Welcome to LOGO!

Dear Customer,

We thank you for the purchase of LOGO! and congratulate you on your decision. With the LOGO! you have acquired a logic module that meets the stringent quality requirements of ISO 9001.

LOGO! can be used in many fields of applications. Due to its high functionality and yet easy operation the LOGO! offers you highly efficient economies for almost any application.

LOGO! documentation

This LOGO! Manual contains information relating to the installation, programming and the use of LOGO! 0BA3 Basic devices and LOGO! 0BA0 expansion modules as well as their down compatibility to the previous Basic devices 0BA0, 0BA1 and 0BA2 (0BAx are the last four characters of the order number, used to distinguish the module series).

You can find information on wiring the LOGO! in the LOGO! manual and in the product info included with every device. Find supplementary information re programming the LOGO! with the PC in the Online Help for LOGO!Soft Comfort.

LOGO!Soft Comfort is the programming software for PCs. It runs under Windows®, Linux®, and Mac OS X® and helps you to get familiarized with your LOGO! and to write, test, print out and archive your programs, independent of the LOGO! .

Guide to the manual

We have divided this manual into 9 chapters:

- Working with LOGO!
- Installing and wiring the LOGO!
- Programming LOGO!
- LOGO! Functions
- Configuring LOGO!
- LOGO! Program Modules
- LOGO! Software
- Applications
- Appendices

Major changes to previous Basic devices (0BA0 to 0BA2)

- The design of LOGO!Basic versions is improved: all versions are equipped with 8 inputs and 4 outputs.
- LOGO!Basic is modular: all versions are equipped with an expansion interface.
- LOGO! is a versatile equipment: there is a series of expansion modules available to you, including, for example, digital modules and an analog module.

New features of the current Basic devices (0BA3)

- Password protection for the user program.
- Program name.
- Special 'Softkey' function.
- New menu item "S/W Time" for automatic summertime/wintertime conversion.
- Acknowledgment of the message text in RUN mode.
- Wall mounting is possible.

Additional support

Queries related to your LOGO! can be answered quickly and easily on our website http://www.ad.siemens.de/logo .

Safety guidelines

The notes in this user manual are for your own personal safety and for preventing damage to assets. You should read them carefully and follow the instructions they give you. These instructions are highlighted by a warning triangle and are marked as follows according to their danger level:

⚠ Danger

Warns that death, serious harm to health or damage to assets **will** result if the respective precautionary measures are not taken.

⚠ Warning

Warns that death, serious harm to health or damage to **can** result if the respective precautionary measures are not taken.

⚠ Caution

Warns that harm to health or damage to assets can result if the respective precautionary measures are not taken.

Note

Draws your attention to particularly important information relating to the product and its handling, or to a part of the documentation requiring your special attention.

⚠ Warning

Only **skilled personnel** should be allowed to start and operate this device. Qualified personnel in the sense of the information on safety technology in this manual are persons who are authorized to commission, to ground and to tag circuits, equipment and systems in accordance with safety regulations and standards.

Warning

This device must always be used as intended for the applications described in the catalog and in the technical specifications, and only in combination with non–Siemens devices or components approved or recommended by Siemens .

Prerequisite for the safe and correct functioning of the product is its proper transportation, storage, commissioning and installation as well as meticulous operation and maintenance.

Disclaimer of liability

We have examined the contents of this publication for agreement with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. Any liability and warranty for the accuracy of this information is excluded. The data in this manual are reviewed at regular intervals. Any corrections required are included in the subsequent editions. Suggestions for improvement are welcomed.

Contents

1 Working with LOGO!

What is LOGO! ?

LOGO! represents the universal Siemens logic module.

LOGO! integrates

- Controls
- An operating and display unit
- Power supply
- Interface for expansion modules
- An interface for program modules and a PC cable
- Ready–to–use basic functions that are often required in day–to–day operation, e.g. functions for on/off delays, current impulse relays and Softkey
- Time switch
- Binary markers
- Inputs and outputs according to the device type

What can LOGO! do ?

LOGO! offers solutions for domestic and installation engineering (e.g. for stairway lighting, external lighting, sun blinds, shutters, shop window lighting etc.), switch cabinet engineering and mechanical and apparatus engineering (e.g. for gate control systems, ventilation systems, or rainwater pumps etc.).

LOGO! can also be implemented for special control systems in conservatories or greenhouses, for control signal processing and, by connecting a communication module (e.g. ASi) for distributed local controlling of machines and processes.

Special versions without operator and display unit are available for series production applications in small machine, apparatus, switch control and installation engineering.

Which new types of equipment are now available?

LOGO! Basically, there are two voltage classes:

- Class 1 < 24 V, that is, 12 V DC, 24 V DC, 24 V AC
  Class 2 > 24 V, that is, 115...240 V AC/DC

in versions:

- **With display**: 8 inputs and 4 outputs.
- **Without display**: 8 inputs and 4 outputs.

Each version is integrated in 4 units. It is equipped with an expansion interface and offers you 30 ready–to–us basic and special functions for creating your program.

Which new expansion modules are now available?

- The LOGO! digital module is available for 12 V DC, 24 V DC and 115...240 V AC/DC, with 4 I/Os.
- The LOGO! analog module is available for 12 V DC and 24 V DC, with 2 inputs.
- The LOGO! Communication module, e.g. the function module ASi (AS Interface bus system). This module is described in a separate documentation.

The digital/analog modules are integrated in 2 units. Each one has two expansion interfaces for connecting additional modules.

Which type of equipment is obsolete?

- All versions with **6** inputs.
- A long variant with 12 inputs and 8 outputs
- The bus version with 12 inputs and 8 outputs.

The modular strikers of LOGO! replace this type of equipment.

It’s your choice

The different basic versions and expansion modules offer structures and precise adaptation to you specific tasks.

LOGO! provides solutions ranging from the small domestic installation through small automation tasks to extensive tasks integrating a bus system (e.g. the AS interface).

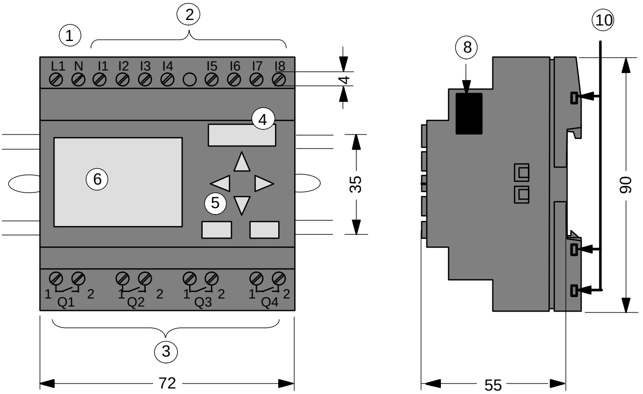
Note

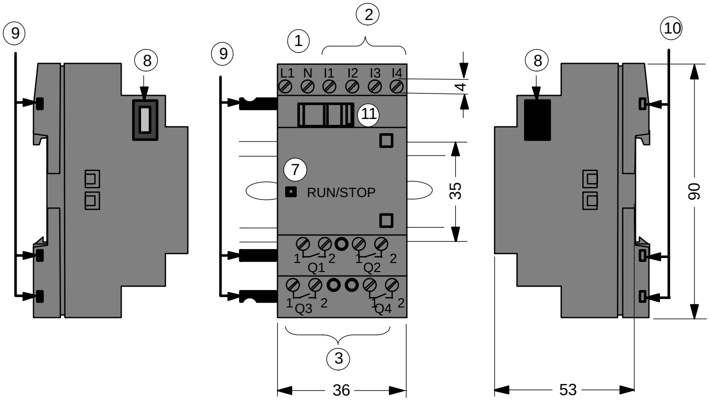
Every basic LOGO! unit can be expanded with expansion modules of the same voltage class. Mechanical encoding (pin in the housing) prevents interconnection of devices of different voltage classes.

Exception: The left interface of the analog module or communication module is separated from potential.
This means that these expansion modules can be connected to devices of a different voltage class. See also Chapter 2.1 'Structure of the modular LOGO!'.

Regardless of the number of modules connected to the LOGO!, the following I/O and memory bits are available: I1 to I24, AI1 to AI8, Q1 to Q16 And M1 to M8.

How the LOGO! is structured


LOGO! Basic (e.g.: 230 RC)


LOGO! Expansion module
(e.g.: DM8 230R)

① Power supply

② Inputs

③ Outputs

④ Module slot with cover

⑤ Control panel (not with RCo)

⑥ LCD (not with RCo)

⑦ Status display RUN/ STOP

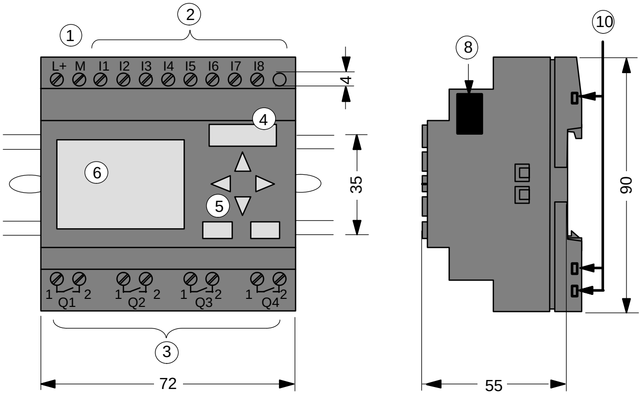
⑧ Expansion interface

⑨ Mechanical coding – Pins

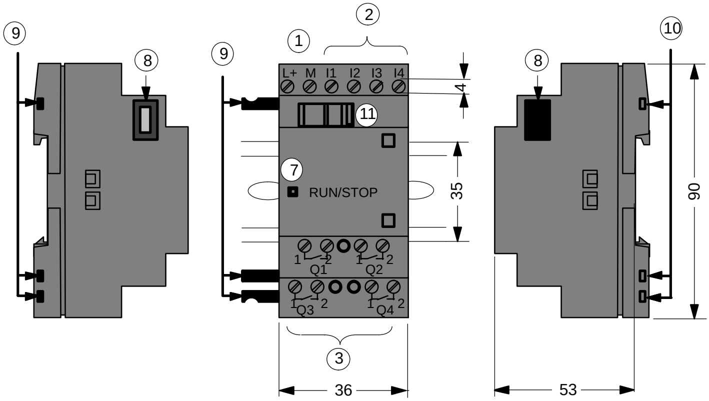
⑩ Mechanical coding sockets

⑪ Slide

LOGO! Basic (e.g.: 12/24 RC)



LOGO! Expansion module (e.g.: DM8 12/24R)



① Power supply

② Inputs

③ Outputs

④ Module slot with cover

⑤ Control panel (not with RCo)

⑥ LCD (not with RCo)

⑦ Status display RUN/ STOP

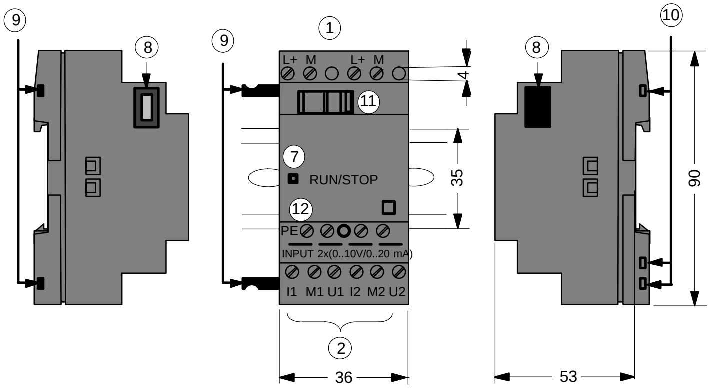
⑧ Expansion interface

⑨ Mechanical coding pins

⑩ Mechanical coding sockets

⑪ Slide

LOGO! AM2



1 Power supply

2 Inputs

7 Status display RUN/ STOP

8 Expansion interface

9 Mechanical coding pins

10 Mechanical coding sockets

11 Slide

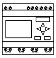
12 Grounding terminal for connecting ground and shielding of the analog measuring line.

How to recognize which LOGO! model you have

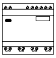
The LOGO! identifier informs of various properties:

- 12: 12 V DC version
- 24: 24 V DC version
- 230: 115...240 V AC version
- R: Relay outputs (without R: transistor outputs)
- C: Integrated Weekly timer switch
- o: Version without display
- DM: Digital module
- AM: Analog module
- FM: Function module (e.g. ASi)

Symbols



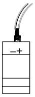
Variants with display are equipped with 8 inputs and 4 outputs



Variants without display are equipped with 8 inputs and 4 outputs

The digital module is equipped with 4 digital inputs and 4 digital outputs

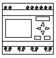
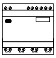
The analog module is equipped with 2 analog inputs



Function module (e.g. ASi) with 4 virtual inputs and 4 virtual outputs

Variants

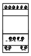
LOGO! is available in the following variants:

Sym-bol	Designation	Supply voltage	Inputs	Outputs	Properties
	LOGO! 12/24RC	12/24 V DC	8 Digital*	4 Relays 230 V x 10 A	
	LOGO! 24	24 V DC	8 Digital*	4 Transistor 24 V x 0.3 A	no clock
	LOGO! 24RC	24 V AC	8 Digital	4 Relays 230 Vx10 A	
	LOGO! 230RC #	115...240 V AC/DC	8 Digital	4 Relays 230 Vx10 A	
	LOGO! 12/24RCo	12/24 V DC	8 Digital*	4 Relays 230 Vx10 A	no display no keyboard
	LOGO! 24RCo	24 V AC	8 Digital	4 Relays 230 Vx10 A	no display no keyboard
	LOGO! 230RCo #	115...240 V AC/DC	8 Digital	4 Relays 230 Vx10 A	no display no keyboard

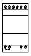
*: alternatively, 2 analog inputs (0...10V) and 2 fast inputs can be used.
#: 230 V AC variants: Inputs in two groups of 4. Within a group only the same phase, between groups different phases are possible.

Expansion module

The LOGO! can be connected to the following expansion modules:

Symbol	Designation	Supply voltage	Inputs	Outputs
	LOGO! DM 8 12/24 R	12/24 V DC	4 Digital	4 Relays (3)
	LOGO! DM 8 24	24 V DC	4 Digital	4 Transistors
	LOGO! DM 8 230R	115...240 V AC/DC	4 Digital (1)	4 Relays

(3)LOGO! AM 212/44 V DC2 A
0–10 V or
0–20 mA (2)none(1): no differe



Certification, recognition and approval

LOGO! is certified according to UL, CSA and FM.

- UL listing mark
  Underwriters Laboratories (UL) to
  UL 508 standard, file no. 116536
- CSA–Certification–Mark
  Canadian Standard Association (CSA) to
  Standard C22.2 No. 142, File No. LR 48323
- FM certification
  Factory Mutual (FM) Approval to
  Standard Class Number 3611,
  – Class I, Division 2, Group A, B, C, D
  – Class I, Zone 2, Group IIC

Warning

Personal injury and material damage may be incurred.

In potentially explosive areas, personal injury or property damage can result if you withdraw any connectors while the system is in operation.

Always switch off the power supply for the LOGO! and its components before you disconnect any connectors.

LOGO! carries CE marking, complies with VDE 0631 and IEC 61131–2 standard and has interference suppression to EN 55011 (limit class B, class A for ASi bus operation).

Shipbuilding certification has been requested.

- ABS – American Bureau of Shipping
- BV – Bureau Veritas
- DNV – Det Norske Veritas
- GL – Germanischer Lloyd
- LRS – Lloyds Register of Shipping
- PRS – Polski Rejestr Statków

LOGO! can therefore be used both in industry and domestic areas.

C Tick Mark (Australia)

The products carrying the label shown at the side are compliant with AS/NZL 2064:1997 (Class A) standard

2 Installing and wiring the LOGO!

General Guidelines

When mounting and wiring your LOGO! you should observe the following guidelines:

- When wiring the LOGO! ensure you are conforming with current rules and standards. You should also heed any national and regional regulations when installing and operating the devices. Contact the relevant authorities to find out the standards and regulations that apply in your specific case.
- Use wires with the appropriate cross–section for the amount of current involved. LOGO! can be wired using cables with a conductor cross–section of 1.5 mm^2 and 2.5 m^{m2}, refer to Chapter 2.3.
- Don’t screw the connectors too tightly. Maximum torque: 0.5 N/m, refer to Chapter 2.3.
- Keep wiring distances as short as possible. If longer wires are necessary, a shielded cable should be used. Arrange you wires in pairs: one neutral conductor with one phase conductor or one signal line.
- Keep separate:
  - AC circuits
  - High–voltage DC circuits with fast switching cycles
  - Low voltage signal wiring.
- Ensure that the wires have the required strain relief.
- Provide suitable overvoltage protection for wires that could be vulnerable to lightning.

- Do not connect an external power supply to an output load parallel to a DC output. This can result in reverse current at the output unless you have a diode or a similar block in your configuration.

Note

LOGO! must always be mounted and wired by skilled personnel who are familiar and follow the general rules of the technology and the respective current rules and standards.

2.1 Structure of the modular LOGO!

2.1.1 Maximum structure

Maximum structure LOGO! *with* analog inputs (LOGO! 12/24 RC/RCo and LOGO! 24)

LOGO! Basic, 4 digital modules and 3 analog modules

I1......I6 AI1 , AI2	I9...I12	I13...I16	I17...I20	I21...I24			
LOGO! Basic	LOGO! DM8	LOGO! DM8	LOGO! DM8	LOGO! DM8	LOGO! AM2	LOGO! AM2	LOGO! AM2
					AI3 , AI4	AI5 , AI6	AI7 , AI8

Tip

When using inputs I7 / AI1 and I8 / AI2 as analog inputs, that is, AI1 and AI2, you should avoid to use them as digital inputs I7/I8 **also**.

