7 Applications

To give you a feeling for the kind of situations in which you can use LOGO!, we have compiled a number of application examples. We have included the circuit diagram of the original solution for each example. For the solutions using LOGO!, we have included the wiring and a diagram.

Solutions for the following tasks are included:

Stairway, hall or corridor lighting 105
An automatic door 110
A ventilation system 117
An industrial gate 121
Centralized activation and surveillance/monitoring of several industrial gates NO TAG125
Fluorescent lamps 129
A rainwater pump 133
Centralized activation and monitoring of pumps 137
Dereeler 141
Other possibilities 144

These applications - and tips for further applications - can be found in the Internet under the address http://www.AUT.Siemens.DE. Search for LOGO!..

7.1 Stairway, hall or corridor lighting

7.1.1 Demands on stairway lighting

The lighting system of a stairway should fulfill the following requirements:

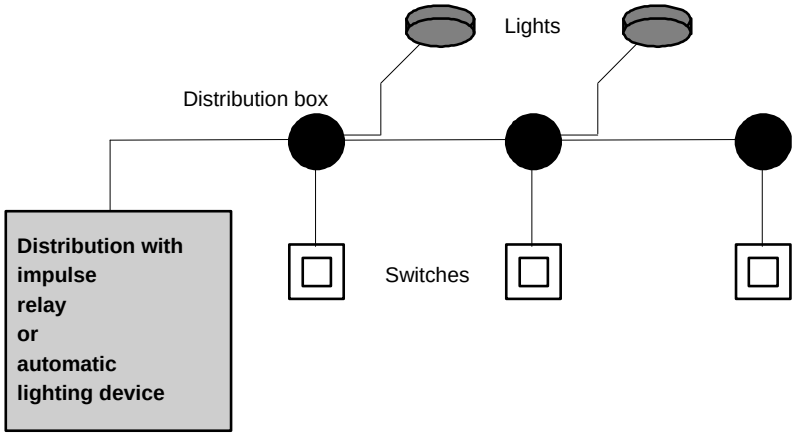
- The light should be on when someone is on the stairway.
- If there is nobody on the stairway, the light should be off to save energy.

7.1.2 Previous solution

Previously there were 2 ways of switching the lighting:

- By means of an impulse relay
- By means of automatic stairway lighting

The wiring for these two lighting systems is the same.



Components used

- Switches
- Automatic lighting device or pulse relay

Lighting system with a pulse relay

- When any switch is pressed again: The lighting is switched off.

Disadvantage: People often forget to switch the light off again.

Lighting system with an automatic lighting device

When an automatic device is used, the lighting system behaves as follows:

- When any switch is pressed: The lighting is switched on.
- After a preset time has elapsed, the lighting is switched off automatically.

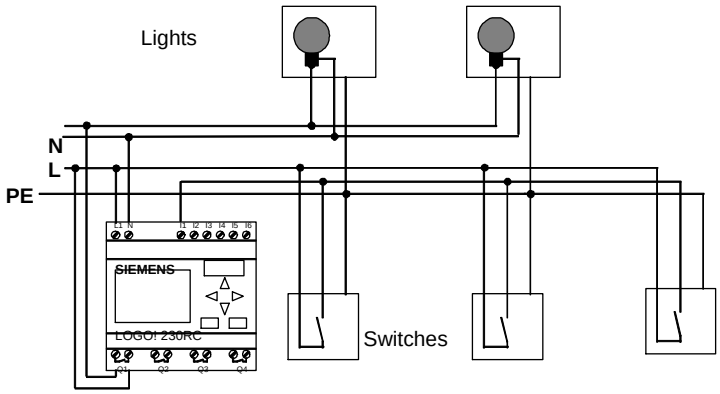
Disadvantage: The lighting cannot be switched on for an extended period of time (e.g. for cleaning purposes). The switch for permanent lighting is usually on the automatic device, which is either impossible or difficult to access.

7.1.3 Lighting system with LOGO!

If you use LOGO!, you can replace the automatic lighting device or the pulse relay. You can implement both functions (time –dependent switching–off and pulse relay) using a single device. You can also include additional functions without changing the wiring. Here are some examples:

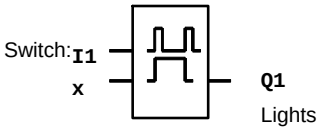
- Impulse relay with LOGO!
- Automatic stairway lighting system with LOGO!
- LOGO! as a multi–function switching system with the following functions:
  - Light on: Press switch
    (Light switches off after the set time elapses)
  - Permanent light on: Press switch twice
  - Light off: Press switch for 2 seconds

Wiring of the lighting system with LOGO! 230RC



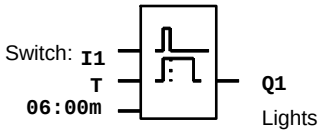
The external wiring of the lighting system with LOGO! is the same as for a conventional hall, corridor or stairway lighting system. The difference is that the automatic lighting device or the pulse relay is replaced. Additional functions are entered directly in LOGO!.

Pulse relay with LOGO!

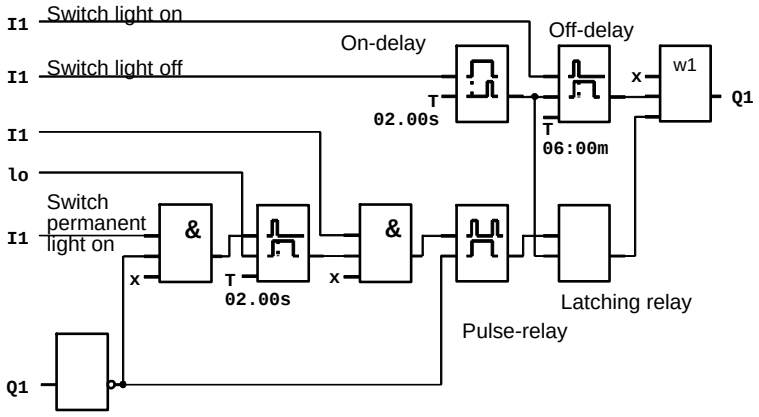


In the event of a gate pulse at input I1, output Q1 switches over.

Automatic stairway lighting system with LOGO!



In the event of a gate pulse at input I1, output Q1 switches on and remains on for 6 minutes.



The diagram shows the circuit for an input with an associated output. This switch offers the following:

- **When the switch is pressed:** The light is switched on and goes off again after the set time of 6 minutes (T=06:00m) has elapsed (off – delay)
- **When the switch is pressed twice:** The light is switched on permanently (the latching relay is set via the impulse relay).
- **When the switch is pressed for 2 seconds:** The light is switched off (on–delay switches the light off; both the permanent light and the normal light; this branch of the circuit is therefore used twice)

You can enter these circuits several times for the remaining inputs and outputs. Instead of using 4 automatic stairway lighting systems or 4 impulse relays, you thus use only a single LOGO! module. However, you can also use the free inputs and outputs for completely different functions.

7.1.4 Special features and enhancement options

Features such as the following are available for adding functions or saving energy:

- You can have the light flash before it goes off automatically.
- You can integrate various central functions:

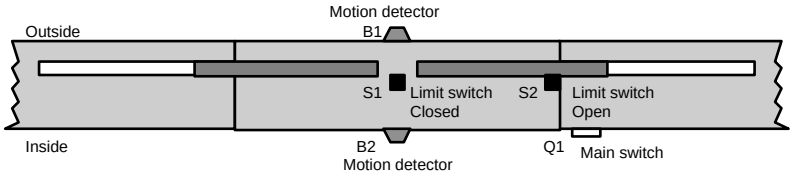
- Central off
- Central on (panic button)
- Control of all lights or individual circuits by a daylight control switch
- Control by the integrated time switch (clock)
  (e.g. permanent light only until 24.00 hours; no enabling at certain times)
- Automatic switching off of permanent light after a preset time has elapsed (e.g. 3 hours)

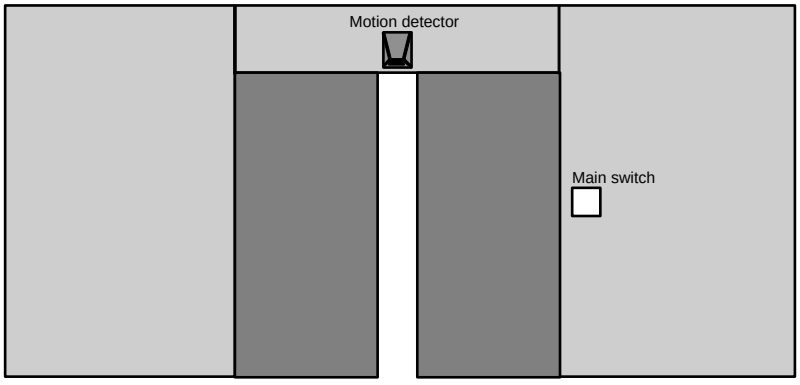
7.2 Automatic door

You often find automatic door control systems at the entrances to supermarkets, public buildings, banks, hospitals, etc.

