.1	Q0.0
0	0	0
0	1	0
1	0	1
1	1	1

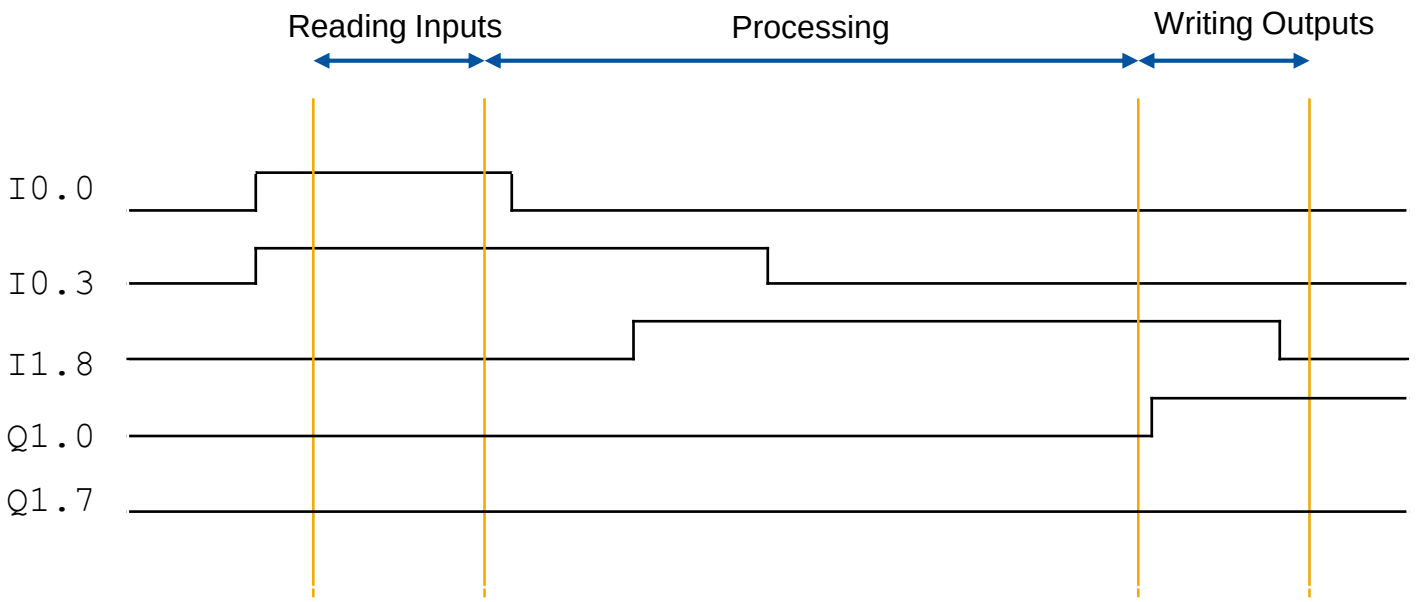


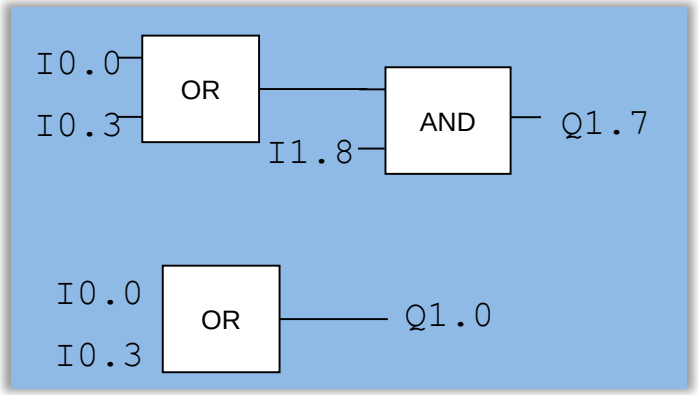
dominant reset

if both set and reset are true, Q will be false

I0.0	I0.1	Q0.0
0	0	0
0	1	0
1	0	1
1	1	0

Example of signals within PLC scan cycle

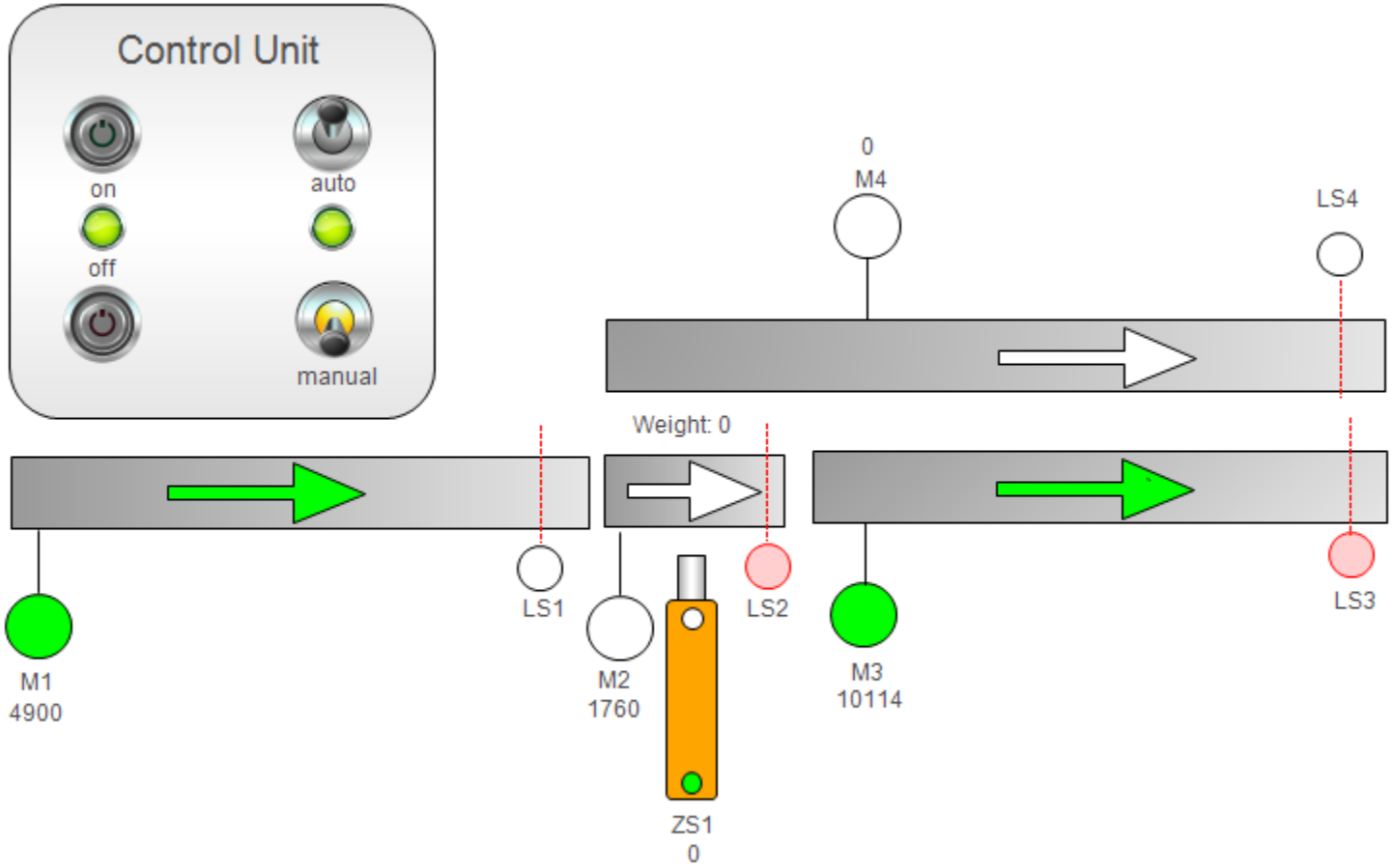





```
LD      I0.0
OR      I0.3
AND     I1.8
=       Q1.7

LD      I0.0
OR      I0.3
=       Q1.0
```

A simple conveyor belt scenario



Task description

Implementing the control panel

Your task is to implement the control unit functionality of the conveyor belt machine
→ Use the empty function block *ControlUnit* within your Codesys environment

- The control unit is connected to the machine with the following signals:

Inputs	Outputs
`PowerButtonO`	`power`
`PowerButtonOf`	`enabled`
`AutoSwitch`	
`ManualSwitch`	