Maximum structure of LOGO! *without* analog inputs (LOGO! 24 RC/RCo and LOGO! 230 RC/RCo)

LOGO! Basic, 4 digital modules and 4 analog modules

I1 . . . . I8	I9...I12	I13...I16	I17...I20	I21...I24				
LOGO! basic	LOGO! DM8	LOGO! DM8	LOGO! DM8	LOGO! DM8	LOGO! AM2	LOGO! AM2	LOGO! AM2	LOGO! AM2
					AI1 , AI2	AI3 , AI4	AI5 , AI6	AI7 , AI8

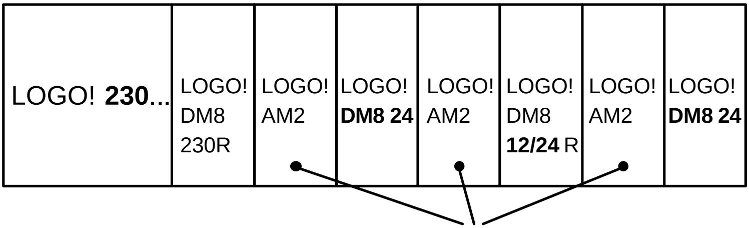
Fast/optimal communication

In order to achieve an optimal and fast communication between LOGO! Basic and the various modules, we recommend the structure “Digital modules first, then the analog modules” (example above).

2.1.2 Structure with different voltage classes

Since the potential of the left analog module interface (AM2, 12/24 V DC) is separated from the right one, you can connect it to all LOGO! Basic versions.
The potential of expansion modules arranged to the right of the analog module is separated from LOGO! Basic.
It is therefore possible to connect an expansion module of a different voltage class as LOGO! Basic at the right side of an analog module.

Example:



The potential of an analog module is separated

2.2 Installing/uninstalling LOGO!

Dimensions

LOGO!'s installation dimensions are compliant with DIN 43880.

LOGO! can be snap–mounted on a 35 mm DIN EN 50022 profile rail or mounted on the wall.

Width of LOGO!:

- LOGO! Basic has a width of 72 mm, corresponding to 4 unit segments.
- The width of LOGO! expansion modules is 36 mm, corresponding to 2 unit segments.

Note

We shall illustrate mounting and removal in a graphic overview for a LOGO! 230 RC and a digital module. The shown methods also apply for all other LOGO! basic variants and expansion modules.

Warning

Expansion modules must only be "Extracted" and "Plugged" after power is switched off.

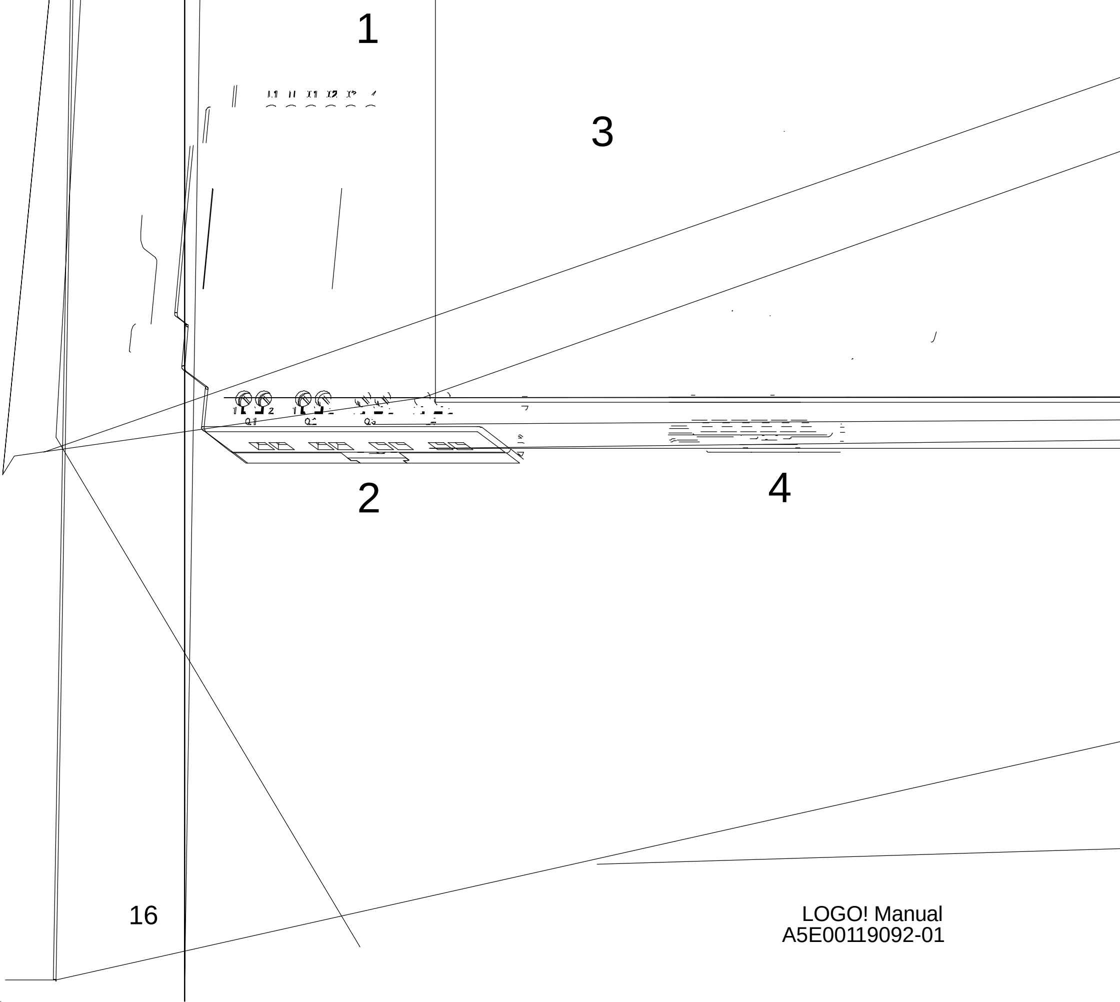
2.2.1 Profile rail mounting

Installing

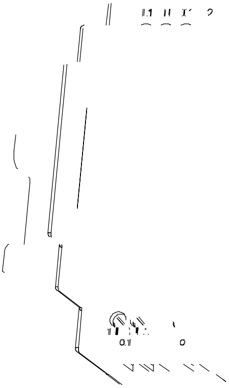
This is how you **mount** a LOGO! basic **and** a digital module on a profile rail:

LOGO! basic:

1. Place the LOGO! basic onto the rail and
2. then swing it around on the rail. The mounting slide at the rear must be engaged



6. Using a screwdriver, slide the integrated to the left. In it end position the slide engages in the LOGO! basic.



1

2

Uninstalling

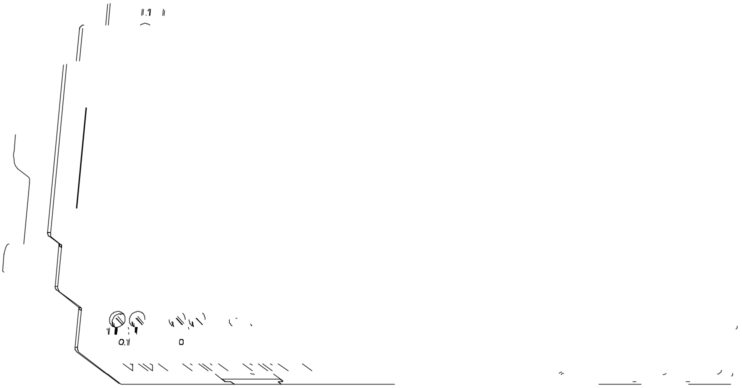
To **uninstall** LOGO!, proceed as follows:

.... if **only one LOGO! Basic** is mounted: Part **A**

2

1. Insert a screwdriver into the hole shown at the lower end of the mounting slide and push it downward
2. Swing the LOGO! Basic off the profile rail.1

3



.... in case **there is at least one expansion module** connected to the LOGO! basic:
Part **B**

1. Using a screwdriver, push down the slide and slide it to the right
2. Slide the expansion module towards the right and
3. Insert a screwdriver into the hole shown at the lower end of the mounting slide and push it downward
4. Swing the expansion module off the profile rail.

Repeat steps 1 to 4 for all other expansion modules.

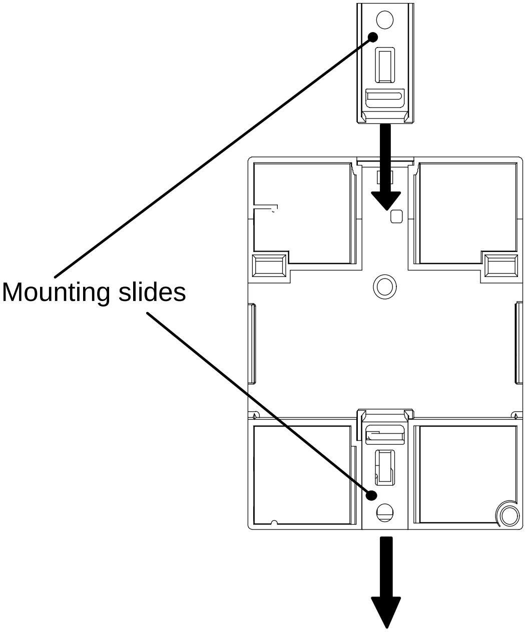
Note

If more than one expansion module is connected, start with the last module at the right.

Make sure that the slide of the module to be installed/removed is not connected to the next module.

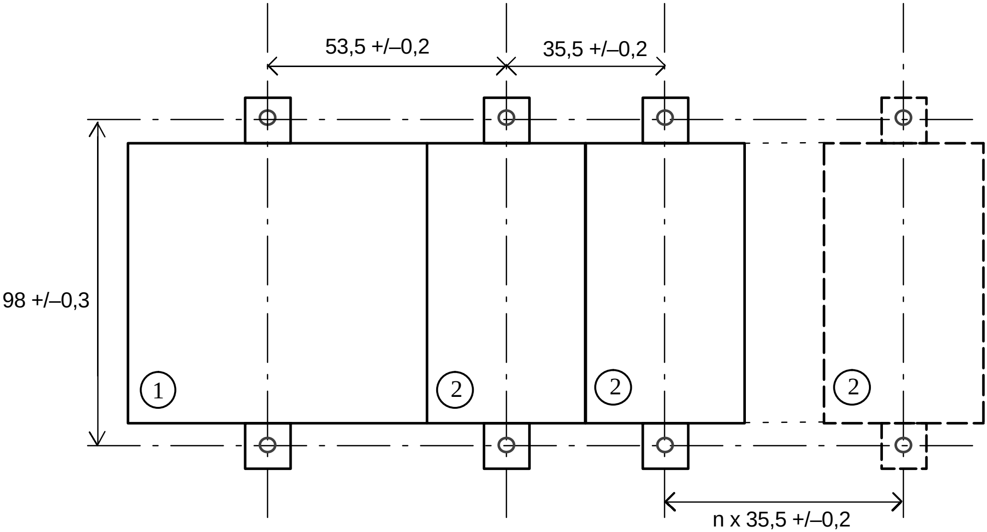
2.2.2 Wall–mounting

Before you wall–mount the device, the mounting slides at the rear of the device must be pushed towards the outside or the inside. Insert the upper mounting slide (included with the modules) and push the lower one to the outside. You can the fasten the LOGO! with two ∅ 4–mm screws (tightening torque 0.8 to 1.2 N/m) to the bracket to mount it on the wall.



Drilling template for wall–mounting

Before you mount the LOGO! to the wall you should prepare the drill holes with the help of this template.



All dimensions in mm

○ Screw bore ∅ 4 mm
Tightening torque 0.8 to 1.2 N/m

① LOGO! Basic

② LOGO! Expansion module

2.3 Wiring the LOGO!

Wire the LOGO! using a screwdriver with a 3 mm blade.

You don’t need wire ferrules for the connectors. You can use wires up to the following sizes:

- 1 x 2.5 mm^2
- 2 x 1.5 mm^2 for each second connector compartment

Connecting torque: 0.4...0.5 N/m or 3...4 LBin

Note

ensuring that the connectors are covered. To protect the LOGO! adequately against contact to voltage carrying parts, country specific standards must be conformed with.

2.3.1 Connecting the Power Supply

LOGO! The 230 V versions are suitable for nominal line voltages oft 115 V AC/DC and 240 V AC/DC. LOGO! The 24 V and 12 V versions are suitable for a supply voltage of 24 V DC, 24 V AC or 12 V DC. Note the information on connection in the product information document shipped with your device and the technical specifications in Appendix A relating to permissible voltage tolerances, line frequency and current consumption.

Note

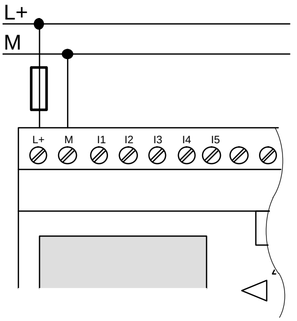
Power failure might result for instance in an additional edge after power restoration with edge–triggered special functions.

Data of the last uninterrupted cycle are stored in LOGO!.

Connecting

This is how you connect your LOGO! to the power supply:

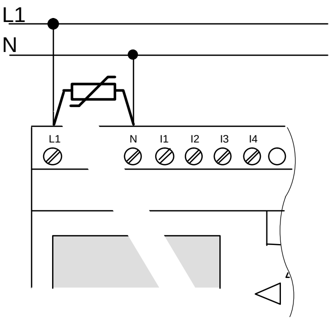
LOGO! ..... with DC
supply voltage



Protection by fuse
if required (recommended) for:

12/24 RC...:	0.8 A
24:	2.0 A

LOGO! ..... with AC
supply voltage



With voltage peaks, use a varistor (MOV) with at least 20% higher operating voltage than nominal voltage.

Note

LOGO! has protective insulation. A ground terminal is not necessary.

Protective circuit with AC voltage

You can eliminate line voltage peaks with a metal oxide varistor (MOV). Make sure the operating voltage of the varistor exceeds the rated voltage by at least 20% (e.g. S10K275)

2.3.2 Connecting LOGO! inputs Connecting

Prerequisites

Connect sensors to the inputs. Sensors may be: pushbuttons, switches, photoelectric barriers, daylight control switches etc.

Sensor attributes for LOGO!

	LOGO! 12/24 RC/RCo LOGO! DM8 12/24 R		LOGO! 24 LOGO! DM8 24	
	I1 ... I6	I7, I8	I1 ... I6	I7, I8
Circuit state 0	< 5 V DC	< 5 V DC	< 5 V DC	< 5 V DC
Input current	< 1.0 mA	< 0.05 mA	< 1.0 mA	< 0.05 mA
Circuit state 1	>8 V DC	>8 V DC	>8 V DC	>8 V DC
Input current	> 1.5 mA	> 0.1 mA	> 1.5 mA	> 0.1 mA

	LOGO! 24 RC/RCo (AC)	LOGO! 230 RC/RCo (AC) LOGO! DM8 230 R (AC)	LOGO! 230 RC/RCo (DC) LOGO! DM8 230 R (DC)
Circuit state 0	< 5 V AC	< 40 V AC	< 30 V DC
Input current	< 1.0 mA	< 0.03 mA	< 0.03 mA
Circuit state 1	> 12 V AC	> 79 V AC	> 79 V DC
Input current	> 2.5 mA	> 0.08 mA	> 0.08 mA

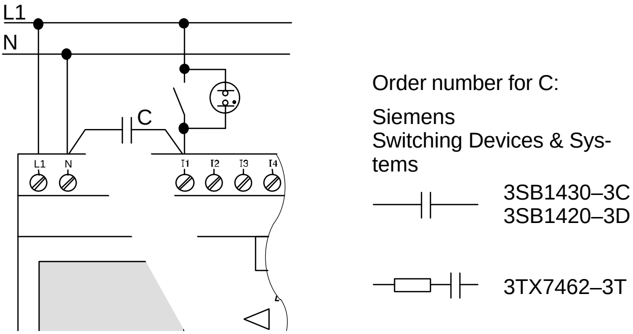
Note

The digital inputs of the LOGO! 230 RC/RCo are divided into two groups equipped with 4 inputs each. **Within** a group all inputs must be operated on the **same** phase. **Different** phases are only possible **between** the groups. Example: I1 to I4 on phase **L1**, I5 to I8 on phase **L2**.

Within the input circuit of the LOGO! DM8 230R you must **not** connect different phases.

Sensor connections

Connecting glow lamps, 2–wire Bero to the LOGO! 230 RC/230 RCo or LOGO! DM8 230 R (AC)



Order number for C:

Siemens
Switching Devices & Systems

3SB1430–3C
3SB1420–3D

3TX7462–3T

Restrictions

– Circuit status transition 0→ 1 / 1→ 0

When the circuit state changes from 0 to 1, circuit state 1 and, in the case of a change from 1 to 0, circuit state 0 must be in place for at least one program cycle for LOGO! to recognize the new circuit status.

The cycle time of the program processing depends on the size of the program. In Chapter 3.7 you can find a description of a short test program that will help you to work out the current cycle time.

Special features of LOGO! 12/24 RC/RCo and LOGO! 24

- *Fast inputs: I5 and I6*

These versions are also equipped with inputs for frequency functions. The same restrictions do not apply to these fast inputs.

Note

There are no changes in the standard version compared to previous Basic devices (0BA0 to 0BA2): I5 and I6 are still the fast inputs, that is, no changes are necessary to transfer the program written in these versions to the new 0BA3 devices. In contrast, programs written in a LOGO!...L version (fast inputs I11/I12) must be changed.

Expansion modules do not have fast inputs.

- *Analog inputs: I7 and I8*

With the LOGO! 12/24 RC/RCo and LOGO! 24 versions the inputs I7 and I8 can be used as normal digital inputs or as analog inputs. How the input is used depends on its purpose in the LOGO! control program.

You can use the digital capability of the input with I7/I8 and its analog capability with the identifiers AI1 and AI2.

See also Section 4.1.

Note

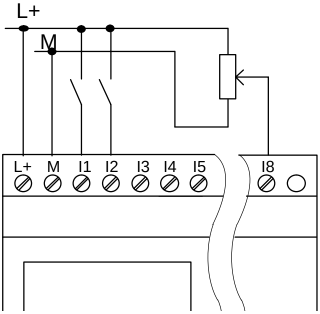
The expansion module LOGO! AM2 is available for additional inputs.

For the analog signals you must always use twisted and shielded cables as short as possible.

Sensor connections

This is how to connect sensors to the LOGO! :

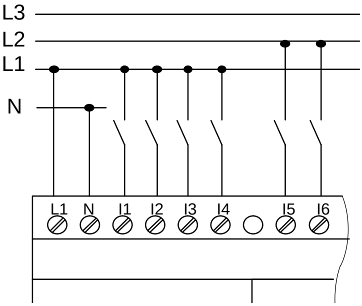
LOGO! 12/24 ....