7.2.1 Demands on an automatic door

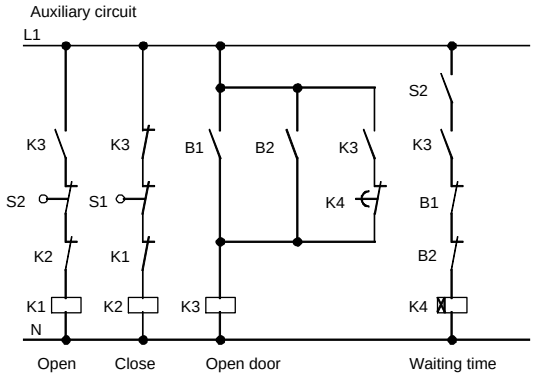
- When somebody approaches, the door must open automatically.
- The door must remain open until there is nobody in the doorway any more.
- If there is nobody in the doorway anymore, it must close automatically after a short time.





The door is generally driven by a motor with a safety clutch. This prevents people from being caught or injured in the door. The control system is connected to the mains via a main switch.

7.2.2 Previous solution

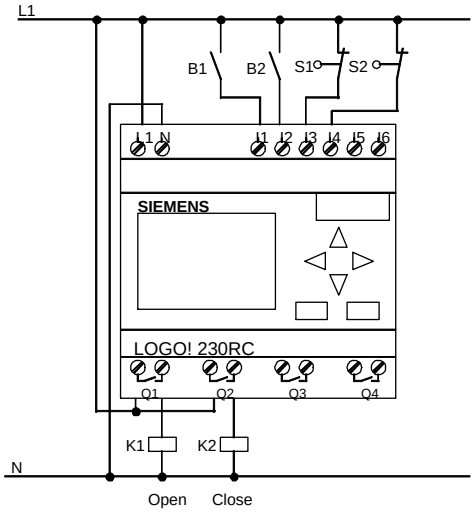


As soon as one of the motion detectors B1 or B2 registers somebody's presence, the door is opened by K3.
If the two motion detectors detect nothing for a minimum period, K4 enables the close operation.

7.2.3 Door control system with LOGO!

LOGO! allows you to considerably simplify the circuit. You need only connect the motion detectors, the limit switches and the master contactors to LOGO!.

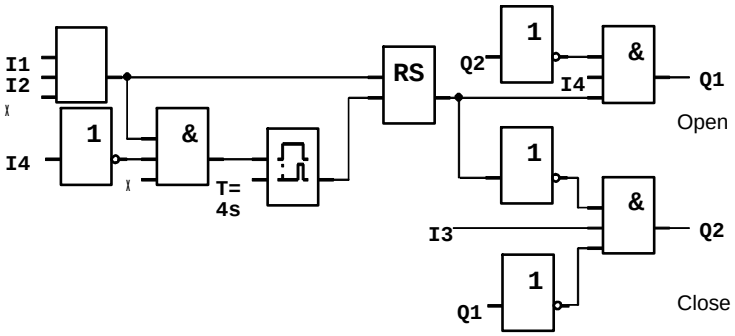
Wiring of the door control system with LOGO! 230RC



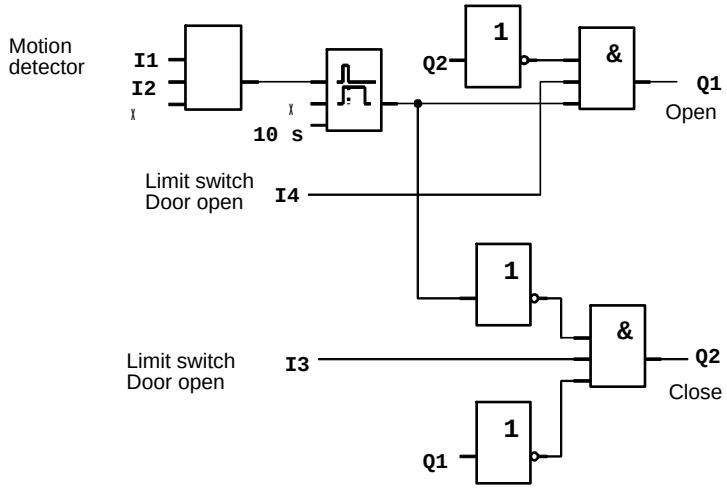
Components used

- K1 Master contactor *Open*
- K2 Master contactor *Close*
- S1 (NC contact) Limit switch *Closed*
- S2 (NC contact) Limit switch *Open*
- B1 (NO contact) Infrared motion detector *Outside*
- B2 (NO contact) Infrared motion detector *Inside*

Diagram of the door control system with LOGO!



This is what the functional block diagram that corresponds to the circuit diagram of the conventional solution looks like.
You can simplify this circuit if you make use of LOGO!'s functions. You can use the off–delay to replace the latching relay and on –delay. The following function block diagram illustrates this simplification:



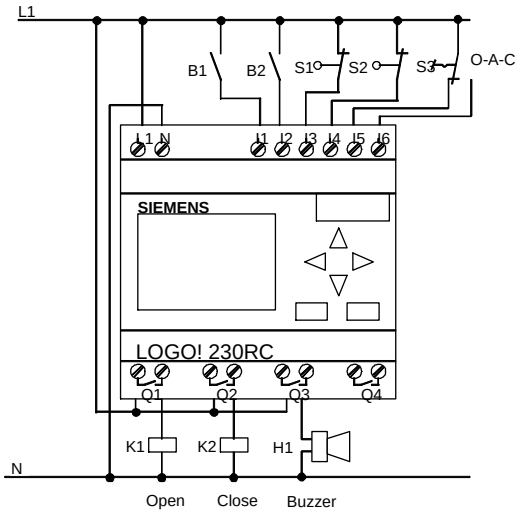
7.2.4 Special features and enhancement options

The functionality and user friendliness can be improved in the following ways, for example:

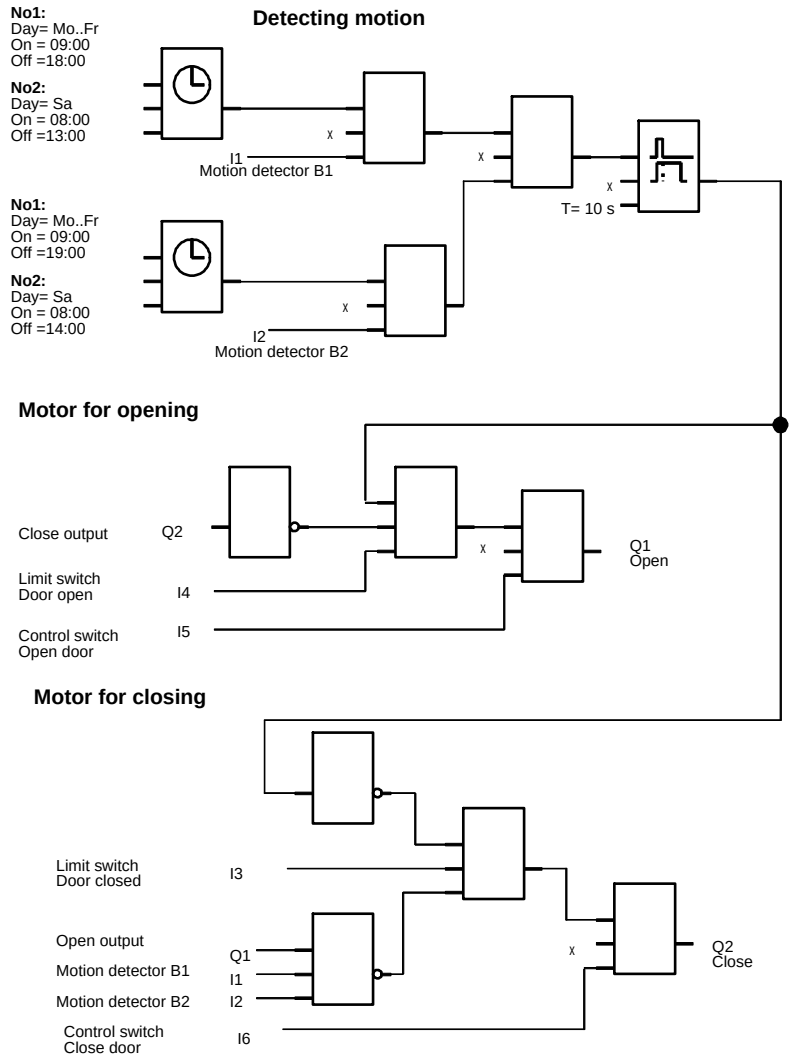
- You can connect an additional control switch: Open - Automatic - Closed (O–A–C)
- You can connect a buzzer to one of LOGO!'s outputs to indicate when the door is about to close.
- You can include time– and direction–dependent enabling of door opening (so that it only opens during shop opening hours and only from the inside to the outside after closing time, for example).