Task description

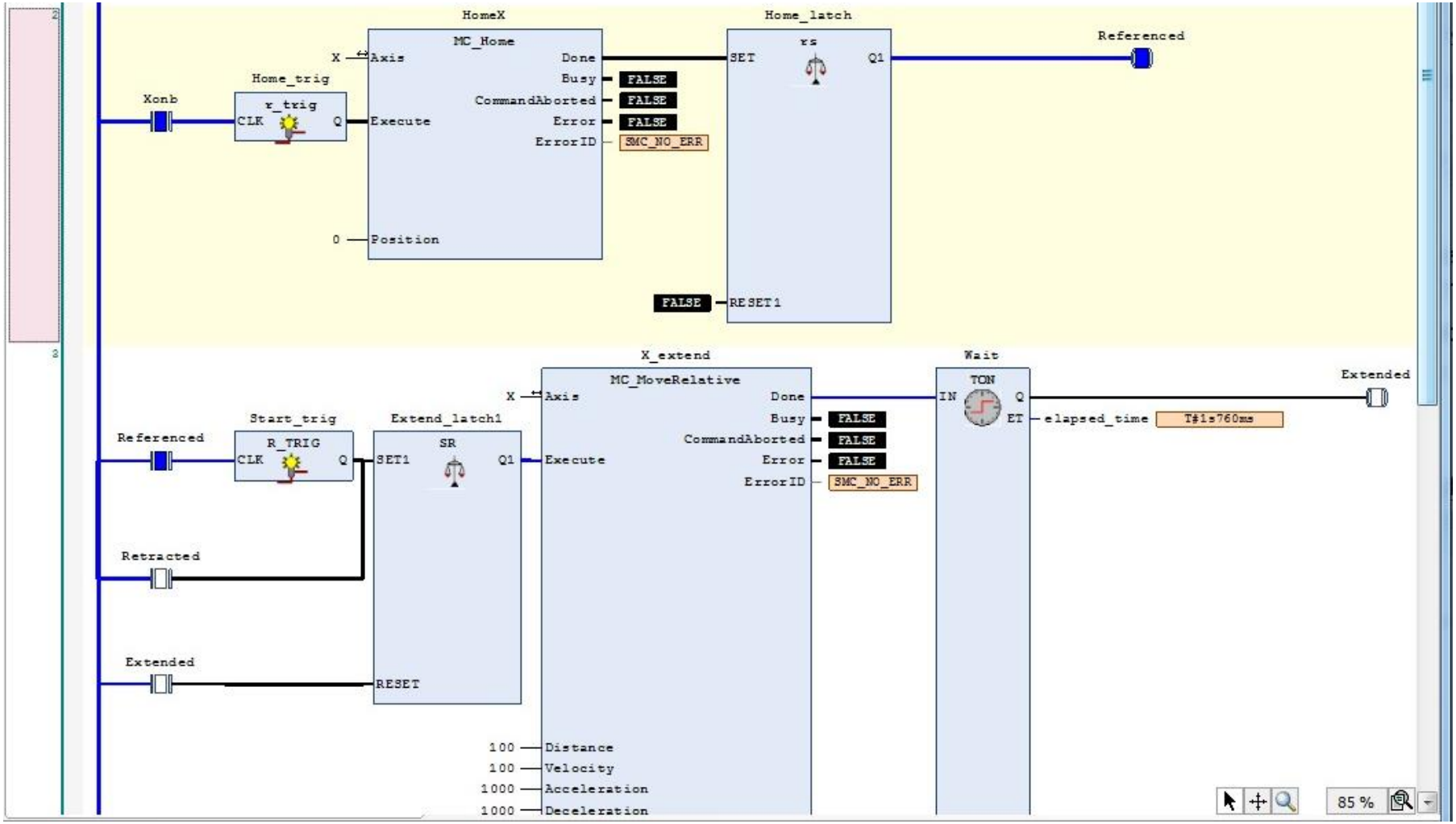
Implementing the control panel

Description of the supposed control panel behaviour

- If the *power on* button is pressed **once and** the *auto switch* is **not** enabled, the *power LED* shall switch on
- If the *power off* button is pressed **once**, the *power LED* shall switch off
- If the *power on* button was pressed before **and** the *auto switch* **or** the *manual switch* is activated, then the machine shall be enabled.
- In all other cases the machine must not be enabled!
- If the machine is enabled, the *run LED* shall be on.

Hint:
Use SR function block, AND and OR function blocks in combination!

Example Ladder Logic Diagram



Sample solution