The inputs of these devices are non–isolated and therefore require the same reference potential (ground) as the power supply.

With the LOGO! 12/24 RC/RCo and LOGO! 24 you can tap the analog signal between the supply voltage and ground.

LOGO! 230 ....

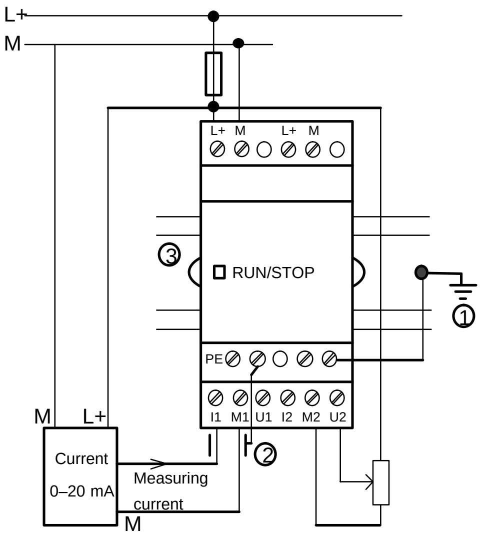


The inputs of these devices are arranged in 2 groups with 4 inputs each. Different phases are only possible between, but not within the blocks.

Warning

Current safety regulations (VDE 0110, ... and IEC 61131–2, ... as well as UL and CSA) do not permit the connection of different phases to one input group (I1–I4 or I5–I8) of an AC version or on the inputs of one digital module.

LOGO! AM2



Current measurement

Voltage measurement

PE Grounding terminal for connecting ground and shielding of the analog measuring line

① Ground

② Cable shielding

③ Profile rail

2.3.3 LOGO! Outputs connecting

LOGO! ...R...

The LOGO! outputs ...**R**... are relays. The relay contacts are isolated from the power supply and from the inputs.

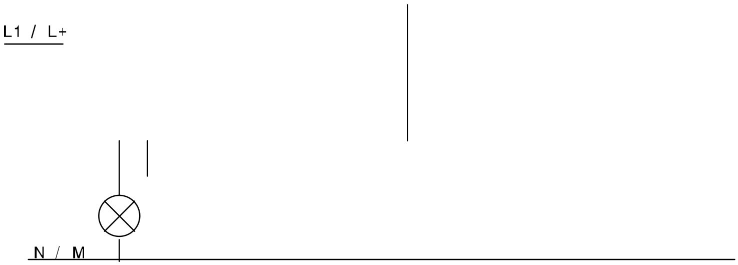
Prerequisites for Relay outputs

You can connect different loads to the outputs such as lamps, fluorescent tubes, motors, contactors etc. The loads connected to LOGO! ...R... must have the following properties:

- The maximum switched current depends on the type of load and the number of switching cycles (For details refer to Chapter A “Technical Data”).
- LOGO! Basic...R..: in switched on state (Q = 1) and with ohmic load the maximum current is 10 A and for inductive loads the maximum is 3 A (2 A at 12/24 V AC/ DC).
- LOGO! DM8....R properties are identical to LOGO! Basic...R, with the following restrictions: The maximum sum switching power **across all four relays** is 20 A.

Connecting

This is how to connect the load to the LOGO! ...**R**... an:DM8...R1



LOGO! with transistor outputs

LOGO! variants with transistor outputs can be identified by the fact that the letter **R** is missing from their type designation. The outputs are short circuit–proof and overload–proof. An auxiliary load voltage supply is not necessary since LOGO! supplies the load voltage.

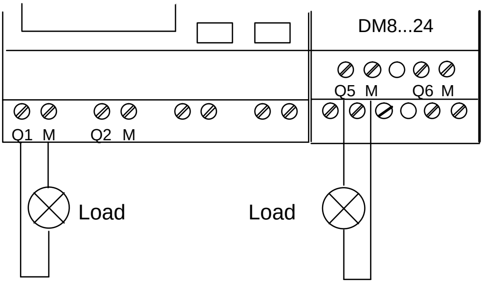
Prerequisites for transistor outputs

The load connected to LOGO! must have the following properties:

- The maximum switched current is 0.3 amperes per output.

Connecting

This is how to connect the load to a LOGO! with transistor outputs:



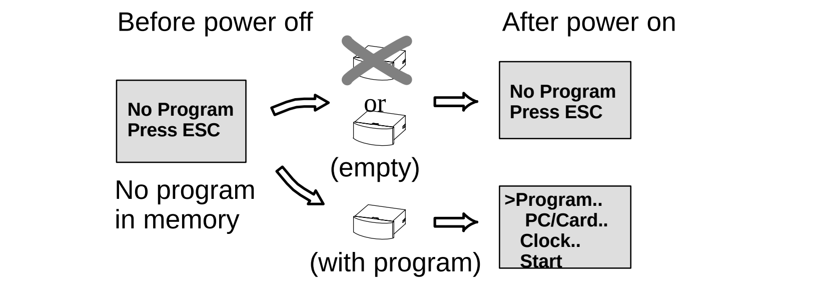
Load: 24 V DC, 0.3 A max.

2.4 Switching on the LOGO!/Power return

LOGO! does not have a power switch. The reaction of LOGO! when switched on depends

- whether a program is stored LOGO! in LOGO!,
- whether a program module is connected,
- Whether it is a LOGO! version without display (LOGO!...RCo),
- in which state LOGO! was prior to POWER–OFF and
- whether a PC cord was connected.

The LOGO! reaction to all possible situations is described on the following page:



Before power off

No Program
Press ESC

No program
in memory

or

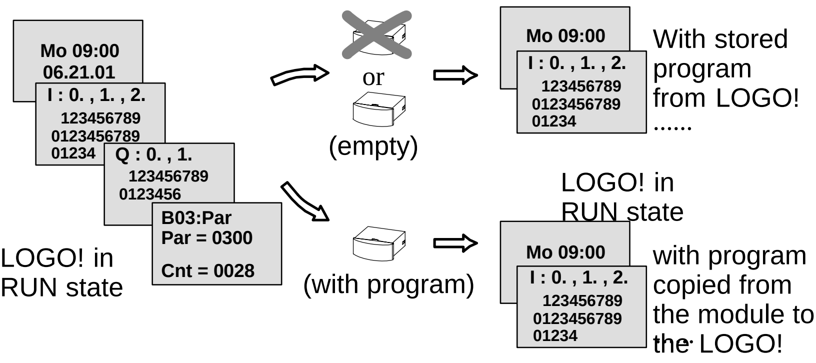
(empty)

(with program)

After power on

No Program
Press ESC

>Program..
PC/Card..
Clock..
Start



Mo 09:00
06.21.01

I : 0. , 1. , 2.
123456789
0123456789
01234

Q : 0. , 1.
123456789
0123456

B03:Par
Par = 0300

Cnt = 0028

LOGO! in
RUN state

or

(empty)

(with program)

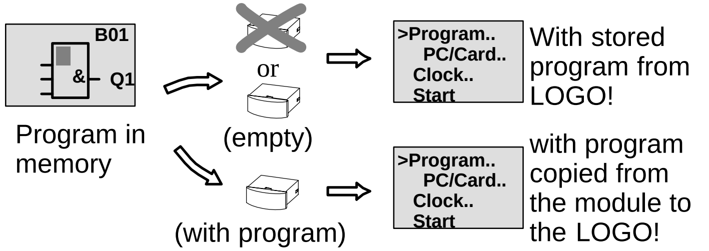
Mo 09:00
I : 0. , 1. , 2.
123456789
0123456789
01234

With stored
program
from LOGO!
......

LOGO! in
RUN state

Mo 09:00
I : 0. , 1. , 2.
123456789
0123456789
01234

with program
copied from
the module to
the LOGO!



Program in
memory

or

(empty)

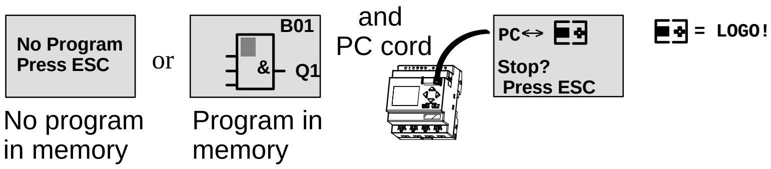
(with program)

>Program..
PC/Card..
Clock..
Start

With stored
program from
LOGO!

>Program..
PC/Card..
Clock..
Start

with program
copied from
the module to
the LOGO!



No Program
Press ESC

No program
in memory

or

Program in
memory

and
PC cord

PC↔
Stop?
Press ESC

= LOGO!

You can also try to remember the 4 simple rules for starting LOGO! Basic:

1. If there is no program in LOGO! or in the connected program modules, LOGO! (with display) reports: ’No Program Press ESC’.
2. If there is a program on the program module, it is automatically copied to LOGO! . A program in LOGO! is overwritten.
3. If there is a program in LOGO! or in the connected program module, LOGO! takes over the operate state it had prior to POWER–OFF. The version without display (LOGO! ...RCo) is switched automatically from STOP to RUN mode (LED toggles from red to green).
4. If at least on function is switched retentive or if you have used a function that is permanently retentive the current values are also retentive at POWER–OFF.

Note

If a power loss occurs while you are entering a program, the program in LOGO! is deleted after power is returned.

You should therefore save your original program before changing it on a program module (card) or on a computer (LOGO!Soft Comfort).

LOGO! Basic operating states

LOGO! Basic knows tow operate states: STOP and RUN

STOP	RUN
• Display: 'No Program' (not LOGO! ...RCo) • LOGO! to programming mode (not LOGO! ...RCo) • The LED lights up red (only LOGO! ...RCo)	• Display: screen form for monitoring I/O and messages (after START in the main menu) (not LOGO! ...RCo) • LOGO! to programming mode (not LOGO! ...RCo) • The LED lights up green (LOGO! ...RCo)
Action by LOGO!: • The inputs are not read. • The program is not executed. • The relay contacts are always open or the transistor outputs are switched off	Action by LOGO!: • LOGO! reads the state of the inputs • LOGO! calculates the state of the outputs with the program. • LOGO! switches the relays/ transistor outputs on or off

LOGO! Expansion modules, operating state

LOGO! expansion modules know three operating states: the LED is lit green, red or orange.

LED is lit		
green (RUN)	**red (STOP)**	**orange**
The expansion module communicates with the left device	The expansion module does **not** communicate with the left device	Initialization phase of the expansion module

3 Programming LOGO!

Your first steps with LOGO!

The term programming refers to the input of a circuit program. A LOGO! program is actually no more than a circuit diagram presented in a slightly different form!

We have adapted this presentation to the LOGO! display. In this chapter we are going to show you how to transform your applications into a LOGO! program.

Note

The LOGO! versions LOGO! 12/24 RCo, LOGO! 24 RCo and LOGO! 230 RCo do not have a keyboard or a display unit. They are mainly intended for series production applications in small machine and plant engineering.

LOGO!...RCo versions are not programmed locally. Rather, programs in LOGO!Soft Comfort or in the memory modules of other LOGO! units are transferred to this device.

In the first section of this chapter we shall use a small example to show you how to handle the LOGO! .

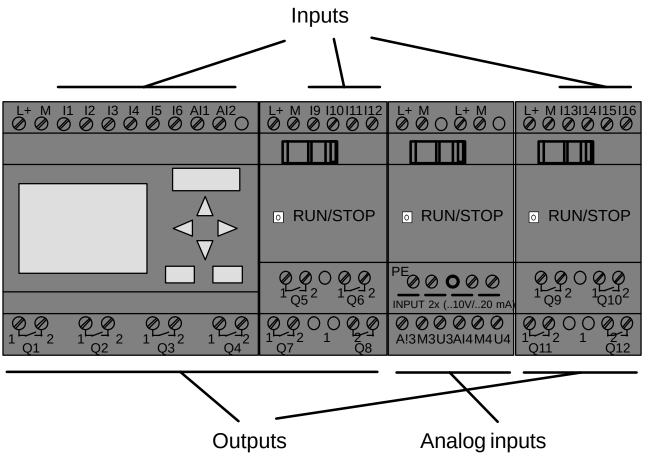
- We shall begin by introducing two basic terms, namely the **connector** and the **block**, and show you what they represent.
- In a second step, we shall work out a simple and common circuit program that you ...
- can enter directly in LOGO! in the third step.

Only few manual pages later you are going to have your first running program stored in the LOGO! . With a suitable hardware (switches etc.) you will then be able to carry out your first tests.

3.1 Connectors

LOGO! has I/Os

Example of a configuration with several modules:



Each input is identified by the letter I and a number. When you look at the LOGO! from the front, you can see the connectors for the inputs at the top. Only the analog module LOGO! AM2 has its inputs at the bottom.

Each output is identified by the letter Q and a suffix. You can see that the connectors of the outputs are located at the bottom.

Note

LOGO! can recognize, read and switch the I/O of all expansion slots, regardless of their type. The I/O is shown in the order of the module arrangement.

The following I/Os and memory bits are available for programming: I1 to I24, AI1 to AI8, Q1 to Q16 and M1 to M8. For the LOGO! 12/24... and LOGO! 24 inputs I7 and I8 applies: if Ix is used in the program, the input signal is interpreted as digital signal; with AIx it is an analog signal. Input AIx can only be the connector that is actually capable of carrying an analog signal.

LOGO!'s connectors

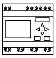
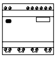
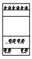
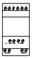
The term connector refers to all connections and states in LOGO! .

The I/O status can be ’0’ or ’1’. Status ’0’ means that the input does not carry a voltage. Status ’1’ means that the input carries voltage. But that, we assume, is nothing new to you.

We have implemented the connectors hi, lo and x in order to facilitate programming for you: the default fixed status of ’hi’ (high) is ’1’ and of ’lo’ (low) it is ’0’.

If you do not want to wire the input of a block, use the ’x’ connector. The meaning of the term block is explained on the next page.

LOGO! knows the following connectors:

Connec-tors	**LOGO! basic** 		**DM** 	**AM** 
Inputs	LOGO! 230 RC/RCo LOGO! 24 RC/RCo	Two groups: I1... I4 and I5 ... I8	I9 ... I24	AI1(AI3) ... AI8
	LOGO! 12/24 RC/ RCo LOGO! 24	I1... I8 along with I7(AI1), I8(AI2)		
Outputs	Q1...Q4		Q5 ... Q16	none
lo	Signal with ’0’ level (off)			
hi	Signal with ’1’ level (on)			
x	An existing connection that is not used			

DM: Digital module.
AM: Analog module.

3.2 Blocks and Block Numbers

This chapter shows you how to use the LOGO! elements to create extensive circuits and how the blocks and the I/O are interconnected.

For this purpose, please turn to Section 3.3. There you are going to learn how to convert a common circuit into a LOGO! program.

Blocks

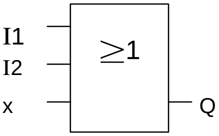
A block in LOGO! is a function that is used to convert input information into output information. Previously you had to wire up the individual elements in the control cabinet or terminal box.

When you program LOGO!, you connect connectors with blocks. To do this, simply select the connection you require from the **Co** menu We have used the abbreviation Co for the English term ”Connector” to name the menu.

Logic operations

The most elementary blocks are logical links:

- AND
- OR
- ...



Inputs I1 and I2 are connected to the OR block. The last input of the block is not used and is therefore marked with an x.

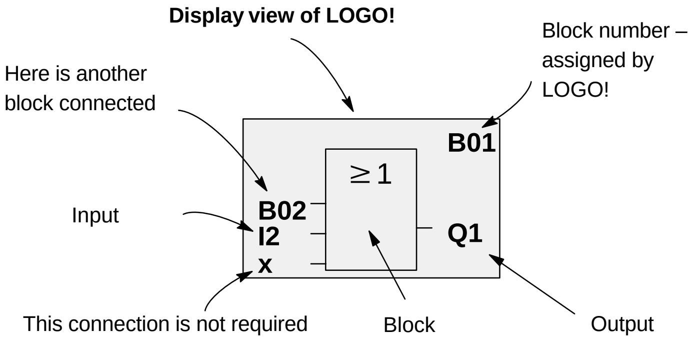
The special functions are far more powerful:

- Pulse relay
- Counter
- On delay
- Softkey
- ....

Chapter 4 provides a complete list of LOGO!'s functions.

Displaying a block in LOGO!

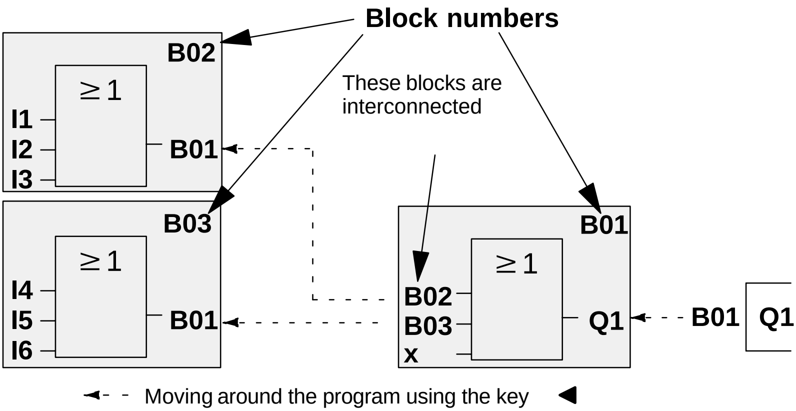
The figure below shows a typical LOGO! display. Only one block can be displayed at a time. We have therefore introduced block numbers to help you check the circuit structure.


Display view of LOGO!
Block number – assigned by LOGO!
Here is another block connected
B01
≥1
Input
B02
I2
x
Q1
This connection is not required
Block
Output

Assigning a block number

When you insert a block in a program, LOGO! always assigns it a block number.

LOGO! uses the block numbers to show you the block interconnections. Primarily, the block numbers are meant to help you find your way around the program.


Block numbers
B02
≥1
I1
I2
I3
B01
These blocks are interconnected
B03
≥1
I4
I5
I6
B01
B01
≥1
B02
B03
x
Q1
B01
Q1
Moving around the program using the key ◀

The overview shows you three displays of LOGO!, which together form the program. You can see how LOGO! interconnects the blocks, using the block numbers.