7.2.5 Enhanced LOGO! 230 RC solution

Wiring of the enhanced LOGO! solution



Functional block diagram of the enhanced LOGO! solution


Detecting motion
No1:
Day= Mo..Fr
On = 09:00
Off =18:00
No2:
Day= Sa
On = 08:00
Off =13:00
I1
Motion detector B1
T= 10 s
No1:
Day= Mo..Fr
On = 09:00
Off =19:00
No2:
Day= Sa
On = 08:00
Off =14:00
I2
Motion detector B2
Motor for opening
Close output
Q2
Limit switch
Door open
I4
Control switch
Open door
I5
Q1
Open
Motor for closing
Limit switch
Door closed
I3
Open output
Motion detector B1
Motion detector B2
Q1
I1
I2
Control switch
Close door
I6
Q2
Close

Detecting motion

During business hours, motion detector B1 opens the door as soon as somebody wants to enter the shop from outside. Motion detector B2 opens the door if somebody wants to leave the shop.

After closing time, motion detector B2 continues to open the door for 1 hour so that customers can leave the shop.

Motor for opening

Output Q1 is switched on and opens the door when

- the control switch at I5 is operated (the door is to be constantly open), or
- the motion detectors indicate that somebody is approaching the door, and
- the door is not yet completely open (limit switch at I4).

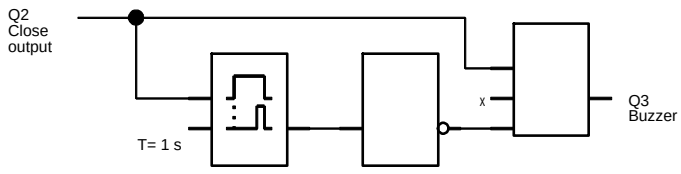
Motor for closing

Output Q2 is switched on and closes the door when

- the control switch at I6 is operated (the door is to be constantly closed), or
- the motion detectors indicate that there is nobody near the door, and
- the door is not yet fully closed (limit switch at I3).

Buzzer

You connect the buzzer to output Q3. The buzzer sounds for a short time (in this case 1 second) when the door is closed. In the block diagram, you enter the following circuit at Q3:



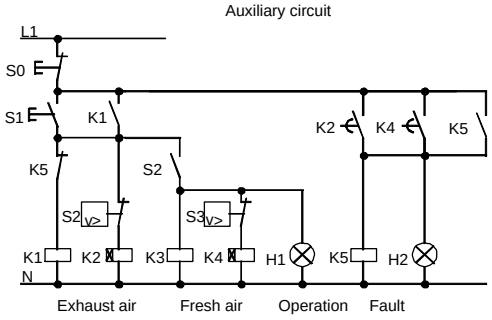
7.3 Ventilation system

7.3.1 Demands on a ventilation system

A ventilation system is used either to feed fresh air into a room or to remove used air from it. Consider the following example:

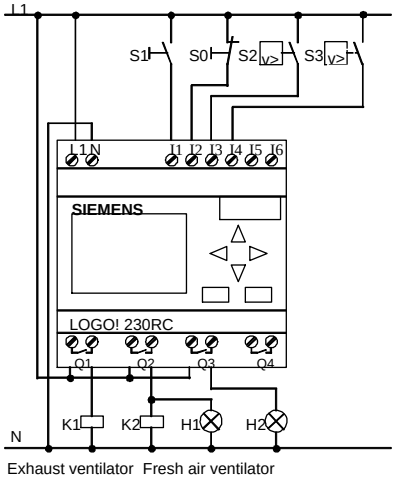
- The room contains an exhaust ventilator and a fresh air ventilator.
- Both ventilators are controlled by a control monitor.
- At no time must excess pressure develop in the room.
- The fresh air ventilator cannot be switched on unless the flow monitor indicates that the exhaust ventilator is functioning properly.
- A warning light comes on in the event of a ventilator failing.

The circuit diagram for the previous solution is as follows:



The ventilators are controlled by flow monitors. If no air flow is detected after a short waiting time has elapsed, the system is switched off and a fault is reported. You acknowledge this by pressing the stop switch.
In addition to the flow monitors, the ventilation monitoring system requires an evaluation circuit with a number of switching devices. The evaluation circuit can be replaced by a single LOGO! module.

Wiring of the ventilation system with LOGO! 230RC

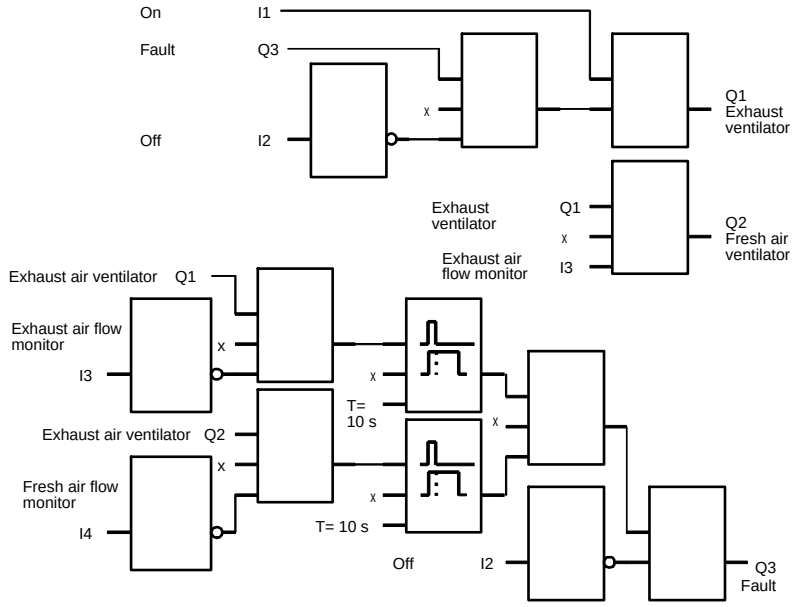


Components used

- K1 Master contactor
- K2 Master contactor
- S0 (NC contact) Stop switch
- S1 (NO contact) Start switch
- S2 (NO contact) Flow monitor
- S3 (NO contact) Flow monitor
- H1 Warning light
- H2 Warning light

Block diagram of the LOGO! solution

The block diagram of the ventilation control system with LOGO! is as follows:



7.3.2 Advantages of using LOGO!

When you use LOGO!, you do not need as many switching devices. Thus, you save on installation time and space in the switch box. You may even be able to use a smaller switch box.

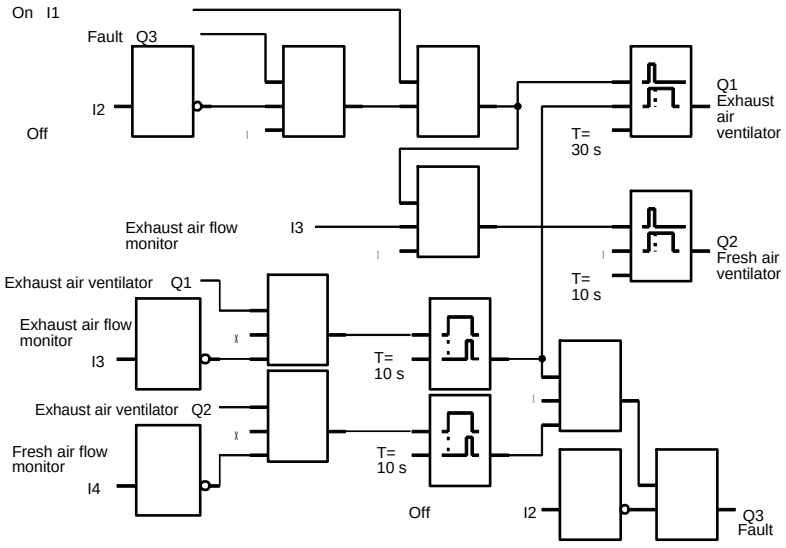
Additional options when using LOGO!

- The free output (Q4) can be used as a potential –free signalling contact in the event of a fault or a power failure.
- It is possible to stagger the switching –off of the ventilators.

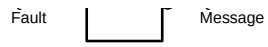
These functions can be implemented without additional switching devices.