Advantages of the block numbers

You can append almost any block to an input of the current block using its block number. In this way you can reuse the interim results of logical links or other operations. This saves you input work and memory space, and ensures a clear arrangement of your circuit. In this case, you must know how LOGO! has named the blocks.

Note

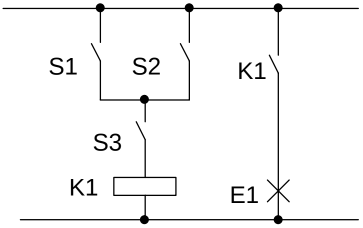
For efficient working, we recommend that you create block diagram of the program. This is going to make programming easier for you, because here you can enter the block numbers assigned by LOGO!.

If you program the LOGO! using the LOGO!Soft Comfort software, you can directly create a logic diagram of your program.

3.3 The way from the Circuit Diagram to LOGO!

How a circuit is represented in a circuit diagram

You know, of course, how a circuit is represented in a circuit diagram. Nevertheless, here is an example:

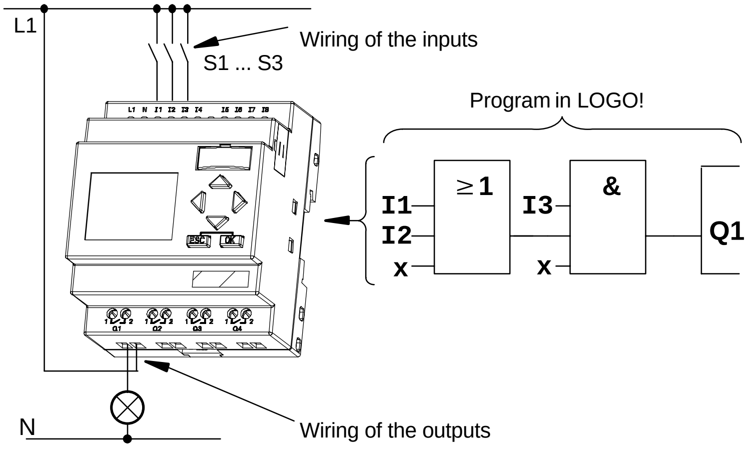


The load E1 is switched on and off by means of the switches (S1 **OR** S2) **AND** S3.

The relay K1 picks up if S1 OR S2 AND S3 are closed.

Realizing this circuit with LOGO!

In LOGO! you construct a circuit by interconnecting blocks and connectors:

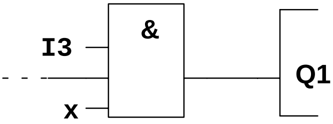


To convert a circuit in LOGO!, start at the output of the circuit.

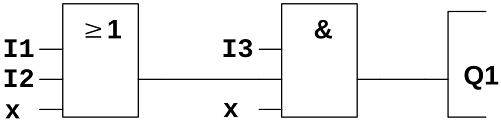
The output is the load or the relay that is to be switched.

Convert the circuit to blocks. To do this, go through the circuit from the output to the input:

Step 1: At output Q1 there is a series connection of the normally open contact S3 with another circuit component. The series connection corresponds to an AND block:



Step 2: S1 and S2 are connected in parallel. The parallel circuit corresponds to an OR block:



You have now completely described the circuit for the LOGO! . Now connect the I/Os to the LOGO! .

Wiring

Connect the switches S1 to S3 to the screw terminals of the LOGO! :

- Connect S1 to connector I1 on the LOGO!
- Connect S2 to connector I2 of the LOGO!
- Connect S3 to connector I3 of the LOGO!

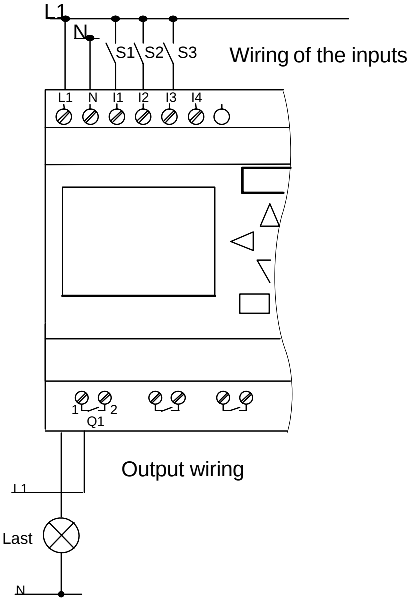
Since only two inputs of the OR blocks are being used, the third input of this block must be marked as “unused”. This is indicated using the suffix **x**.

Likewise, only 2 inputs of the AND block are used. Thus, the third input is also marked as ’unused’ by the suffix **x.**

The output of the AND block controls the relay of output Q1. The load E1 is connected to output Q1.

Wiring example

The following table shows you the wiring based on a 230 V AC version of LOGO!.



3.4 The 4 Golden Rules for Working with LOGO!

Rule 1
Changing operating mode

- Edit the circuit in programming mode. After Power On and if “No Program, Press ESC” is displayed, you can open the programming mode by pressing the **ESC** key.
- You can edit the time and parameter values of an existing program in the **parameter assignment mode** and in **programming mode** .
- Start **RUN mode** by executing ’Start’ in the main menu.
- In **RUN mode** you can return to **parameter assignment mode** via **ESC** key.
- If you want to return from **parameter assignment mode** to **programming mode**, execute the **“Stop”** command in the parameter assignment menu. When prompted to confirm with **“Yes”** when **“Stop Prg”** appears, move the cursor to “**Yes**” and confirm with **OK**.

You can find more information on operating modes in the Chapter **LOGO! Menu Structure** Page 231.

Rule 2
Outputs and inputs

- Always program a circuit working from the output towards the input.
- You can connect an output to several inputs, however, you cannot fan out one input to several outputs.
- You cannot connect an output to a preceding input in the same program path. For such internal recursions you should interconnect memory bits or outputs.

Rule 3
Cursor and cursor movement

When programming a circuit, note:

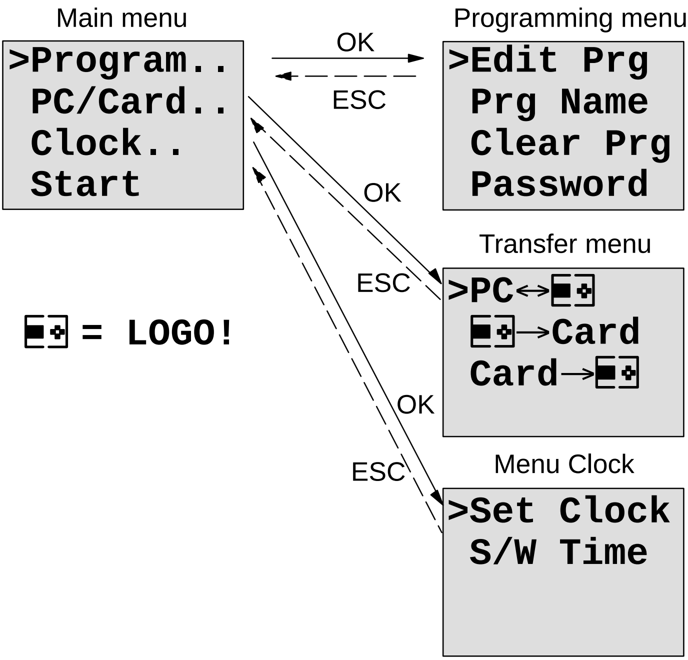
- When the cursor appears in the form of an underscore, you can **move the cursor**:
  - Use the ◀, ▶, ▼ or ▲ key to move the cursor in the circuit
  - Press OK to change to ”Select terminal/block”
  - Press ESC to exit circuit programming.
- When the cursor appears as solid square, you should **select a connector/block**
  - Use the ▼ or ▲ key to select a connector/block.
  - Confirm your selection with OK.
  - Press ESC to go back one step.

Rule 4
Planning

- Make a complete plan of your circuit on paper before you input the circuit or program LOGO! directly using LOGO!Soft or LOGO!Soft Comfort.
- LOGO! can only save complete programs. If the circuit program is incomplete LOGO! cannot exit the **programming mode**.

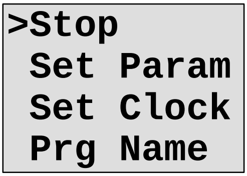
3.5 Overview of the LOGO! Menus

Programming mode



Parameter assignment mode

Parameter assignment menu



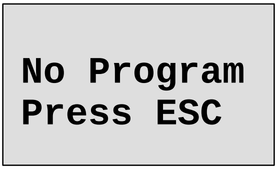
You can find more information on menus in the Chapter **LOGO! Menu Structure** Page 231.

3.6 Program Input and Start

You have designed a circuit and now want to enter it in LOGO! . A small example will show how to do this.

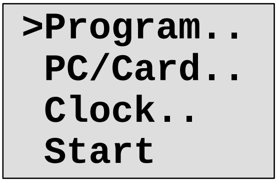
3.6.1 Change to Programming mode

You have connected the LOGO! to the power supply and voltage is switched on. The display shows you the message:



```
No Program
Press ESC
```

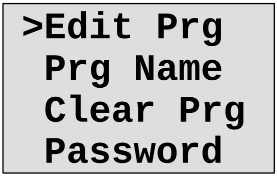
Switch the LOGO! to programming mode by pressing the **ESC** key. This will take you to the main menu of the LOGO!:



```
>Program..
 PC/Card..
 Clock..
 Start
```

LOGO!'s main menu

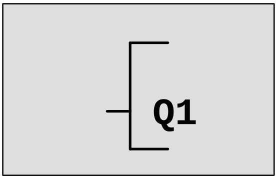
The first character in the first row is ">". Use the keys ▲ and ▼ to move the ">" up and down. Move the ">" to "Program.." and confirm with **OK**. LOGO! opens the programming menu.



```
>Edit Prg
 Prg Name
 Clear Prg
 Password
```

LOGO!'s programming menu

Here too, you can move the ”>” by pressing the ▲ and ▼ keys. Move the ”>” to ”**Edit Prg**” (edit program, that is, input) and confirm with **OK**. LOGO! no shows you the first output:



LOGO!’s first output

You are now in programming mode. Use the keys ▲ and ▼ keys to select the other outputs. At this point you can start programming your circuit.

Note

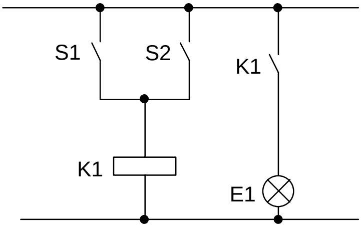
Since our program has not yet been saved with a **password** in LOGO! you can start editing your program right away. If you start a program already saved with password protection, “Edit Prg“ and confirmation with **OK** would be followed by the prompt to enter a password. In this case you cannot start editing unless you enter the correct password. (refer to Chapter 3.6.5.)

3.6.2 First Program

Let us now take a look at the following parallel circuit consisting of two switches.

Circuit diagram

How the circuit is represented in a circuit diagram



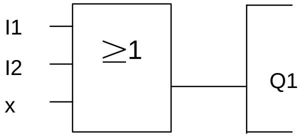
The load is switched on via switch S1 OR S2. LOGO! interprets the circuit as ’OR’, because either switch S1 **OR** S2 switches the output.

Translated in the LOGO! program this means: relay K1 (in LOGO! via output Q1) is controlled by an OR block.

Program

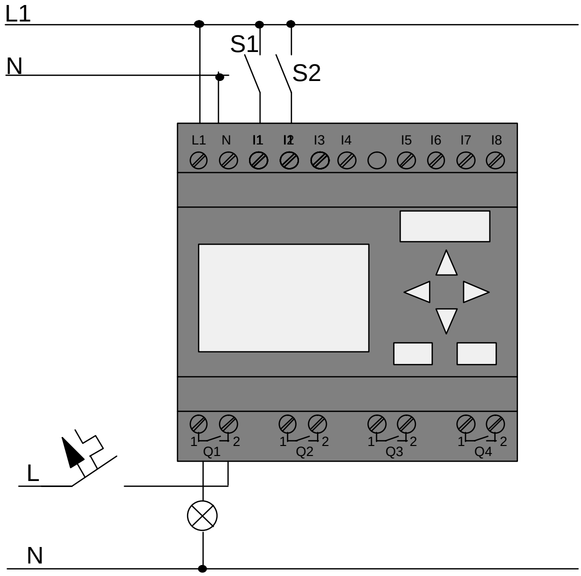
I1 and I2 are connected to the input of the OR block, whereby S1 is connected to I1 and S2 to I2.

This is what the LOGO! program then looks like:



Wiring

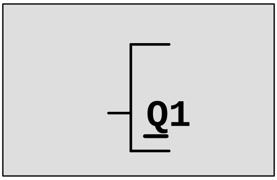
The corresponding wiring:



Switch S1 acts on input I1, switch S2 on input I2. The load is connected to relay Q1.

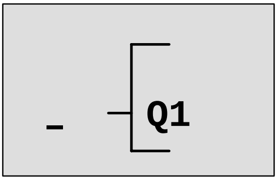
3.6.3 Editing a Program

Let us now edit the program (working from the output to the input). Initially, LOGO! displays the output:



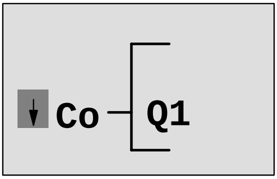
LOGO!’s first output

The Q of Q1 is underscored. This underscore is called the **cursor**. The cursor indicates your current position in the program. You can move the cursor by pressing the ▲, ▼, ◀ and ▶ keys. Now press the ◀key. The cursor moves to the left.



The cursor indicates your position in the program.

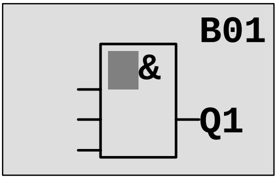
At this point, enter only the first block (the OR block). Press **OK** to switch to editing mode.



The cursor is displayed as a solid square: You can now select a terminal or a block

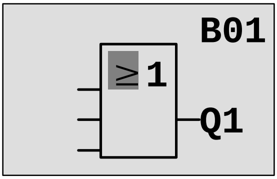
The cursor no longer appears in the form of an underscore; but rather as a flashing solid square. At the same time LOGO! gives you various options.

Select the BF (basic functions) by pressing the ▼ key until BF appears. Confirm with **OK**. LOGO! then displays the first block in the list of basic functions:



An AND is the first block in the list of basic functions. The cursor is displayed as solid square, thus prompting you to select a block.

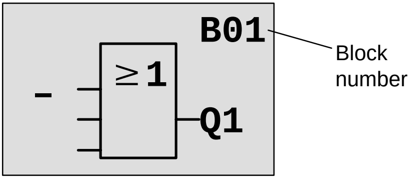
Now press the ▼ or ▲ key until the OR block is displayed:



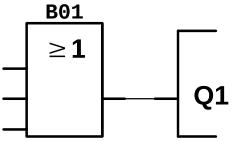
The cursor square is still positioned in the block.

Press **OK** to confirm your selection.

The is what you see in the display



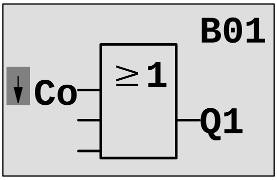
Your entire program looks like this



You have now entered the first block. Each block you enter is assigned a block number. What is now left to do is to wire the inputs of the block. This is how it is done:

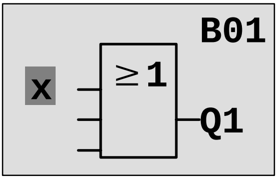
Press **OK**.

The is what you see in the display



Select the Co list: Confirm with **OK**

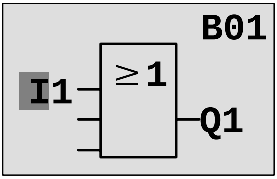
The is what you see in the display



The first element in the Co list is the ”Input not used” character, an ’**x’**. Use the keys ▼ or ▲ to select input I1.

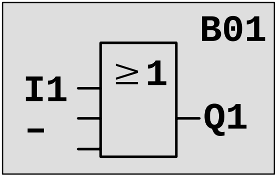
Note

Use the key ▼ to go to the start of the Co list: I1, I2 .... to lo, and again ’**x**’. Use the ▲ key to start at the end of the Co list: lo, hi, Q ..... to I1, and once again ’**x**’.

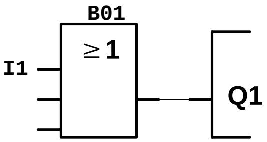


Press **OK**. I1 is now connected to the input of the OR block. The cursor jumps to the next input of the OR block.

The is what you see in the display



Up to this point, your program in LOGO! looks like this

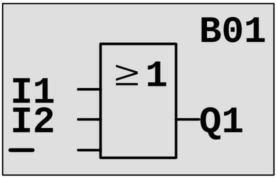


Now connect input I2 to the input of the OR block. You already know how to do this:

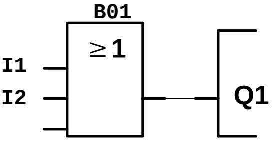
1. Switch to editing mode: **OK**
2. Select the Co list: per ▼ or ▲
3. Accept the Co list: **OK**
4. Select I2: per ▼ or ▲
5. Accept I2: **OK**

I2 is now connected to the input of the OR block:

The is what you see in the display



Up to this point, your program in LOGO! looks like this

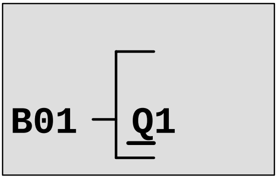


We do not need the last input of the OR block for this program. In a LOGO! program the unused inputs are identified with an ”x”. Now enter the ’x’:

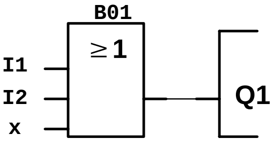
1. Switch to editing mode: **OK**
2. Select the Co list: per ▼ or ▲
3. Accept the Co list: **OK**
4. Select x: per ▼ or ▲
5. Accept x: **OK**

Now all the inputs of the block are now wired. LOGO! considers the program as being complete LOGO! jumps back to output Q1.

The is what you see in the display



Your program looks like this



If you want to review your first program, you can use the ◀ or ▶ key to move the cursor through the program.

But we are going to exit program input now. This is how it is done:

1. Return to the programming menu: **ESC**

If this does not return you to the programming menu, you have not wired a block completely. LOGO! indicates positions at which you have missed something (LOGO! accepts only complete programs, for the sake of your safety.). Also refer to page 71.

Note

LOGO! has now saved your program retentive on power failure. The program is only stored in the LOGO! until you delete it per instruction.

3.6.4 Assigning a Program Name

You can assign a name to your program. This name consists of upper/lower case letters, numbers and special characters. The maximum length is 16 characters.

2. move “>” to ’**Prg Name**’: per ▼ or ▲
3. Accept ’Prg Name’: **OK**

Use the keys ▲ and ▼ you can list the alphabet from A(a) to Z(z), numbers and special characters. You can also list them forward and backward. Here you can select any letter, number or character.

Input an empty by moving the cursor with ▶ to the next position. This is the first character of the list.

Examples:

Press ▼ once: the result is an “ **A** ”
Press ▲ four times: the result is a left bracket “ **{** ”etc.

This character set is available:

	a	b	C			F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e
f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
v	w	x	y	z	0	1	2	3	4	5	6	7	8	9	!
”	#	$	%	&	’	(	)	*	+	,	–	.	/	:	;
<	=	>	?	@	[	\	]	^	_	‘	{	|	}	~	

Let us assume you want to name your program “**ABC**”:

4. Select “ **A**”: Press ▼
5. To the next letter: Press ▶
6. Select “ **B**”: Press ▼
7. To the next letter: Press ▶
8. Select “ **C**”: Press ▼
9. Confirm the complete name: **OK**

Your program is now named “**ABC**” and you have been returned to the programming menu.

The program name can be **changed** in the same way as above.

Note

The program name can only be changed in programming mode. You can read the program name in programming mode **and** in parameter assignment mode .

3.6.5 Password

You can assign a password in to protect it from being edited by unauthorized persons.

How to assign a password

The maximum password length is 10 characters. It consists of uppercase letters only (A to Z). On the device you can only assign, edit and deactivate the password in the “Password” menu.

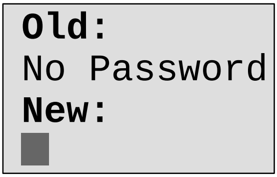
In the programing menu:

1. move ’>’ to ’**Password**’: per ▼ or ▲
2. Accept the ’Password’: **OK**

Use the keys ▼ or ▲ to move up and down the alphabet to select your letters. Since LOGO! allows only uppercase letters for the password, you can quickly access the letters ”at the end” of the alphabet faster by using the key ▲ :

Press ▲ once gives you a “**Z**”
Pressing ▲ twice gives you a “**Y**” etc.

Let us now assign the password “**AA**” to our first program. The display shows:

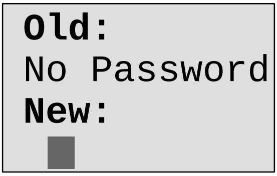


```
Old:
No Password
New:
■
```

The procedure is the same as for entering the program name. Under “New”, enter:

3. Select “ **A**”: Press ▼
4. To the next letter: Press ►
5. Select “ **A**”: Press ▼

The display now shows:



```
Old:
No Password
New:
  ▮
```

6. Confirm the password: **OK**

Your program is now password protected with “**AA**” and you have been returned to the programming menu.

Note

If the input of the new password is interrupted with ESC LOGO! returns to the programming menu without saving the password.

You can also input your password in LOGO!Soft Comfort. You can only upload a password protected program in LOGO!Soft Comfort or edit your program on the device after you have entered the correct password.

Changing the Password

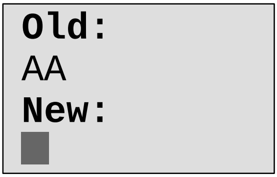
In order to change the password you must know the current one.

In the programming menu:

1. move ’>’ to ’Password’: per ▼ or ▲
2. Accept the ’Password’: **OK**

Under “Old”, enter your old password (in our case ’**AA**’) by repeating steps 3 to 6 as described above.

The display now shows:

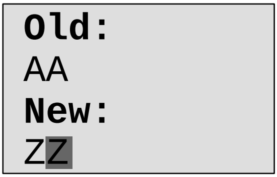


```
Old:
AA
New:
```

Now you can enter a new password under “New”, e.g. “**ZZ**”:

3. Select “**Z**”: Press ▲
4. To the next letter: Press ▶
5. Select “**Z**”: Press ▲

The display now shows:



```
Old:
AA
New:
ZZ
```

6. Confirm your new password: **OK**

“**ZZ**” is now your new password and you are back in the programming menu.

Deactivating the Password

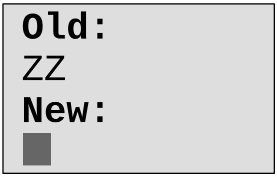
Let us assume you want to deactivate the password for whichever reason. For example, you want to grant another user read/write access to your program. Same as when changing it, you must know your current password (in our example “**ZZ**”).

In the programming menu:

1. move ’>’ to ’Password’: per ▼ or ▲
2. Accept the ’Password’: **OK**

Under “Old” you must now enter your current password as described in steps 3 to 5. Confirm your entry with **OK**.

The display shows:



```
Old:
ZZ
New:
```

Now deactivate the password **without making another entry** :

3. Confirm the “empty” password: **OK**

The password does not exist anymore. You have been returned to the programming menu.

Note

This deactivation switches off the password prompt. Editing is possible without entering a password.

For the moment, leave the password prompt **deactivated** in order to speed up our progress with the remaining tutorials/examples.

Password: Wrong input !

When you enter the **wrong** password and confirm your entry with **OK**, LOGO! does not open editing mode, but rather returns to the programming menu. This repeats itself over and over until you have entered the correct password.

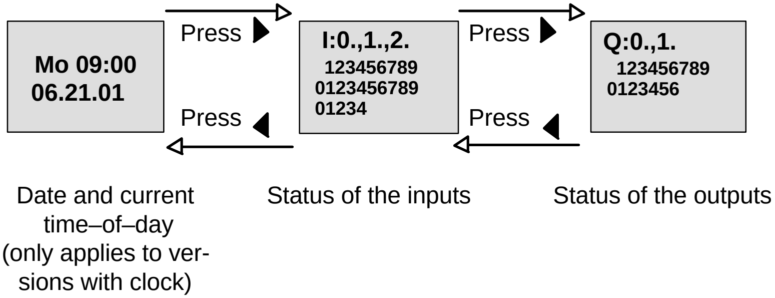
3.6.6 LOGO! to RUN mode

LOGO! to RUN mode in the main menu.

1. Return to the main menu: **ESC**
2. move ’>’ to ’**Start**’: per ▲ or ▼
3. Confirm ’Start’: **OK**

LOGO! starts the program and displays:

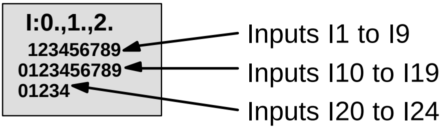
Display field of the LOGO! in RUN mode



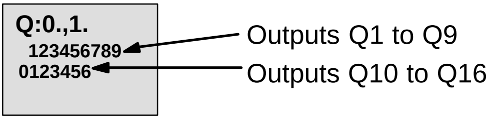
Date and TOD on the display

This display flashes as long as date and TOD are not set.

Presentation of the inputs on the display



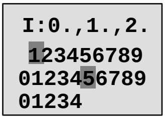
Presentation of the outputs on the display



What does ”LOGO! is in RUN” mean?

In RUN mode LOGO! processes the program. To do this, LOGO! initially reads the status of the inputs, determines the status of the outputs using your specified program and switches the outputs on or off.

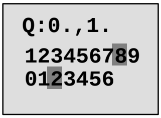
The LOGO! presents the I/O status in this way:



```
I:0.,1.,2.
 123456789
0123456789
01234
```

Input/output has the state ’1’: inverse ▮

Input/output has the state ’0’: not inverse

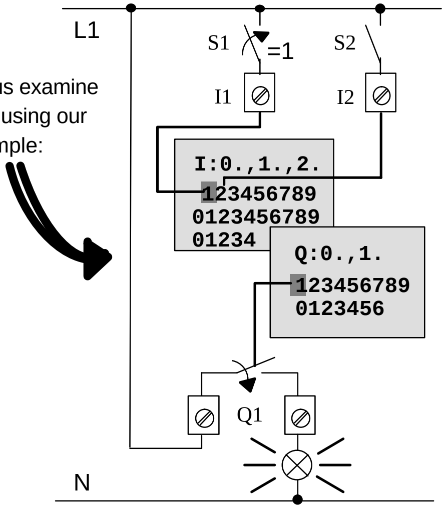


```
Q:0.,1.
 123456789
0123456
```

In this example, only the inputs I1, I15, Q8 and Q12 are “high“.

Status display

Let us examine this, using our example:



When switch S1 is closed, voltage is applied to input I1, which has the state ’1’.

LOGO! uses the program to calculate the output states.

Output Q1 has the state ’1’ here.

If the status of Q1 is ’1’ LOGO! switches the relay Q1; the load on Q1 is supplied with voltage.

3.6.7 Your Second Program

Now that you have successfully programmed your first circuit (plus the program name and, if desired, assigned a password), We shall commence by showing in this section how you can modify existing programs and use the special functions.

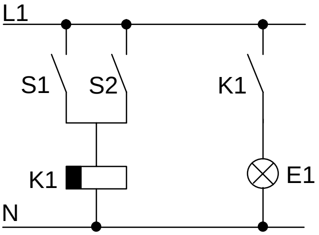
In a second program you are shown how to:

- Insert a block in an existing program.
- Select a block for a special function.
- Assign parameters.

Modification of circuits

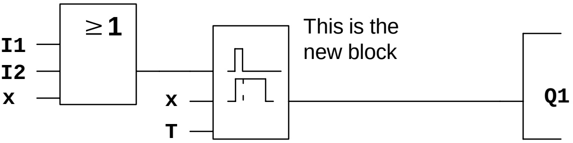
In order to produce the second program, we are now going to modify the first one slightly.

In the first step, let us examine the circuit diagram for the second program:



You already know the first part of the circuit. Switches S1 and S2 operate a relay. This relay switches on the load E1. It should switch off the load again on expiration of a 12–minute off delay.

In LOGO! :



This is the new block

You will recognize the OR block and the output relay Q1 from or first program. Only the off delay is new.

How to edit the program

Switch the LOGO! to programming mode

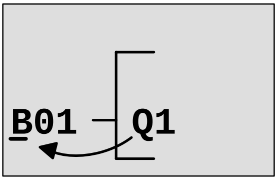
As a reminder, this is how it was done:

1. Switch the LOGO! to programming mode
   (In RUN mode: press **ESC**. This opens the parameter assignment menu
   Select ’Stop’ : confirm with OK, move ’>’ to ’Yes’ and confirm once again with **OK**). See page 45
2. In the main menu, select ”Program..”
3. In the programming menu, select ”Edit Prg”
   (If required, enter the password and confirm with **OK**)

You can now modify the existing program.

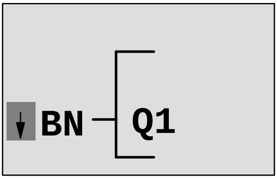
How to insert a new block in a program

Move the cursor underneath the B in B01 (B01 is the block number of the OR):



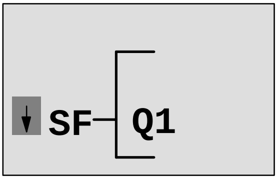
Move the cursor:
press the ◀ key

We now insert the new block at this position. Press **OK**.



LOGO! shows you the BN list.

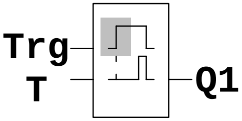
Select the SF list (▼ key):



The SF list contains the blocks for the special functions.

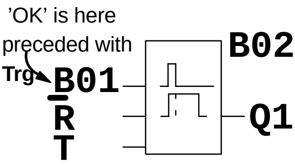
Confirm with OK.

The block of the first special function is displayed:



When you select a special or basic function block, LOGO! displays the respective function block. The full square cursor is positioned in the block. Use the keys ▼ or ▲ to select the required block.

Select the block (off delay, see next diagram) and confirm with **OK**:



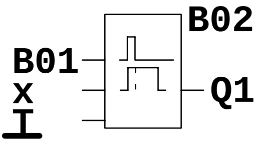
’OK’ is here preceded with Trg

The inserted block is assigned the block number B02. Block B01, up to now connected to Q1, is automatically connected to the upper input of the new block. The cursor is positioned at the upper input of the new block.

The off–delay block has three inputs. The upper input is the trigger input (Trg). Use this input to start the off delay. In our example, the off delay is started via the OR block B01. Reset the time and outputs, using the reset input. In the T parameter, set off delay time.

In our example, we do not use the reset input of the off delay. We wire it with ’x’. In the first program you have seen how this is done. As a reminder to you:

1. Position the cursor under the R: per ▲ or ▼
2. change over to editing mode: **OK**
3. Select the Co list: per ▲ or ▼
4. Accept the Co list: **OK**
5. Select x: per ▲ or ▼
6. Accept x: **OK**



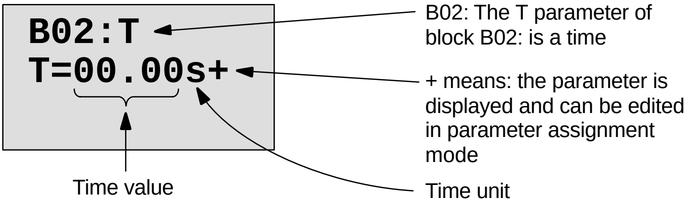
The display should now look like this:

How to assign block parameters

Now, specify the off delay time T:

1. If the cursor is not yet positioned underneath the T, move it there: per ▲ or ▼
2. change over to editing mode: **OK**

For the parameters LOGO! displays the parameter assignment screen form:



```
B02:T
T=00.00s+
```

B02: The T parameter of block B02: is a time

+ means: the parameter is displayed and can be edited in parameter assignment mode

Time value

Time unit

The cursor is positioned on the first digit of the time value.

This is how you change the time value:

- Use the keys ◀ and ▶ to move the cursor to and fro.
- Use the keys ▲ and ▼ to change the value.
- Confirm the time value you have entered with **OK**.

Setting the time

Set the time T = 12:00 minutes:

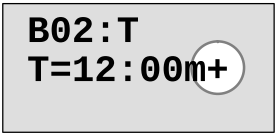
1. Move the cursor to the first digit: per ◀ or ▶
2. Select the digit ’1’: per ▲ or ▼
3. Shift the cursor to the second digit: per ◀ or ▶
4. Select the digit ’2’: per ▲ or ▼
5. Move the cursor onto the unit: per ◀ or ▶
6. Select the m unit for minutes: per ▲ or ▼

Displaying/hiding parameters – type of protection

If you do not want to have the parameter displayed in parameter assignment mode:

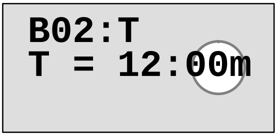
1. Move the cursor onto the type of protection: per ◀ or ▶
2. Select the type of protection '–': per ▲ or ▼

On the display you should now see:



```
B02:T
T=12:00m+
```

or



```
B02:T
T = 12:00m
```

Type of protection +: The time T can be changed in parameter assignment mode

Type of protection – : The time T cannot be changed in parameter assignment mode

3. Close and confirm your entries with **OK**

Note

You can only change the type of protection and the time unit in programming mode, that is, you **cannot** do this in parameter assignment mode.

Checking the program

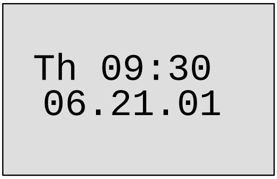
This program path for Q1 is now complete. LOGO! shows you the output Q1. You can review the program on the display. Use the keys to browse through the program, e.g. ◀ or ▶ to move from block to block ▲ and ▼ to move between the inputs on a block.

Exiting programming mode

You already know how to exit a program from our first program. As a reminder:

1. Return to the programming menu: **ESC**
2. Return to the main menu: **ESC**
3. Move ’>’ to ’Start’: per ▲ or ▼
4. Confirm ’Start’: **OK**

LOGO! has now returned to RUN mode:

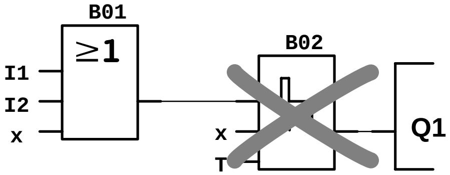


```
Th 09:30
 06.21.01
```

You can use ◀ or ▶ for viewing and monitoring the status of I/Os.

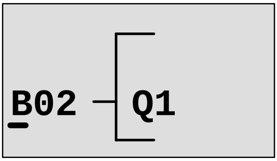
3.6.8 Deleting a Block

Let us assume, in your program you want to delete block B02 and connect B01 directly to Q.



Proceed as follows:

1. Switch the LOGO! to programming mode (as a reminder, refer to page 45).
2. Select ’Edit Prg’: per ▲ or ▼
3. Confirm ’Edit Prg’: **OK**
   (If required, enter the password and confirm with **OK**)
4. Position the cursor on the input of Q1, that is, underneath B02. Use the ◀:

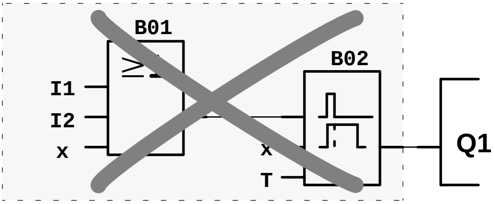


5.
6. Confirm with OK.
7. Now, replace the block B02 with block B01 directly on output Q1. How to do this:
   – Select the BN list: per ▲ or ▼
   – Accept the BN list: **OK**
   – Select ’B01’: per ▲ or ▼
   – Accept ’B01’: **OK**

Result: Block B02 is deleted because it is not used in the circuit. Block B01 is now connected directly to the output instead of B02.

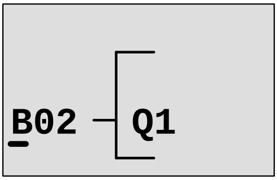
3.6.9 Deleting Multiple Interconnected Blocks

In the following program, (corresponds with the program in Chapter 3.6.7) let us assume you want to delete the blocks B01 **and** B02.