Functional diagram of the enhanced LOGO! solution

The ventilators at Q1 and Q2 are switched off as shown in the following circuit:

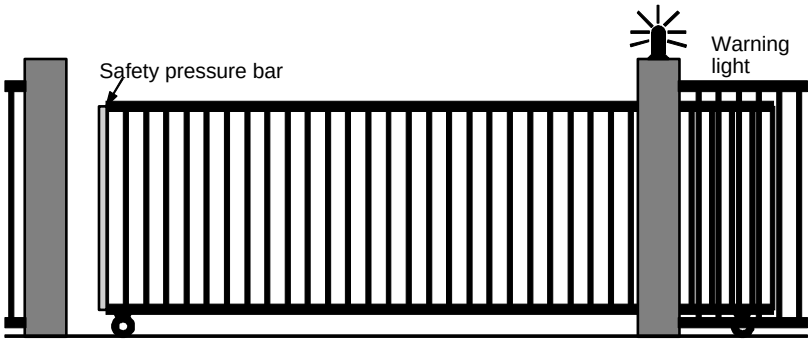


You can also generate a message via output Q4:



The contacts of output Q4 are always closed when the system is running. Relay Q4 does not release unless there is a power failure or a fault in the system. This contact can be used for teleindication, for example.

7.4 Industrial gate



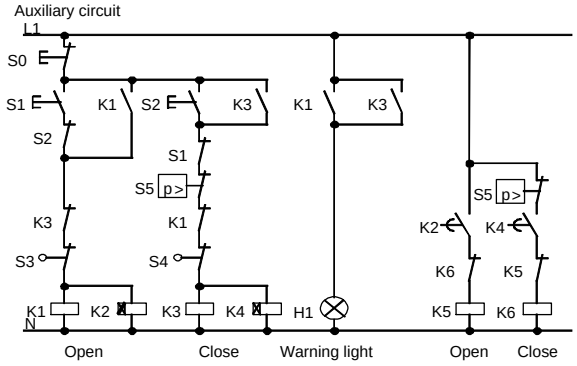
There is often a gate at the entrance to a company's premises. This is only opened to let vehicles in and out.
The gate is controlled by the gateman.

7.4.1 Demands on the door control system

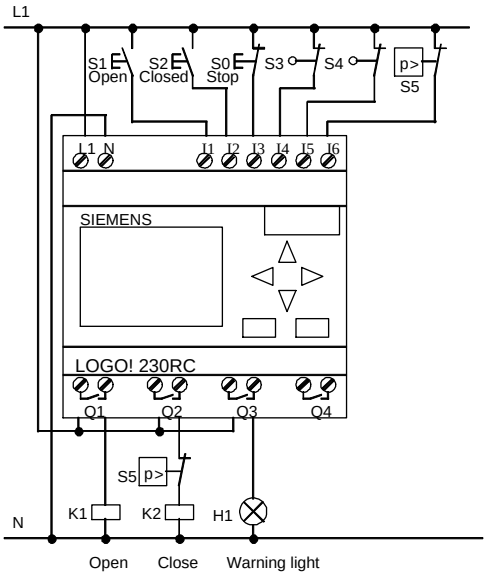
- The gate is opened, closed and monitored by the gateman, who operates it by means of a switch in the gatehouse.
- The gate is normally completely open or completely closed, but its movement can be interrupted at any time.
- A warning light starts flashing on and off 5 seconds before the gate begins to move and continues for as long as the gate is still moving.
- A safety pressure bar ensures that nobody gets injured and nothing gets caught or damaged when the gate closes.

7.4.2 Previous solution

Various kinds of control system are used to drive automatic gates. The circuit diagram shows *one* possible gate control circuit.



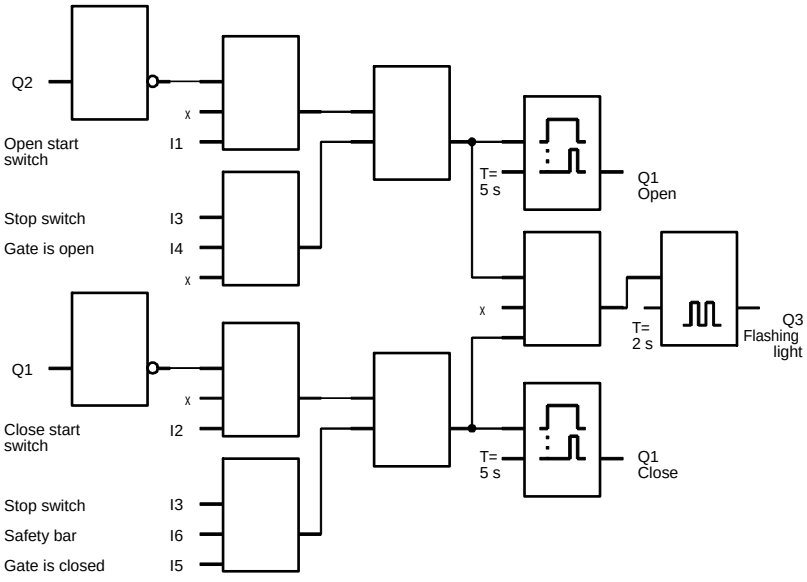
Wiring of the gate control system with LOGO! 230RC



Components used

- S0 (NC contact) Stop switch
- S1 (NO contact) Open switch
- S2 (NO contact) Close switch
- S3 (NC contact) Open position switch
- S4 (NC contact) Closed position switch
- S5 (NC contact) Safety pressure bar

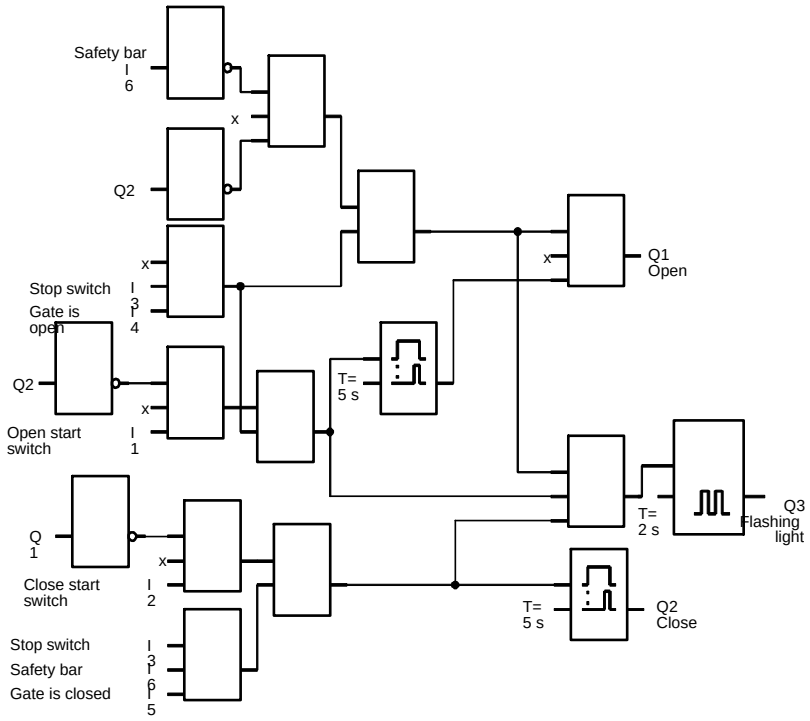
Functional diagram of the LOGO! solution



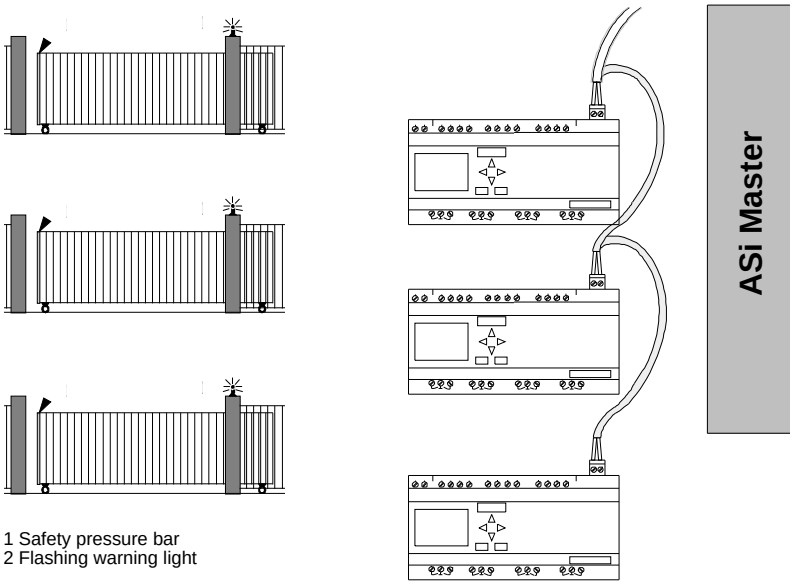
The open and close start switches start the movement of the gate, provided the gate is not currently moving in the opposite direction. The gate stops moving when the stop switch is pressed or when it reaches a limit switch. The gate is also prevented from closing by the safety bar.