Proceed as follows:

1. Switch the LOGO! to programming mode (as a reminder, refer to page 45).
2. Select ’Edit Prg’**:** per ▲ or ▼
3. Confirm ’Edit Prg’: with **OK** (if required, enter the password and confirm with **OK**)
4. Position the cursor on the input of Q1, that is, underneath B02. Use the ◀:



5. Confirm with **OK.**
6. Now, replace block B02 with the connector x on output Q1. How to do this:
   - – Select the Co list: per ▲ or ▼
   - – Accept the Co list: **OK**
   - – Select x: per ▲ or ▼
   - – Accept x: **OK**

Result: Block B02 is deleted because it is not used in the circuit. All blocks connected to B02 are deleted (e.g. in our example block B01).

3.6.10 Correcting Typing Errors

Programming errors can be corrected easily in LOGO! :

- Provided editing mode is not yet closed, you can revert by one step via **ESC**.
- If you have configured all inputs, just enter the wrong input once again:
  1. Move the cursor to the location of the error.
  2. Change to editing mode. Confirm with **OK**
  3. Enter the correct input circuit.

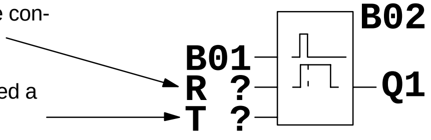
You can only replace one block with another if the new block has exactly the same number of inputs as the old one. However, you can delete the old block and insert a new one. You can choose any new block.

3.6.11 ”?” on the Display

If you have entered a program and want to exit “Edit Prg” with **ESC**, LOGO! checks whether you have connected the inputs of all blocks. If you have missed out on an input or parameter LOGO! leads you to the respective position. It indicates the first faulty position and marks all inputs which are not connected and the parameters with a question mark.

In this position you have connected the input

You have not yet declared a parameter value

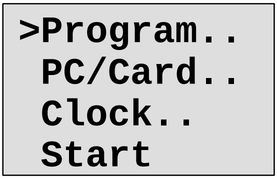


Connect the input and enter a value for the parameter. You can then close the editor via **ESC** key.

3.6.12 Deleting a Program

This is how you delete a program:

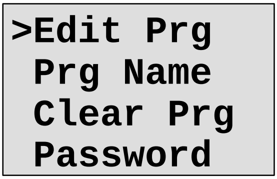
1. Switch the LOGO! to programming mode



```
>Program..
 PC/Card..
 Clock..
 Start
```

LOGO! displays the main menu

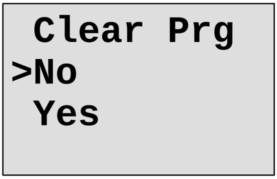
2. In the main menu, use ▲ or ▼ to move '>' to 'Program..'– Confirm with **OK**



```
>Edit Prg
 Prg Name
 Clear Prg
 Password
```

LOGO! opens the programming menu.

3. Move '>' to '**Clear Prg**': per ▲ or ▼
4. Confirm 'Clear Prg': **OK**



```
 Clear Prg
>No
 Yes
```

To prevent you from unintentionally deleting your program, we have implemented an additional prompt.

If you do not want to delete the program, leave the '>' on 'No' and confirm with **OK.**

If you are sure that you want to delete the program saved in the LOGO!,

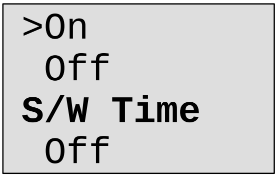
5. move the '>' to 'Yes': per ▲ or ▼
6. Confirm with **OK**. LOGO! deletes the program.

3.6.13 Summertime/Wintertime Conversion

You can enable or disable automatic Summertime/Wintertime Conversion in programming mode under the menu item “Clock”.

1. Switch the LOGO! to programming mode
2. You are now in the main menu and want to select the menu item ’Clock’: per ▲ or ▼
3. Confirm ’Clock’: **OK**
4. Move the ’>’ to ’S/W Time’: per ▲ or ▼
5. Confirm ’S/W Time’: **OK**

LOGO! displays:



```
>On
 Off
S/W Time
 Off
```

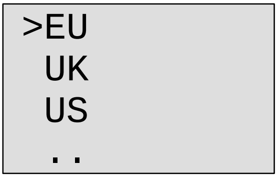
The current setting of automatic Summertime/Wintertime Conversion is shown in the bottom row. Factory default is Off (’Off’: disabled).

Enabling Summertime/Wintertime Conversion

You now want to enable this conversion and specify or declare its parameter:

1. Move ’>’ to ’On’: per ▲ or ▼
2. Confirm ’On’: **OK**

The display shows:



```
>EU
 UK
 US
 ..
```

Description of what is displayed:

- ’**EU**’ represents the start and end of summertime in Europe.
- ’**UK**’ represents the start and end of summertime in the United Kingdom.
- ’**US**’ represents the start and end of summertime in the United States.
- **. .** : here you can specify any month, day and time difference.

The default program for EU, UK and US conversion are found in the table below:

	Start of summertime	End of summertime	Time difference Δ
EU	Last Sunday in March: 02:00—>03:00	Fourth Sunday in October: 03:00—>02:00	60 Min
UK	Last Sunday in March: 02:00—>03:00	Last Sunday in October: 03:00—>02:00	60 Min
US	First Sunday in April: 02:00—>03:00	Last Sunday in October: 03:00—>02:00	60 Min
. .	Customizing the month and the day: 02:00—> 02:00 + Time difference	Customizing the month and the day: 03:00—> 03:00 + Time difference	Specified by the user (minute accuracy)

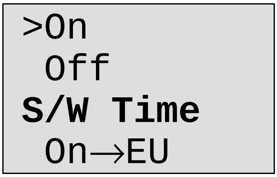
Note

You can specify a time difference Δ between 0 and 180 minutes.

Let us assume you want to enable European Summertime/ Wintertime Conversion:

3. Move ’>’ to ’EU’: per ▲ or ▼
4. Confirm ’EU’: **OK**

LOGO! displays:



```
>On
 Off
S/W Time
 On→EU
```

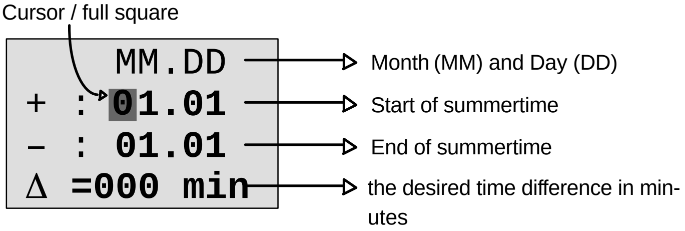
LOGO! indicates that European Summertime/Wintertime Conversion is enabled.

How to customize parameters

If all parameters/conversions do not apply to your country, you can customize them in the menu item '..'. How to do this:

1. Confirm '> On' once again: **OK**
2. Move '>' to '..': per ▲ or ▼
3. Confirm menu item '..' : **OK**

The display shows:



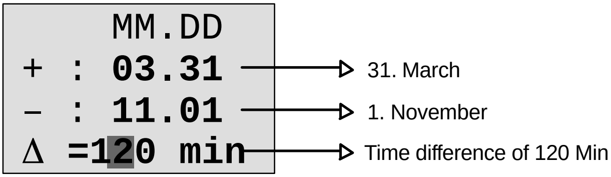
```
    MM.DD
+ : 01.01
– : 01.01
Δ =000 min
```

Let us assume you want to configure the following parameters: start of summertime 31st of March, end of summertime 1st of November, time difference of 120 minutes.

This is how you can enter your data:

- Use the keys ◀ and ▶ to move the cursor/full square to and fro.
- Use the keys ▲ and ▼ to change the values at the cursor position.

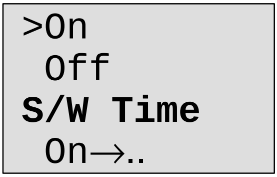
The display shows:



```
    MM.DD
+ : 03.31
– : 11.01
Δ =120 min
```

- Confirm all your entries with **OK.**

You have now customized your summertime/wintertime conversion. LOGO! displays:



```
>On
 Off
S/W Time
 On→..
```

LOGO! indicates that summertime/wintertime conversion is enabled and that the parameters were customized (’..’).

Note

To disable summertime/wintertime conversion, all you have to do is to confirm ’Off’ with **OK** in this menu

3.7 Memory Space and Size of a Circuit

Then size of a program (Circuit program in LOGO!, circuit diagram) is limited by the available memory space (memory requirement for the blocks).

Memory area

In LOGO! you can only utilize a specific number of blocks in your program. Some blocks require extra memory for their special functions.

The memory required for special functions can be split into four memory areas.

- **Par**: The area in which the LOGO! stores setpoint values, e.g. the limit values of a counter.
- **RAM**: The area in which the LOGO! stores actual values, e.g. a counter value.
- **Timer**: The area LOGO! utilizes for timer functions, e.g. for on delays.
- **REM**: The area in which the LOGO! stores retentive actual values, e.g. the hours counter value. In blocks with selective use of the retentivity function, this memory area is only used if retentivity is switched on.

Resources available in LOGO!

A program in LOGO! can occupy the following maximum resources:

Blocks	Par	RAM	Timer	REM	Bit
56	48	27	16	15	8

LOGO! monitors memory utilization. It restricts the functions offered in the function lists to those for which sufficient memory space is physically available.

Memory utilization

The table gives you an overview of the specific memory requirements of the special functions:

Function block	Par	RAM	Timer	REM
Latching relay*	0	(1)	0	(1)
Pulse relay*	0	(1)	0	(1)
Wiping relay	1	1	1	0
Edge–triggered wiping relay	1	1	1	0
On delay	1	1	1	0
Off delay	2	1	1	0
On/off delay	2	1	1	0
Retentive on delay	2	1	1	0
Weekly timer switch	6	2	0	0
Yearly timer switch	2	0	0	0
Up/down counter*	2	(2)	0	(2)
Operating hours counter	2	0	0	4
Symmetric clock generator	1	1	1	0
Asynchronous pulse generator	3	1	1	0
Random generator	2	1	1	0
Frequency trigger	3	3	1	0
Analog trigger	4	2	0	0
Analog comparator	3	4	0	0
Staircase lighting switch	1	1	1	0
Comfort switch	2	1	1	0
Message texts	1	0	0	0
Softkey	1	(1)	0	(1)

* Depending whether or not the function is configured retentive, it occupies the following memory space:

- Retentivity switched off: RAM area
- Retentivity switched on: REM area

Utilization of memory space

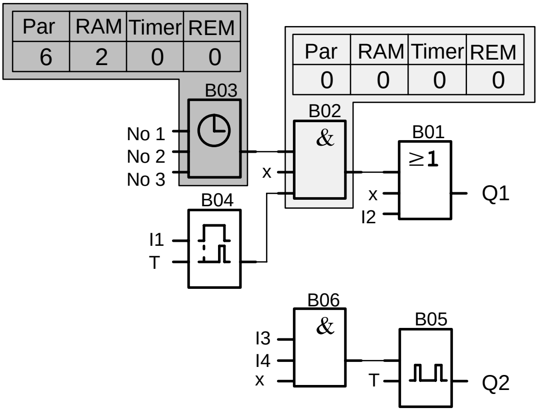
If you are unable to add another block when editing a program, this is a clear indication that no more memory space is available. LOGO! offers only the blocks for which it can provide sufficient memory space. If a block from the list cannot be added into the LOGO! program you cannot call this list anymore.

If the memory space is fully utilized you must optimize your circuit program or use a second LOGO! .

Determining the amount of memory required

When calculating the memory requirements of a circuit, you must always take all memory areas into account.

Example:



Par	RAM	Timer	REM
6	2	0	0

Par	RAM	Timer	REM
0	0	0	0

The sample program contains:

Block no.	Function	Memory area				
		Par	RAM	Timer	REM	Blocks
B01	OR	0	0	0	0	1
B02	AND	0	0	0	0	1
B03	Timer switch	6	2	0	0	1
B04	On delay	1	1	1	0	1
B05	Clock generator	1	1	1	0	1
B06	AND	0	0	0	0	1
	Resources occupied by the program	8	4	2	0	6
	Memory limitations in LOGO!	48	27	16	15	56
	in LOGO! still available	40	23	14	15	50

The program therefore fits into LOGO!.

4 LOGO! Functions

Order

LOGO! provides various elements for the programming mode. In order to avoid loosing the overview, we have distributed the elements in ’Lists’. These lists are:

- ↓**Co**: Connector list (Connector)
  (see Chapter 4.1)
- ↓**BF**: List of basic functions AND, OR, ...
  (refer to Chapter 4.2)
- ↓**SF**: List of special functions
  (refer to Chapter 4.4)
- ↓**BN**: List of reusable blocks configured in the circuit program

List Contents

All lists show the elements available in LOGO!. Normally, this includes all connectors, all basic functions and all special functions the LOGO! knows. This includes all blocks you have created in LOGO! by the time you call the list ↓**BN** .

If not all is shown

LOGO! does not show all elements if:

- No more blocks can be added

  in this case, there is either no more memory space available or the maximum possible number of blocks was reached (56).
- A specific block’s memory space requirement would exceed the space available in LOGO! .

4.1 Constants and Connectors – Co

Constants and Connectors (= Co) are inputs, outputs, memory bits and fixed voltage levels (constants).

Inputs:

1) Digital inputs

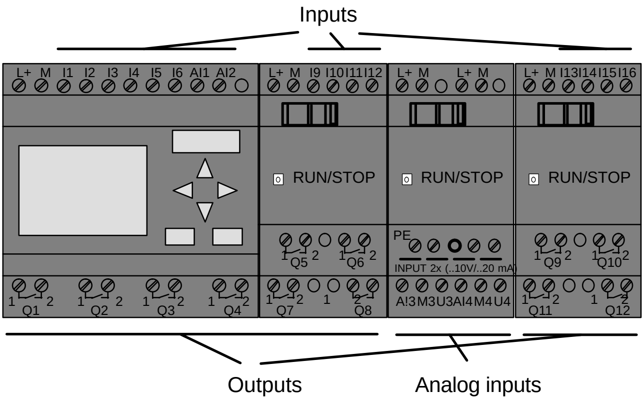
Digital inputs are designated with an **I**. The numbers of the digital inputs (I1, I2, ...) correspond with the numbers of the input connectors of the LOGO! Basic and of the connected digital modules in the order they were installed. See the figure on the next page.

2) Analog inputs

The LOGO! versions LOGO! 24, LOGO! 12/24 RC and LOGO! 12/24 RCo are equipped with the inputs I7 and I8 which can also be used as AI1 and AI2, depending on the program. If these inputs are used as I7 and I8 the input signal is interpreted as digital value. When using AI1 and AI2 the signals are interpreted as analog value. When you connect an analog module, the inputs are numbered in the order of the existing analog inputs. When selecting the input signal in programming mode, only the analog inputs AI1 to AI8 are offered for special functions which sensibly ought to be connected to analog inputs. See the figure on the next page.

Outputs

Outputs are designated with a **Q**. The numbers of the outputs (Q1, Q2, ...) correspond to those of the of the output connectors of the LOGO! Basic and of the connected expansion modules in the order they were installed. See the figure on the following page.



Memory bits

Memory bits are identified with an **M**. Memory bits are virtual outputs, with a value at their output analog to that at the input. The LOGO! provides 8 memory bits, namely M1 ... M8.

Tip on previous devices

With previous versions of LOGO! the maximum number of blocks connected in series can be exceeded by adding memory bits to the program.

Initialization memory bit

Memory bit M8 is set during the first cycle of the user program. You can therefore use it in the program as initialization memory bit. After the first program cycle it is automatically reset.

In all subsequent cycles you can use memory bit 8 in the same way as memory bits M1 to M7 for setting, deleting and evaluation operations.

Note

The output signal of the memory bit is always that of the previous program cycle. The value does not change within the same program cycle.

Levels

Voltage levels are designated **hi** and **lo**. A constant block status of “1” = hi or “0” = lo is achieved via input of a fixed level or constant hi or lo value.

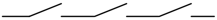
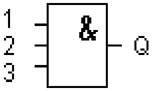
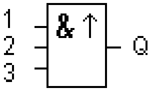
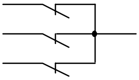
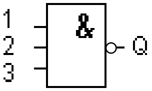
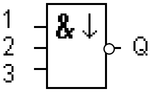
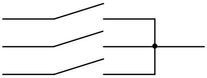
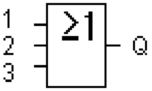
Open connectors

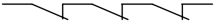
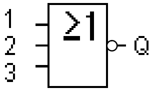
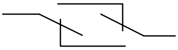
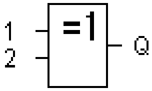
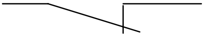
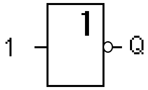
Block pins not connected are symbolized with an **x**.

4.2 List of basic functions – BF

Basic functions represent a simple Boolean algebra logic.

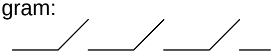
When programming a circuit, you can find the basic function blocks in the BF list. In the last column you can locate the position of every basic function by scrolling through the BF list per ▼ key from top to bottom. Here are the available basic functions:

View in the circuit diagram	View in LOGO!	Designation of the basic function	Position in the BF
 Series circuit n.o. contact		AND (see page 87)	1
		AND with edge triggering (see page 87)	7
 Parallel circuit n.c. contact		NAND (AND not) (see page 88)	4
		NAND with edge triggering (see page 89)	8
 Parallel circuit n.o. contact		OR (see page 87)	2

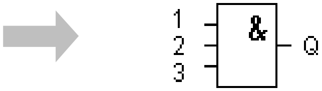
View in the circuit diagram	View in LOGO!	Designation of the basic function	Position in the BF
 Series circuit n.c. contact		NOR (OR not) (see page 90)	5
 Double change-over contact		XOR (exclusive OR) (see page 91)	6
 n.c. contact		NOT (negation, inverter) (see page 91)	3

4.2.1 AND (AND)

Series connection of multiple make contacts in the circuit diagram:



Symbol in LOGO!:



The status of the AND output is 1 when **all** inputs are 1, that is, if they are closed.

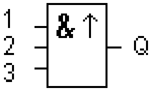
The status of a block input pin which is not connected (x) is: x = 1.

Table of the AND logic

1	2	3	Q
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

4.2.2 Edge–triggered AND

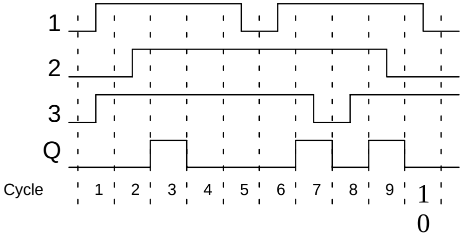
Symbol in LOGO!:



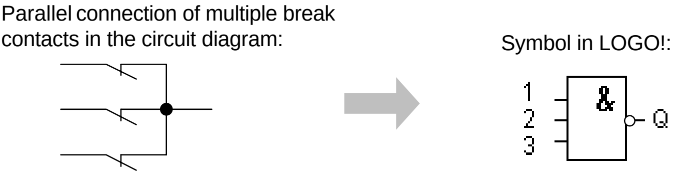
The output status of an edge–triggered AND is only 1 if **all** inputs are 1, and if **at least one** input was 0 in the previous cycle.

The status of a block input pin which is not connected (x) is: x = 1.

Timing profile for the edge–triggered AND



4.2.3 NAND (AND not)


Parallel connection of multiple break contacts in the circuit diagram:
Symbol in LOGO!:
1
2
3
&
Q

The output status of the NAND is only 0 if **all** inputs are 1, that is, if the contacts are closed.

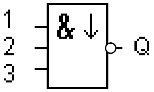
The status of a block input pin which is not connected (x) is: x = 1.

Table of the NAND logic

1	2	3	Q
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

4.2.4 NAND With Edge Evaluation

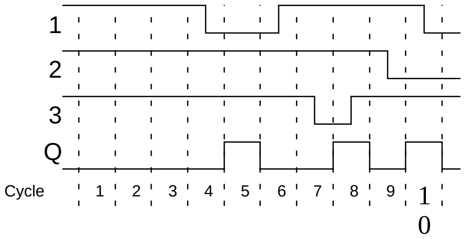
Symbol in LOGO!:



The output status of the NAND with edge evaluation is only 1 if **at least one** input is 0 and if **all** inputs were 1 in the previous cycle.

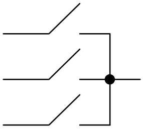
The status of a block input pin which is not connected (x) is: x = 1.

Timing profile for the NAND with edge evaluation

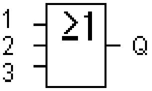


4.2.5 OR (OR)

The parallel connection of multiple make contacts in a circuit diagram:



Symbol in LOGO!:



The output status of the OR is only 1 if **at least one** input is 1, that is, if one of the contacts is closed.

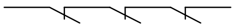
The status of a block input pin which is not connected (x) is: x = 0.

Table of the OR logic

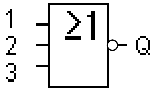
1	2	3	Q
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

4.2.6 NOR (OR not)

The series connection of multiple break contacts in the circuit diagram:



Symbol in LOGO!:



The output status of the NOR is only 1 if **all** inputs are 0, that is, if switched off. The NOR output is set to 0 at the 0 to 1 transition at one of the inputs.

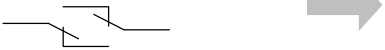
The status of a block input pin which is not connected (x) is: x = 0.

Table of the NOR logic

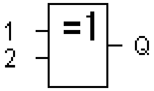
1	2	3	Q
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

4.2.7 XOR (exclusive OR)

The XOR in the circuit diagram as 2 changeover contacts connected in series:



Symbol in LOGO!:



The output status of the XOR is 1 if the inputs are **non-equivalent** .

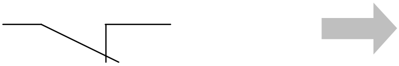
The status of a block input pin which is not connected (x) is: x = 0.

Table of the XOR logic

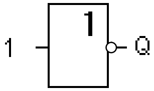
1	2	Q
0	0	0
0	1	1
1	0	1
1	1	0

4.2.8 NOT (Negation, Inverter)

A break contact in the circuit diagram:



Symbol in LOGO!:



The output status is 1 if the input is 0. The NOT block is an input status inverter.

The advantage of the NOT is, for example: For the LOGO! you do not need break contacts anymore. You simply use a make contact and convert it with the NOT into a break contact.

Table of the NOT logic

1	Q
0	1
1	0

4.3 Basics on special functions

At first sight, the special functions differ from the basic functions because of their different input designation. Special functions include timer functions, retentivity and diverse parameter assignment options for customizing the program.

In this section we should like to give you a brief overview of the input designations and of special basics relating to special functions. The special functions in particular are described in Chapter 4.4.

4.3.1 Designation of the inputs

Logical inputs

Here you find the description of the connections which can be linked to other modules or inputs of the LOGO! device.

- **S (set):**
  Input S can be used to set the output to “1”.
- **R (reset):**
  The reset input R has priority over all other inputs; it switches the outputs to “0”.
- **Trg (trigger):**
  This input is used to trigger the start of a function cycle.
- **Cnt (count):**
  This input is used to capture count pulses.
- **Fre (frequency):**
  Frequency signals to be evaluated are input with this designation.
- **Dir (direction):**
  This input, for example, determines the direction of count.
- **En (enable):**
  This input enables the block functions. When this input is “0”, the block ignores all other signals.
- **Inv (invert):**
  The output signal of the block is inverted when this input is set.
- **Ral (reset all):**
  All internal values are reset.

Connection X at the inputs of the special functions

The inputs of the special functions are 0 when connected to the connection ”x”. That is, the inputs are ’lo’.

Parameter inputs

To some of the inputs you do not apply signals, but rather assign specific values to the function block.

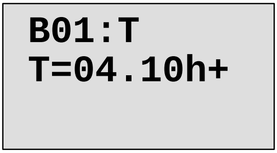
- **Par (parameter):**
  This input is not wired. Here, you configure the block parameters.
- **T (time):**
  This input is not wired. Here you configure the times for a block.
- **No (cam):**
  This input is not wired. Here, you configure the time patterns.
- **P (priority):**
  This input is not wired. Here, you specify priorities and determine whether or not a message must be acknowledged in RUN mode.

4.3.2 Time Response

Parameter T

With some of the special functions it is possible to configure a time value T. When specifying the time, please note that the values to be entered depend on the set timebase:

Timebase	_ _ : _ _
s (seconds)	seconds : $^1/_{100}$ seconds
m (minutes)	minutes : seconds
h (hours)	hours : minutes



```
B01:T
T=04.10h+
```

Setting the time T to 250 minutes:

Unit in hours h:

04.00 hours	240 minutes
00.10 hours	+10 minutes
=	250 minutes

Note

Always specify a time T ≥ 0.10 s. The time T is not defined for T = 0.05 s and T= 0.00 s.

Accuracy of T

All electronic components have slightly different parameters. This can cause deviations in the configured time T. With the LOGO! the maximum deviation is ± 0.02 %.
If 0.02 % of time T is smaller than 0.1 seconds the maximum deviation is 0.1 seconds.

Example:

The maximum deviation for 1 hour (3600 seconds) is ± 0.02 %, that is, ± 0.72 seconds.
The maximum deviation for 1 minute (60 seconds) is ± 0.1 seconds.

Timer switch accuracy

In order to prevent inaccuracies of clock timing in the C–versions as a result of this deviation, the timer switch is continuously compared with a highly accurate timebase and readjusted. This results in a maximum timing deviation of ±5 s/day.

4.3.3 Buffering The Clock

The internal clock of a LOGO! continuous operation even on power failure, that is, the clock is buffered. The duration of this buffering is influenced by the ambient temperature. At an ambient temperature of 25°C the buffering time is normally 80 hours.

4.3.4 Retentivity

For special functions there is a possibility to keep circuit states and counter values retentive. This, however, requires that retentivity is enabled for the respective functions. An exception is the principally retentive operating hours meter. See also Chapter 6.1 on the description of modules.

4.3.5 Parameter Protection

In the parameter protection configuration you can specify whether the parameters can be displayed and edited in LOGO! parameter assignment mode . There are two optional configurations:

+: The parameter configuration can be displayed and edited in parameter assignment mode, too.
–: The parameter configuration cannot be displayed in parameter assignment mode. Editing is only possible in programming mode. See the example on page 67.

4.3.6 Gain and Offset Calculation With Analog Values

The gain and offset parameters can be used to adjust the internal image of an analog value to the actual measurement value.

Characteristic quantity	Minimum	Maximum
Terminal voltage (in V)	0	≥ 10
Internal value	0	1000
Gain (in %)	0	1000
Offset	–999	+999

The terminal voltage (at input AI) of 0 to 10 V is mapped internally to values from 0 to 1000. A terminal voltage higher than 10 V is mapped internally by the value 1000.

With the gain parameter, for example, you can achieve an amplification of 1:10 at a setting of 1000 %.

The offset parameter can be used to shift the zero of measurement values.

Formula

Displayed value **Ax** = (Internal value + Offset) · Gain / 100
The gain value displayed is the amplification as %–age. Hence, the division by 100 in the formula.

Example of analog values

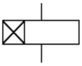
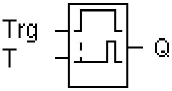
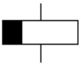
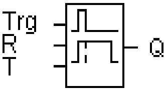
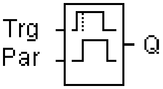
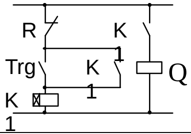
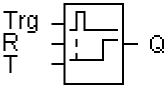
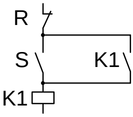
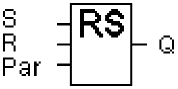
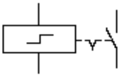
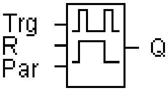
Measurement value	Voltage (V)	Internal value	Offset	Gain	Displayed value (Ax)
	0	0	0	1	0
	5	500	0	1	5
	10	1000	0	1	10
	0	0	0	100	0
	5	500	0	100	500
	10	1000	0	100	1000
	0	0	0	1000	0
	5	500	0	1000	5000
	10	1000	0	1000	10000
	0	0	500	1	5
	5	500	500	1	10
	10	1000	500	1	15
	0	0	500	100	500
	5	500	500	100	1000
	10	1000	500	100	1500
	0	0	–200	100	–200
	5	500	–200	100	300
	10	1000	–200	100	800
	0	0	–999	1000	–9990
	10	1000	999	1000	19990
	0,02	2	0	1	0
	0,02	2	0	10	0
	0,02	2	0	100	2
	0,02	2	0	1000	20
–30° C	0	0	–300	10	–30
0° C	3	300	–300	10	0
+70° C	10	1000	–300	10	70

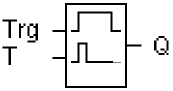
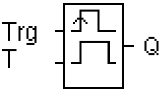
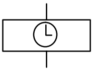
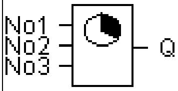
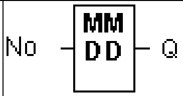
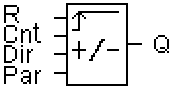
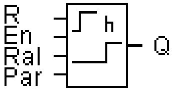
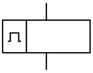
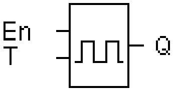
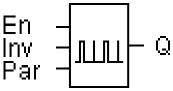
You can find an a sample application in the description of the special function “Analog comparator” on page 138.

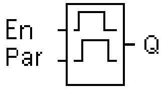
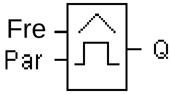
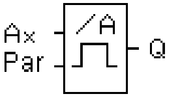
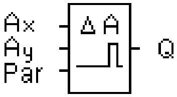
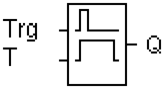
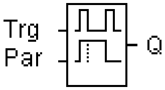
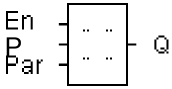
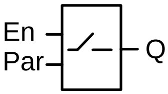
For information on analog inputs also refer to Chapter 4.1.

4.4 List of Special Functions – SFr

When programming in LOGO!, you can find the blocks for the special functions in the SF list. In the table below you can also find comparable views of circuit diagrams as well as the information whether or not retentivity can be configured for the respective function. In the last column you can locate the position of all SFs by scrolling through the list via the ▼ key.

Display in the circuit diagram	Display in LOGO!	Designation of the special function	Re	Position in SF
		On delay (see page 101)		1
		Off delay (see page 103)		2
		On/off delay (see page 105)		14
		Retentive on delay (see page 107)		7
		Latching relay (see page 109)	Re	5
		Pulse relay (see page 111)	Re	3

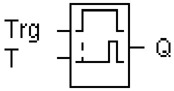
Display in the circuit diagram	Display in LOGO!	Designation of the special function	Re	Posi-tion in SF
		Wiping relay (see page 112)		9
		Edge triggered wiping relay (see page 114)		18
		Weekly timer switch (see page 115)		4
		Yearly timer switch (see page 120)		13
		Up/down counter (see page 122)	Re	10
		Operating hours meter (see page 124)		8
		Symmetric clock generator (see page 128)		6
		Asynchronous pulse generator (see page 130)		12

Display in the circuit diagram	Display in LOGO!	Designation of the special function	Re	Position in SF
		Random generator (see page 131)		15
		Frequency trigger (see page 133)		11
		Analog trigger (see page 135)		20
		Analog comparator (see page 138)		21
		Stairway lighting switch (see page 141)		16
		Comfort switch (see page 143)		17
		Message texts (see page 145)		19
		Softkey (see page 148)	Re	22

4.4.1 On Delay

Short description

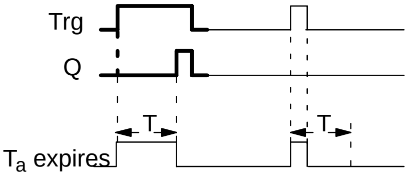
An output with on delay is not switched on until a specified time has expired.

Symbol in LOGO!	Wiring	Description
	Input Trg	Use input Trg (Trigger) to start the on delay time
	Parameter T	T is the time after which the output is switched (0 to 1 transition of the output signal).
	Output Q	Q is switched on when a specified time T has expired, provided Trg is still set.

Parameter T

Please not the value specification for parameter T in Chapter 4.3.2.

Timing diagram



The section of the timing diagram displayed in bold print is found again in the symbol for the on delay.

Description of the function

On 0 to 1 transition of input Trg the time T_a starts (T_a is the current time in LOGO! .

If the status of input Trg is 1 at least for the duration of the configured time T, the output is set to 1 on expiration of this time (the output follows the input with on delay).

The time is reset if the status of input Trg changes to 0 before the time T has expired.

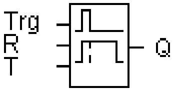
The output is set to 0 when the status at input Trg is 0.

The time elapsed is reset after a power failure.

4.4.2 Off Delay

Short description

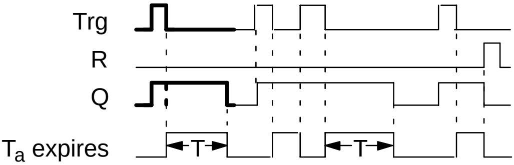
The output is not reset until a configured time has expired.

Symbol in LOGO!	Wiring	Description
	Input Trg	You start the off delay at the negative edge (1 to 0 transition) at input Trg (Trigger)
	Input R	Input R resets the on delay time. It also resets the output to 0.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg. It holds this state until T has expired.

Parameter T

Please not the value specification for parameter T in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the off delay.

Description of the function

When the status of Trg has changed to 1, the output Q is switched instantaneously to 1.

The actual time T_a in LOGO! restarts on a 1 to 0 transition at Trg. The output remains set. When T_a reaches the configured value T (T_a=T), output Q is reset to 0 (off delay).

The time T_a restarts when input Trg is switched on and off again.

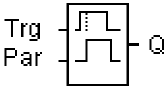
Input R (Reset) is used to reset the time T_a and the output before T_a has expired.

The time elapsed is reset after a power failure.

4.4.3 On/Off Delay

Short description

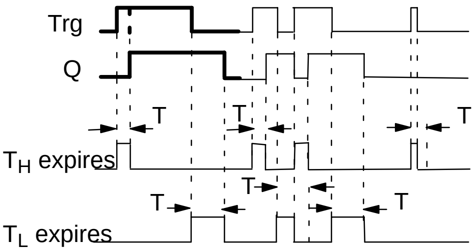
An output with on/off delay is set and reset on expiration of specified times.

Symbol in LOGO!	Wiring	Description
	Input Trg	The positive edge (0 to 1 transition) at input Trg (Trigger) starts the time T_H for the on delay. The negative edge (1 to 0 transition) at input Trg (Trigger) starts the time T_L for the off delay.
	Parameter Par	T_H is the time after which the output is switched on (0 to 1 transition of the output signal). T_L is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	On expiration of the configured time T_H, output Q is switched on provided Trg is still set. On expiration of the time T_L it is switched off, provided Trg was not set again.

Parameter T_H and T_L

Note the value specifications for the parameters T_H and T_L in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the off delay.

Description of the function

The time T_H starts after a 0 to 1 transition at input Trg.

If the status at input Trg is 1 at least for the duration of the time T_H, the output is set to 1 on expiration of the time T_H (the output follows the input on delayed).

The time is reset if input Trg changes to 0 before the time T_H has expired.

Time T_L starts when the status at input Trg returns to 0.

If the status at input Trg is 0 at least for the duration of T_L, the output is set to 0 on expiration of the time T_L (the output follows the input off delayed).

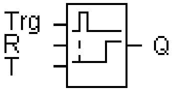
The time is reset if the status at input Trg returns to 1 before the time T_L has expired.

The time elapsed is reset after a power failure.

4.4.4 Retentive On Delay

Short description

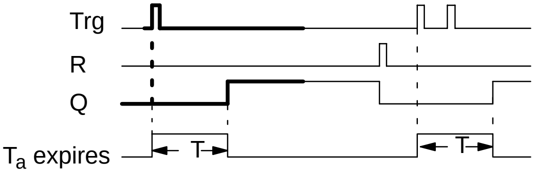
A specified time starts after an input pulse. The output is set on expiration of this time.

Symbol in LOGO!	Wiring	Description
	Input Trg	You start the on delay at the negative edge (1 to 0 transition) at input Trg (Trigger).
	Input R	Use the input R to reset the on delay time and the output.
	Parameter T	T is the time after which the output is switched on (output transition 0 to 1).
	Output Q	On expiration of the time T output Q is switched on.

Parameter T

Note the value specifications in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the retentive on delay.

Description of the function

The current time T_a starts at the 0 to 1 transition at input Trg. Output Q is set to 1 when T_a = T. Further switching actions at input Trg have no influence on T_a.