7.4.3 Enhanced LOGO! solution

In our enhanced solution, the gate will automatically open again when the safety bar operates.



7.5 Centralized activation and surveillance/monitoring of several industrial gates



1 Safety pressure bar
2 Flashing warning light

There are often a number of different entrances to a company’s premises. Not all gates can always be surveilled and monitored directly by a member of staff. They must therefore be able to surveilled, monitored and operated by a gateman who sits in the a central control room.

In addition, it is obvious that each gate must also be able to be opened and closed immediately at the gate by personnel.

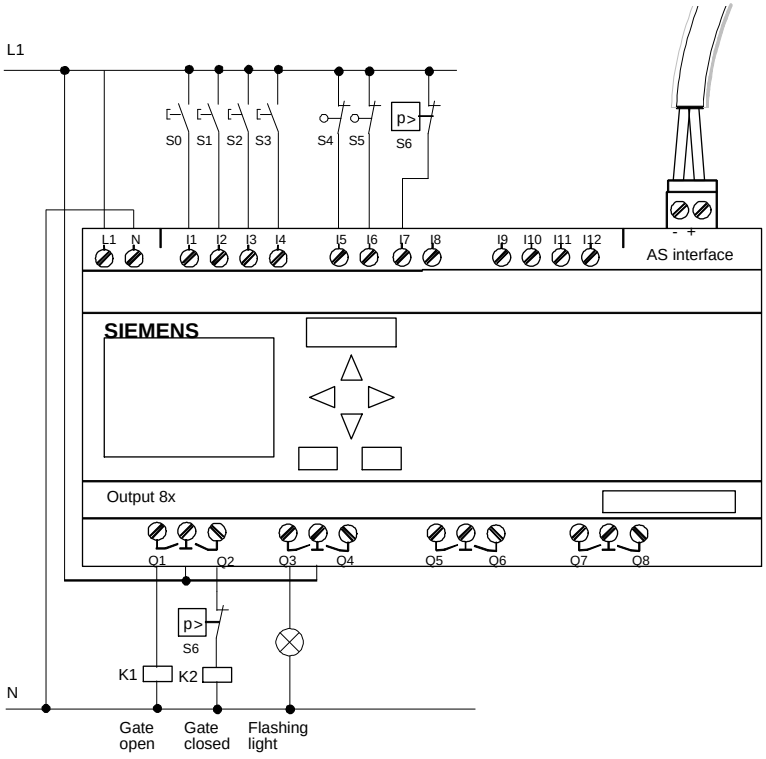
A LOGO!230RLB11 is used for each gate. The modules are linked to each other and an ASi master by means of the ASi bus.

In this chapter, we will describe the gate control system used for a gate. All the other gate control systems are identical.

7.5.1 Demands on the gate control system

- Each gate is opened and closed by means of a pull –cord switch. The gate is always opened and closed completely.
- In addition, each gate can be opened and closed by means of switches at the gate.
- The ASi bus connection enables the gateman to open and close the gate from the gatehouse. The state GATE OPEN or GATE CLOSED is indicated in the gatehouse.
- A flashing warning light starts flashing on and off 5 seconds before the gate begins to move and continues for as long as the gate is still moving.
- A safety pressure bar ensures that nobody gets injured and nothing gets caught or damaged when the gate closes.

Wiring of the gate control system with LOGO! 230RLB11



Components used

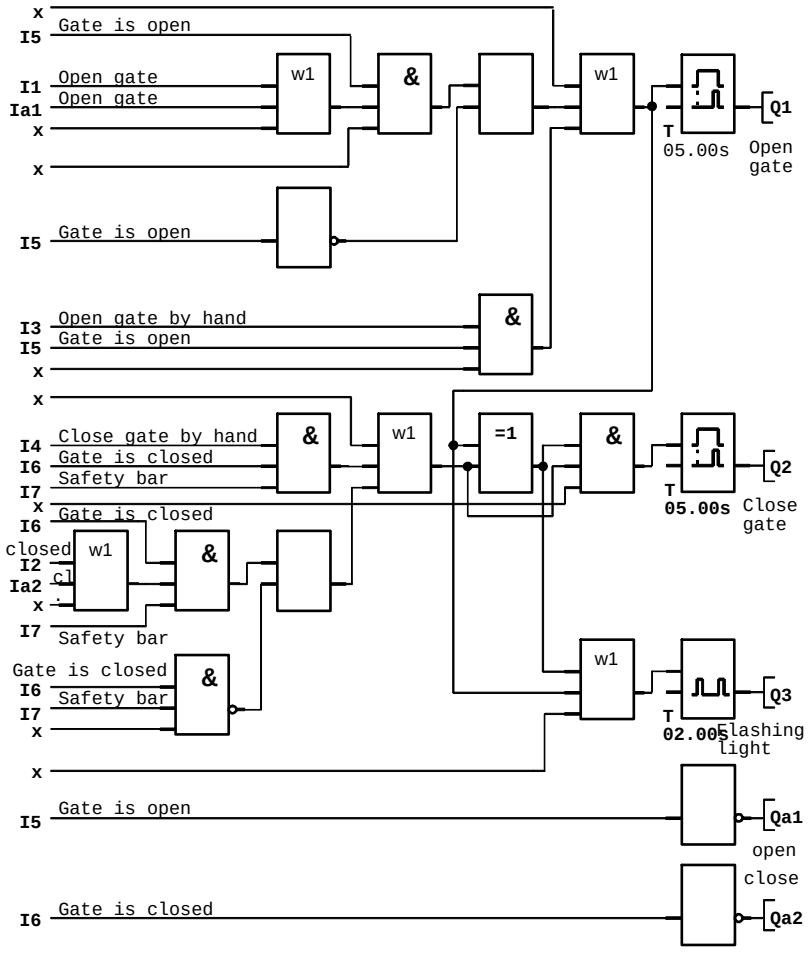
- K1 Master contactor, opening
- K2 Master contactor, closing
- S0 *(NO contact)* OPEN pull–cord switch
- S1 *(NO contact)* CLOSE pull–cord switch
- S2 *(NO contact)* OPEN switch
- S3 *(NO contact)* CLOSE switch
- S4 *(NC contact)* OPEN GATE position switch
- S5 *(NC contact)* CLOSE GATE position switch

- S6 *(NC contact)* Safety pressure bar

Higher–level control system

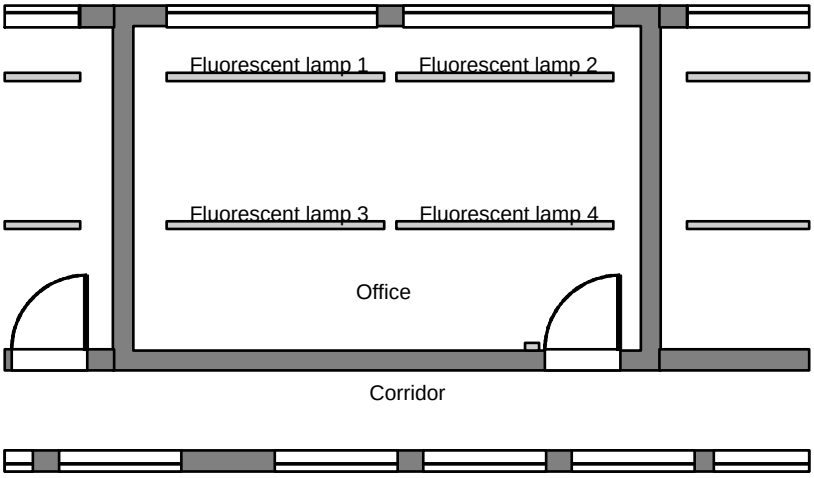
- Qa1 GATE OPEN position switch
- Qa2 GATE CLOSED position switch
- Ia1 External OPEN GATE switch
- Ia2 External CLOSE GATE switch

Functional diagram of the LOGO! solution



The OPEN GATE and CLOSE GATE start switches start movement of the gate provided the gate is not currently moving in the opposite direction. The gate stops moving when it reaches a limit switch. The gate is also prevented from closing by the safety bar.

7.6 Fluorescent lamps

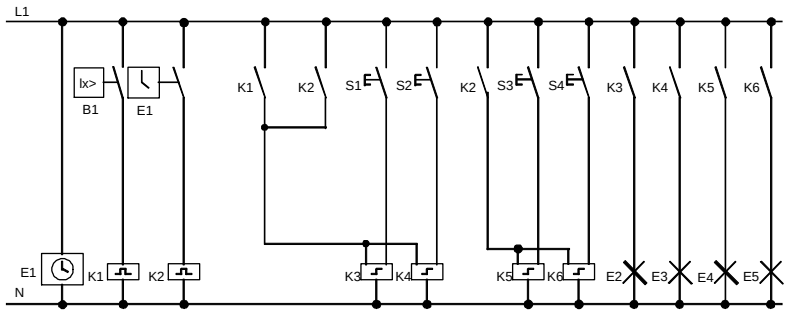


When lighting systems are planned in companies, the type and number of lamps used depends on the level of lighting required. For reasons of cost efficiency, fluorescent lamps arranged in rows of tubes are often used. They are subdivided into switching groups according to how the room is used.

7.6.1 Demands on the lighting system

- The lamps are switched on and off locally.
- If there is sufficient natural light, the lamps on the window side of the room are automatically switched off by means of a brightness –sensitive switch.
- The lights are switched off automatically at 8 o'clock in the evening.
- It must be possible at all times to switch the lights on and off locally.

7.6.2 Previous solution



The lights are operated by means of a pulse relay controlled by the switches at the door. Independently of this, they are reset by the time switch (clock) or by the brightness–sensitive switch via the *central off* input. The switching–off commands must be cut by impulse relays so that it is still possible to switch the lights on and off locally after they have been switched off centrally.

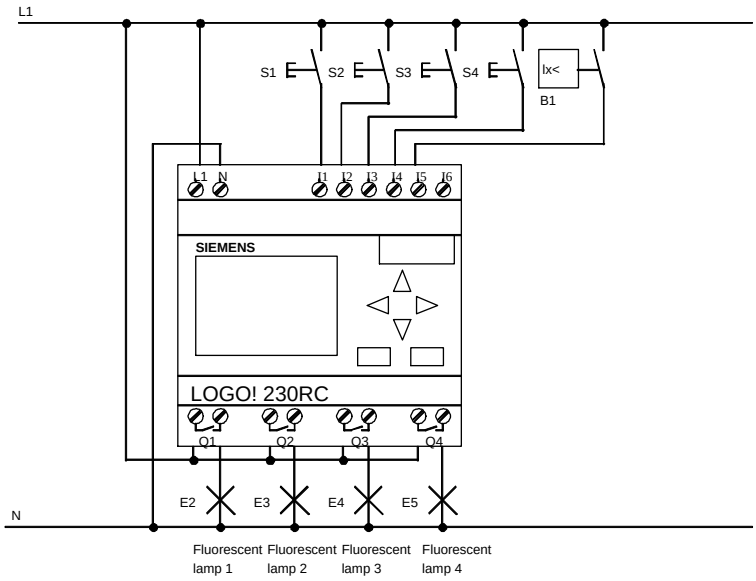
Components required:

- Switches S1 to S4
- Daylight control switch B1
- Time switch (clock) E1
- Impulse relays K1 and K2
- Remote–control switches with central off K3 to K6

Disadvantages of the previous solution

- To implement the required functions, a large amount of circuitry is required.
- The large number of mechanical components means that considerable wear and high maintenance costs can be expected.
- Functional changes are costly to implement.

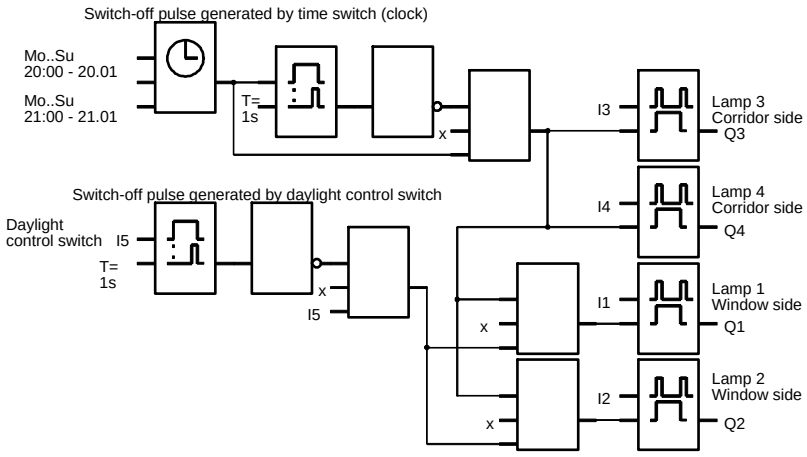
7.6.3 Fluorescent lamp control with LOGO! 230RC



Components used

- S1 to S4 (NO contact) Switches
- B1 (NO contact) Daylight control switch

Functional diagram of the LOGO! solution



Advantages of the LOGO! solution

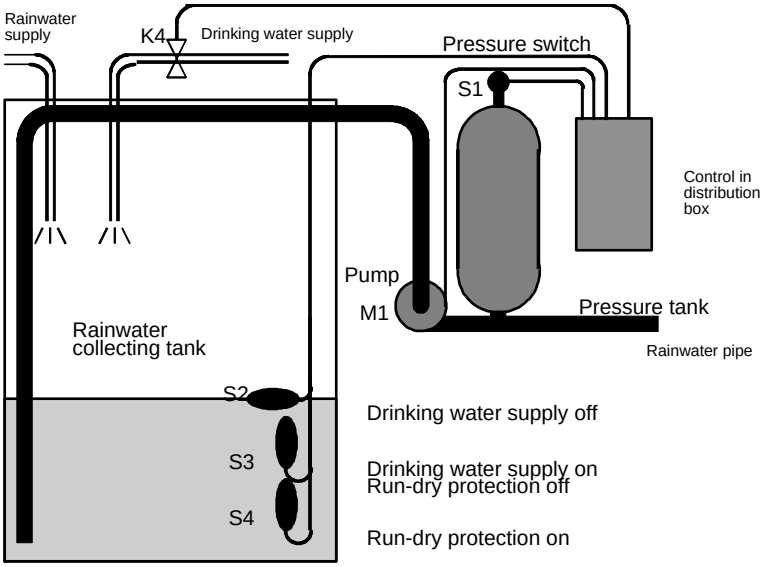
- You can connect the lamps to LOGO! directly provided the switching capacity of the outputs is not exceeded. In the case of greater capacities, you should use a power contactor.
- You connect the brightness–sensitive switch to one of LOGO!'s inputs directly.
- You do not need a time switch; this function is integrated in LOGO!.
- The fact that fewer switching devices are required means you can install a smaller sub–distribution unit and thus save space.
- Fewer devices are required.
- The lighting system can be easily modified.
- Additional switching times can be set as required (staggered switch –off pulses at the end of the day).
- The effect of the brightness–sensitive switch can easily be applied to all lamps or a changed group of lamps.

7.7 Rainwater pump

Rainwater is being used increasingly in homes in addition to drinking water. This saves money and is environment–friendly. You can use rainwater, for example, for:

- Washing clothes
- Watering the garden
- Watering house plants
- Washing the car
- Flushing the toilet

The following drawing illustrates how a system for using rainwater works:

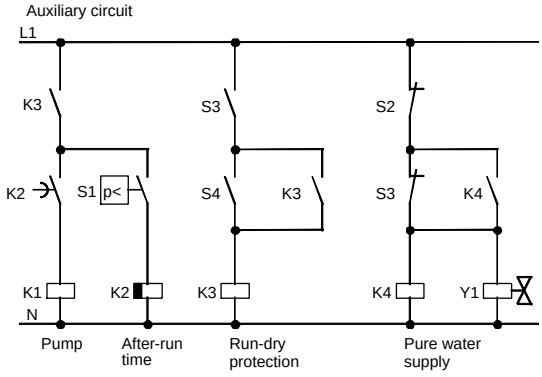


The rainwater is caught in a collecting tank, from which it is pumped into a pipe system. The rainwater can then be taken from this in the same way that drinking water can. If the tank should ever run dry, it can be supplied with drinking water.

7.7.1 Demands on the control system for a rainwater pump

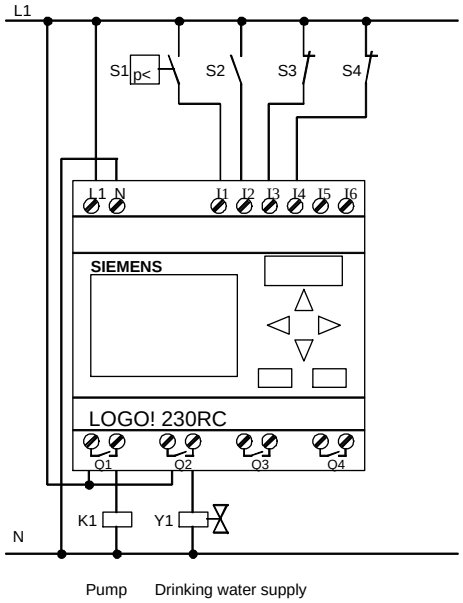
- The water must be available at all times. Whenever necessary , the controller must switch automatically to drinking water.
- When the switch to drinking water takes place, no rainwater must get into the drinking water system.
- If there is not enough water in the rainwater tank, the pump cannot be switched on (run–dry protection).

7.7.2 Previous solution



The pump and a solenoid valve are controlled by a pressure switch and 3 float switches in the rainwater tank. The pump must be switched on when the pressure goes below the minimum permitted. Once the operating pressure is reached, the pump is switched off again after an after –run time of a few seconds. The after–run time prevents the water pump from constantly being switched on and off if the water is drawn for any length

7.7.3 Rainwater pump with LOGO! 230RC

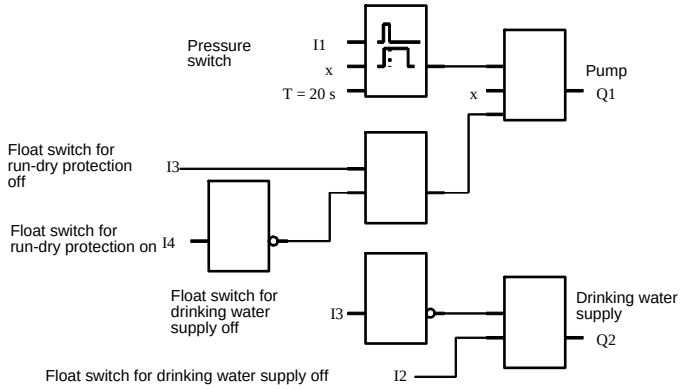


Apart from LOGO!, you need only the pressure switch and the float switches to control the pump. If you are using a three –phase motor, you need a master contactor. If the system has a single –phase motor, you need a contactor if the motor requires more current than output relay Q1 can switch. The consumption of a solenoid valve is so low that you can normally control it directly.

- K1 Master contactor
- Y1 Solenoid valve
- S1 (NO contact) Pressure switch
- S2 (NO contact) Float switch
- S3 (NC contact) Float switch

- S4 (NC contact) Float switch

Functional diagram of the LOGO! solution



7.7.4 Special features and enhancement options

In the functional diagram you can see how to wire the control system for the pump and the solenoid valve. Its structure corresponds to that of the circuit diagram. However, you can also integrate additional functions for specific applications that, with conventional technology, would require additional equipment:

- Enabling of the pump at specific times
- Indication of an imminent or existing water shortage
- Indication of malfunctioning

7.8 Centralized activation and monitoring of pumps

Areas in buildings that are endangered by being flooded by groundwater must be monitored constantly. In most cases, it is enough just to pump away the groundwater as of a certain level.

Each area endangered is equipped with 2 pumps which are controlled by a LOGO! 230RLB11. LOGO! receives all the information is requires from various sensors.

All logic modules are linked with each other and an ASi master by means of the ASi bus. All the areas are monitored in a central control room. Each individual pump can be operated separately via the ASi bus by means of switches.

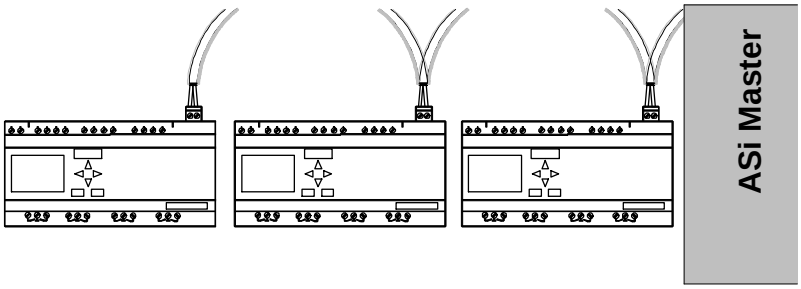
The following operating sequence must be programmed in each LOGO!:

When the maximum permitted water level is reached, pump 1 is switched on. If pump 1 fails, pump 2 is switched on automatically.

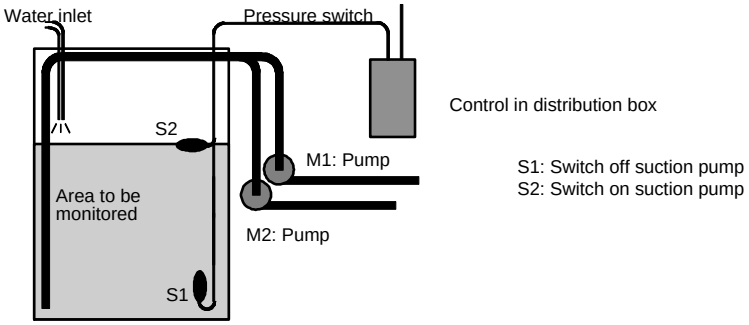
If both pumps fail, this ”emergency” state is signaled by a horn.

The program and the wiring of a LOGO! 230RLB11 can be found on the following pages.

You coordinate the individual slave assemblies (LOGO! 230RLB11) in your ASi master assembly.



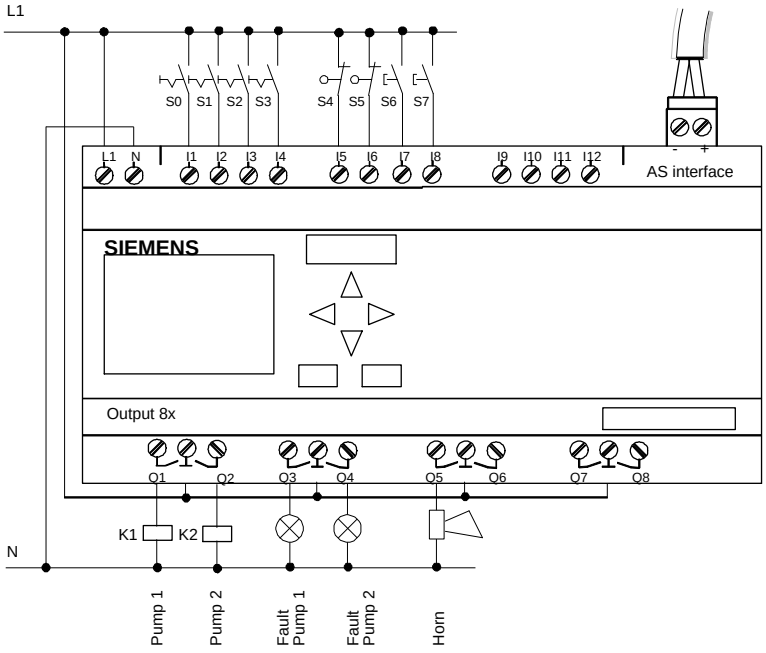
Area monitoring (principle)



7.8.1 Demands on the control system of a tank pump system

- When water level S2 is reached, pump 1 is switched on and continues pumping until the defined switch–off point S1 is reached.
- If pump 1 fails due to a fault while pumping, pump 2 is switched on automatically. The fault is signaled by an indicator light.
- If pump 2 also fails, total failure of the two pumps is signaled by a horn. The fault is also signaled by an indicator light.

7.8.2 Pump control with LOGO! 230RLB11

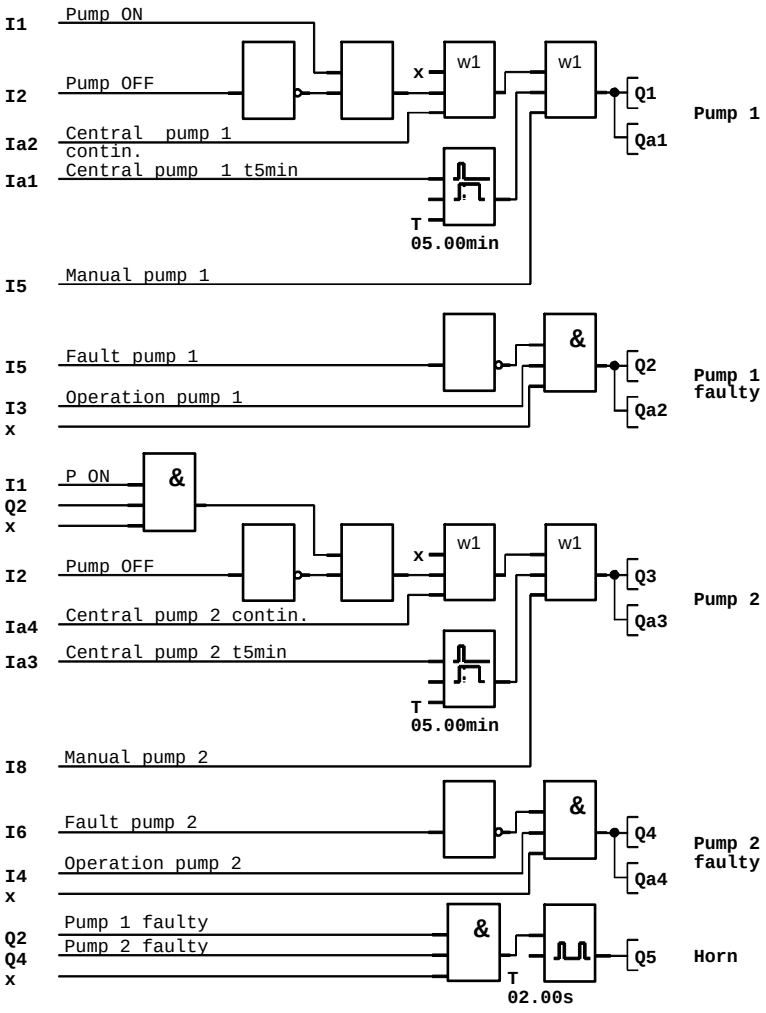


In addition to LOGO!, you also require the following components to control the pumps:

- K1, K2 — one master contactor for switching each of the two three–phase motors of pumps 1 and 2
- H1, H2 — one fault indicator light for each pump (pumps 1 and 2)
- H3 — horn for signaling failure of both pumps
- S0 *(NO contact)* — level sensor for switching on the pump

- S1 *(NO contact)* level sensor for switching off the pump
- S2, S3 *(NO contact)* one sensor for each pump for signaling that pump 1 or pump 2 is operating
- S4, S5 *(NC contact)* once sensor for each pump for monitoring pump 1 or pump 2 and signaling a fault
- S6, S7 *(NO contact)* switches for operating the pumps manually

Functional diagram of the LOGO! solution


I1
Pump ON
I2
Pump OFF
Ia2
Central pump 1 contin.
Ia1
Central pump 1 t5min
x
w1
w1
Q1
Qa1
Pump 1
T
05.00min
I5
Manual pump 1
I5
Fault pump 1
I3
Operation pump 1
x
&
Q2
Qa2
Pump 1 faulty
I1
P ON
Q2
x
&
I2
Pump OFF
Ia4
Central pump 2 contin.
Ia3
Central pump 2 t5min
x
w1
w1
Q3
Qa3
Pump 2
T
05.00min
I8
Manual pump 2
I6
Fault pump 2
I4
Operation pump 2
x
&
Q4
Qa4
Pump 2 faulty
Q2
Q4
x
Pump 1 faulty
Pump 2 faulty
&
Q5
Horn
T
02.00s

A single LOGO! assembly only enables you to perform a limited range of control tasks. If, however, you connect a number of LOGO!..LB11 in an ASi system by means of the AS interface, you have an extensive range of control options open to you.

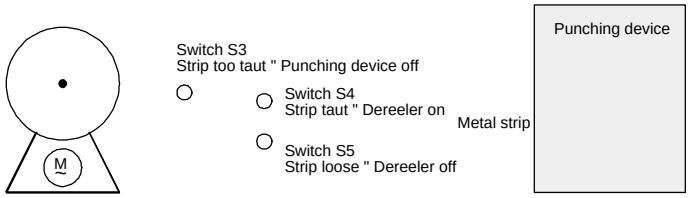
7.9 Dereeler

A metal strip (coil) is fed to a punching device over a dereeler.

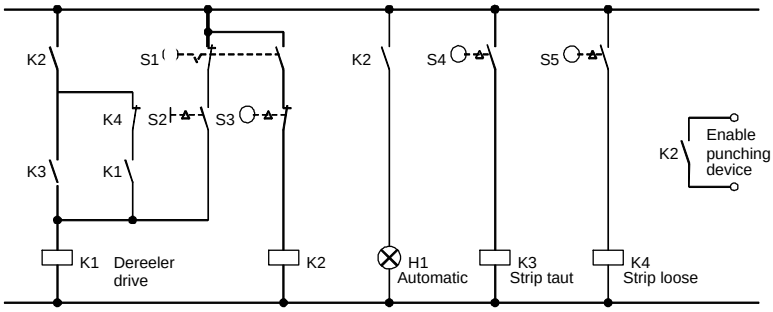
7.9.1 Demands on a dereeler

The following demands are placed on a dereeler:

- The metal strip must not sag.
- The metal fed to the punching device must not exceed a defined maximum tension.
- If the metal strip becomes too taut, the punching device must be switched off.



7.9.2 Previous solution

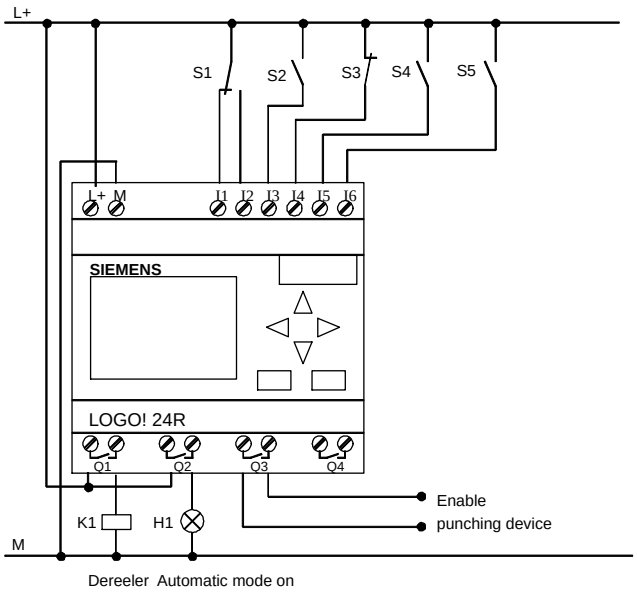


The key–operated switch S1 is the operating mode switch (manual/automatic) for the dereeler. You can use switch S2 to control the motor of the dereeler manually. Switches S4 and S5 monitor the tension of the strip and switch the motor of the dereeler on and off. Switch S3 switches the punching device off when the strip is too taut.

7.9.3 Dereeler with LOGO! 24R

If you use LOGO!, you can make the circuit much simpler. You only have to connect the switches, the indicator light and the main contactor to LOGO!.

Wiring the dereeler with LOGO! 24R



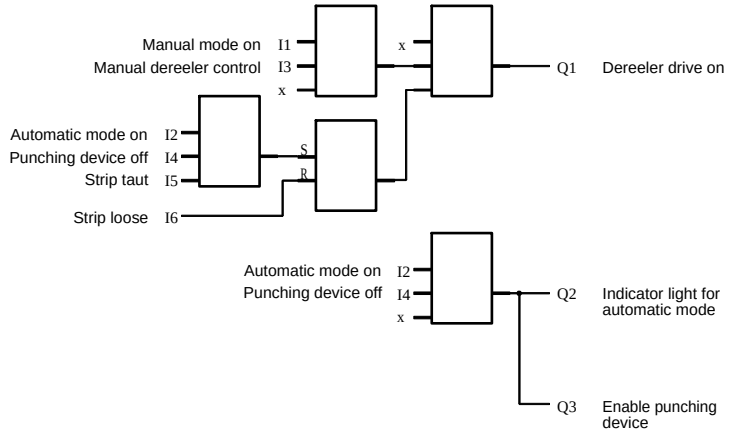
Components used

- S1 Operating mode switch: manual/automatic
- S2 (NO contact) Switch for manual dereeler control
- S3 (NC contact) Switch for switching the punching device off
- S4 (NO contact) Strip taut switch
- S5 (NO contact) Strip loose switch
- K1 Motor contactor

- H1 Indicator light for automatic mode

Functional diagram of the LOGO! solution

The block diagram for controlling the dereeler with LOGO! is as follows:



7.9.4 Advantages of the LOGO! solution

If you use LOGO!, you need fewer switching devices less wiring is involved. You also save on assembly time and space in the switch box. You may even be able to use a smaller switch box.

7.10 Additional application options

It is worth using LOGO! particularly when you:

- Can replace a number of auxiliary switching devices with the integrated functions of LOGO!.
- Want to save yourself wiring and installation work (because the wiring is done in LOGO!).
- Want to reduce the space required by the components in the control cabinet/distribution box. You may be able to use a smaller control cabinet/distribution box.
- Can add or change functions subsequently without having to install an additional switching device or change the wiring.
- Have to provide your customers with additional functions for their domestic or building installation. Here are some examples:
  - Home security: You can program LOGO! to switch a lamp on regularly or open and close your shutters while you are on holiday.
  - Heating system: You can program LOGO! to run the circulation pump only when water or heat is really required.
  - Cooling systems: You can program LOGO! to thaw your cooling systems automatically on a regular basis to save energy costs.
  - You can illuminate aquaria and terraria automatically on a time – dependent basis.

You can also:

- Use commercially available switches and buttons, which makes it easy to integrate in the installation.
- Connect LOGO! directly to your domestic installation due to its integrated power supply.

Do you have any suggestions?

There are many more potential applications for LOGO!. If you know of one, why not write to us? We will collect all the suggestions we receive, and we intend to pass on as many as we can. So drop us a line - no matter how unusual or simple your LOGO! circuit is! We will be delighted to receive all your suggestions.

Write to:

D–90327 Nuremberg