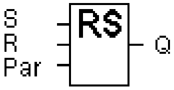
The output and the time T_a are only reset to 0 when the status at input R is 1.

The time elapsed is reset after a power failure.

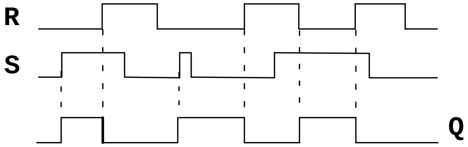
4.4.5 Latching Relay

Short description

Input S sets output Q. Input R resets output Q.

Symbol in LOGO!	Wiring	Description
	Input S	Use input S to set output Q to 1.
	Input R	Use input R to reset output Q to 0 again. If both S and R are 1, the output is reset.
	Parameter Par	This parameter can be used to switch retentivity on and off. Ret: off = no retentivity on = the status is retentive
	Output Q	Q is switched on with a signal at input S. This state is maintained until input R is set.

Timing diagram



Switching behavior

A latching relay is a simple logic memory. The output value depends on the input states and on the previous output status. The following table shows the logic once again:

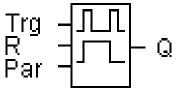
S_n	R_n	Q	Comment
0	0	x	The status is retentive
0	1	0	Reset
1	0	1	Set
1	1	0	Reset (has priority over Set)

With enabled retentivity the status of the output signal does not change when power is returned after power failure.

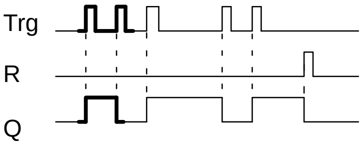
4.4.6 Pulse Relay

Short description

A short one–shot at the input is used to set and reset the output.

Symbol in LOGO!	Wiring	Description
	Input Trg	You use input Trg (Trigger)to switch the output Q on and off.
	Input R	The input R is used to reset the output and the relay.
	Parameter Par	This parameter can be used to switch retentivity on and off. Ret: off = no retentivity on = the status is retentive
	Output Q	Q is switched on with Trg and off again with the next Trg.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the pulse relay.

Description of the function

Output Q status is toggled at every 0 to 1 transition of the status at input Trg, that is, the output is switched on or off.

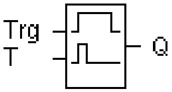
Use input R to reset the pulse relay to initial state, that is, the output is set to 0.

After a power failure the pulse relay is reset and the output Q is set to 0 if you have not enabled retentivity.

4.4.7 Wiping Relay – Pulse Output

Short description

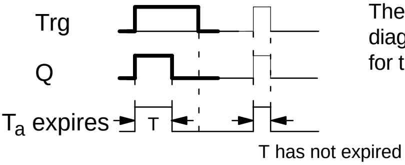
An input signal generates a signal of specified length at the output.

Symbol in LOGO!	Wiring	Description
	Input Trg	You use input Trg (Trigger) to start the time for the wiping relay.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg as long as the time Ta expires and the input is set to 1.

Parameter T

For information on the parameter T refer to the note in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the wiping relay.

Description of the function

The output status is switched to 1 after the input Trg is set to 1. The time T_a is started at the same time and the output remains set.

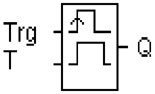
When T_a reaches the value specified in T (T_a=T), the status of output Q is reset to 0 (pulse output).

On input Trg transition from 1 to 0 before the specified time has expired, the output follows immediately with a 1 to 0 transition.

4.4.8 Edge–triggered Wiping Relay

Short description

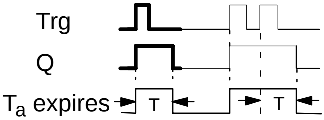
An input signal generates an output signal of specified length (retriggering).

Symbol in LOGO!	Wiring	Description
	Input Trg	Use the input Trg (Trigger) to start the time for the edge–triggered wiping relay.
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output signal).
	Output Q	Q is switched on with Trg. It holds this state until T has expired.

Parameter T

For information on the parameter T refer to the note in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the edge–triggered wiping relay.

Description of the function

The output status is switched to 1 after the input Trg is set to 1. Time T_a is started at the same time. After T_a has reached the value specified in T (T_a=T) the output Q status is reset to 0 (pulse output).

The time T_a is reset if input Trg changes again from 0 to 1 (retriggering) before the specified time has expired. The output remains switched on.

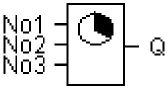
4.4.9 Weekly Timer Switch

Short description

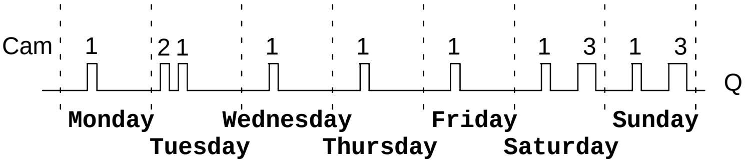
The output is controlled via a specified on–/off–date. The function supports any combination of weekdays. You select the active weekdays by hiding the inactive days.

Note

The LOGO! 24 version does not have an internal clock. Therefore, the weekly timer switch cannot be used for this version.

Symbol in LOGO!	Wiring	Description
	The parameters Cam 1, Cam 2 Cam 3	In the Cam parameter you set the on–/off–time respectively for one **Cam** of the weekly timer switch. Here you configure the days and the time–of–day.
	Output Q	Q is switched on when the configured cam is switched on.

Timing diagram (three examples)



Cam1:	Daily:	06:30 h to 08:00 h
Cam 2:	Tuesday:	03:10 h to 04:15 h
Cam 3:	Saturday and Sunday:	16:30 h to 23:10 h

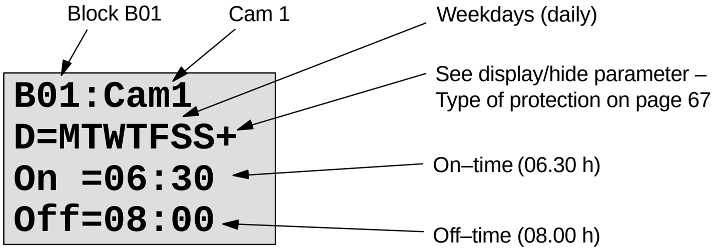
Description of the function

Every weekly timer switch has three cams. You can configure in a time hysteresis for each cam. In the cam setting you specify the on–/off–times. At the on–time, the weekly timer switch switches on the output, if the output is not already switched on.

At the off–time, the weekly timer switch switches off the output, if the output is not already switched off. The on– and off–times are in conflict if their specified switching time is the same for the weekly timer switch, but on different cams. In this case cam 3 has priority over cam 2, whereas cam 2 has priority over cam 1.

Parameter assignment screen form

This is what a parameter assignment screen form looks like, for instance, for cam no.1:



```
B01:Cam1
D=MTWTFSS+
On =06:30
Off=08:00
```

Weekday

The letters behind the “D=” have the following meaning:

- M : Monday
- T : Tuesday
- W : Wednesday
- T : Thursday
- F : Friday
- S : Saturday
- S : Sunday

An upper case letter means that the weekday is selected. The character “–” means that the weekday is not selected.

Switching times

Possible is any time between 00:00 h and 23:59 h.
—:— means there are no on– and off–times.

Setting the weekly timer switch

This is how you specify the switching times:

1. Position the cursor on one of the Cam parameters of the timer switch (e. g. Cam 1).
2. Confirm with **OK**. LOGO! opens the parameter assignment screen form for the cam. The cursor is positioned on the weekday.
3. Use ▲ and ▼ to select one or several weekdays.
4. Use ▶ to move the cursor to the first position of the on–time.
5. Set the on–time.
   Modify the value at the respective position, using the keys ▲ and ▼. Move the cursor around to the various positions, using the keys ◀ and ▶. You can only select the value —:— at the first position
   (—:— means: no switching operation).
6. Using the key ▶ , move the cursor to the first position of the off–time.
7. Set the off–time (in same way as in step 5).
8. Confirm your entries Confirm with **OK**.

   The cursor is positioned on the Cam 2 parameters. You can now configure another cam.

Note

You can find information on timer switch accuracy in the Technical Data and in Chapter 4.3.2.

Weekly timer switch: Example

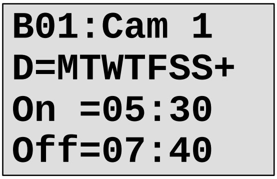
The output of the weekly timer switch is to be switched on daily from 05:30 h to 07:40 h. The output should also be switched on every Tuesday from 03:10 h to 04:15 h and at the weekends from 16:30 h to 23:10 h.

This requires three cams.

Here are the parameter assignment screen forms of the cams 1, 2 and 3, based on the timing diagram above.

Cam 1

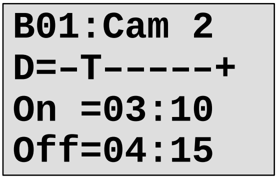
Cam 1 must switch on the output of the weekly timer switch daily from 05:30 h to 07:40 h.



```
B01:Cam 1
D=MTWTFSS+
On =05:30
Off=07:40
```

Cam 2

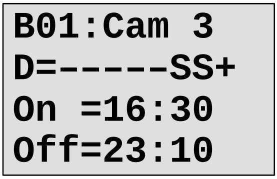
Cam 2 must switch on the output of the weekly timer switch every Tuesday from 03:10 h to 04:15 h.



```
B01:Cam 2
D=-T-----+
On =03:10
Off=04:15
```

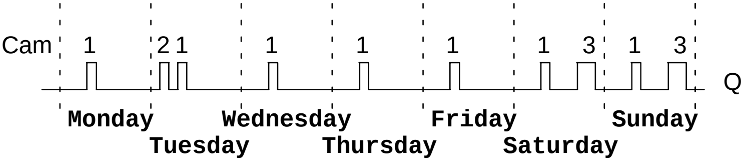
Cam 3

Cam 3 must switch on the output of the weekly timer switch every Saturday and Sunday from 16:30 h to 23:10 h.



```
B01:Cam 3
D=-----SS+
On =16:30
Off=23:10
```

Result



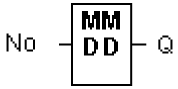
4.4.10 Yearly Timer Switch

Short description

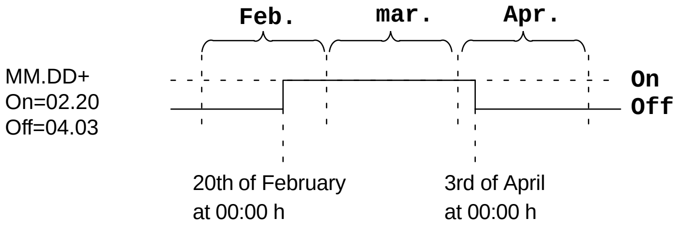
The output is controlled via a specified on–/off–date.

Note

The LOGO! 24 version does not have a clock. Therefore, the yearly timer switch cannot be used for this version.

Symbol in LOGO!	Wiring	Description
	input Cam	In the Cam parameters, you configure the on–/off–times for the cams of the yearly timer switch.
	Output Q	Q is switched on when the configured cam is switched on.

Timing diagram

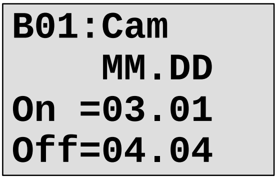


Description of the function

At the specified on–time the yearly timer switch switches on the output. At the specified off–time the yearly timer switch switches off the output. The off–date specifies the day on which the output is reset to 0 again. The first value identifies the months, the second value the day.

Sample configuration

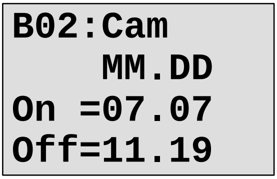
On 1st of March the output of a LOGO! is to be switched on until the 4th of April. On 7th of July it is switched on once again until the 19th of November. This requires two yearly timer switches for which the respective on times must be configured. The outputs are then linked via an OR block.



```
B01:Cam
    MM.DD
On =03.01
Off=04.04
```

on–time 1st of march

off–time 4th of April



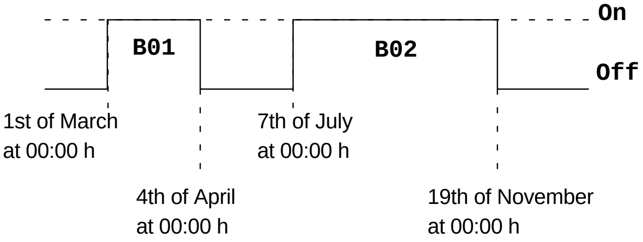
```
B02:Cam
    MM.DD
On =07.07
Off=11.19
```

in addition:

on–time 7th of July

off–time on 19th of November

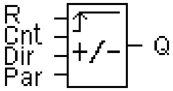
Result



4.4.11 Up/Down Counter

Short description

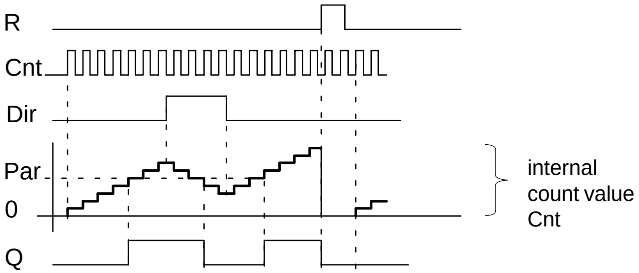
Depending on the configuration, an internal value is counted up or down at every input pulse. The output is set when the configured count value is reached. A special input can be used to change the counting direction.

Symbol in LOGO!	Wiring	Description
	Input R	Input R resets the internal count value and the output to zero.
	Input Cnt	The counter counts the 0 to 1 transitions at input Cnt. 1 to 0 transitions are not counted. Maximum counting frequency at the input terminals: 5 Hz

	Input Dir	You specify the counting direction via the input Dir:
		Dir = 0: Up–count
		Dir = 1: Down–count

	Parameter Par	Lim: Counter value limit at which the output is reset by the internal count value. Ret: Enabling retentivity
	Output Q	Q is switched on when the count value is reached.

Timing diagram



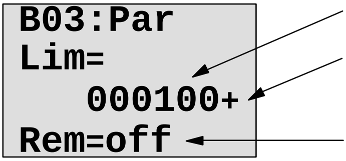
Description of the function

With every positive edge at input Cnt the internal counter increments (Dir = 0) or decrements (Dir = 1) by one count.
.

Output Q is set to 1 when the internal value is greater than or equal to the value specified in Par.

You can use reset input R to reset the output and the internal count value to ’000000’. When R=1, the output is 0 and the pulses at input Cnt are not counted.

Configuration of the Par parameter



```
B03:Par
Lim=
   000100+
Rem=off
```

Count value

See display/hide parameter – Type of protection on page 67

Retentivity

The output is set when the internal value is greater than or equal to the value specified in Par. The counter stops on over/underflow.

Lim can lie between 0 and 999999.
Ret: This parameter is used to switch retentivity on and off for the internal count value Cnt.

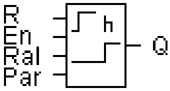
off = no retentivity
on = the count value Cnt is retentive

When retentivity is switched on, the counter value is maintained in the event of power failure. The count is resumed at the same value after power is returned .

4.4.12 Operating Hours Counter

Short description

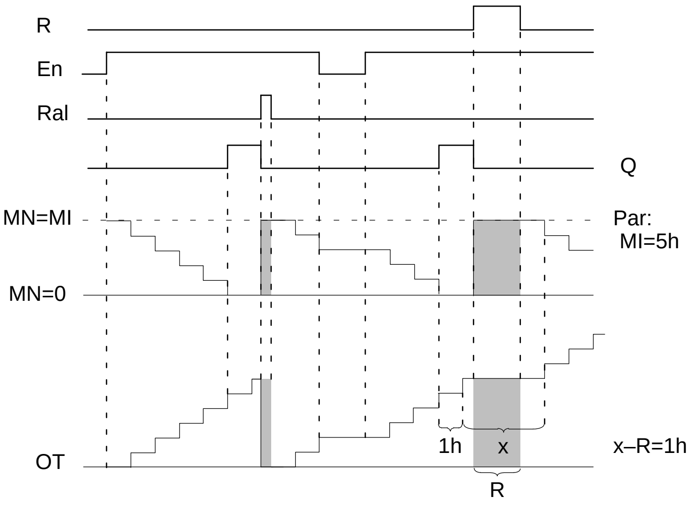
A specified time starts when the input is set. The output is set on expiration of this time.

Symbol in LOGO!	Wiring	Description
	Input R	**R = 0:** Counting is enabled if Ral is not 1 **R = 1:** Counter has stopped Use input R to reset the output. The time–to–go for the maintenance interval MN is set to the value MN = MI. The time elapsed is maintained.
	Input En	En is the monitoring input. LOGO! measures the time when this input is set.
	Input Ral	**Ral = 0:**Counting is enabled if Ral is not 1 **Ral = 1:** The counter has stopped Use input Ral (Reset all) to reset the counter and the output. That is, • output Q = 0, • measured operating time OT = 0 and • the time–to–go of the maintenance interval MN = MI.

Symbol in LOGO!	Wiring	Description
	Parameter Par: MI	**MI:** maintenance interval to be specified, in hour units. MI can lie between 0 and 9999 hours.
	Output Q	The output is set when the time–to–go MN = 0 (see the timing diagram).

MI = configured count value
MN= time–to–go
OT= total time elapsed since the last 1 signal at the Ral input

Timing diagram



▨ The counter holds when R or Ral is set

MI = configured time interval
MN = time–to–go
OT = total time elapsed since the last 1 signal at the Ral–input

Description of the function

The hours counter monitors the input En. As long as the status of this input is 1, LOGO! determines the time expired and the time–to–go MN. The LOGO! displays the times in parameter assignment mode. Output Q is set to 1 when the time–to–go MN = 0.

Use input R to reset output Q and time–to–go counter to the specified value MI. The internal counter OT continues the count.

Use input Ral to reset output Q and the time–to–go counter to the specified value MI. The internal counter OT is reset to 0.

Viewing MN and OT values

- LOGO! Basic with display: In parameter assignment mode you can view the actual values of MN and OT while the program is running.
- LOGO! Basic without display: with LOGO!Soft Comfort (refer to Chapter 7 for additional information) you can read the values as follows.

Note

The PC link must be connected to the LOGO! **before** you switch on the power supply. .

1. In the “Extras transfer” menu, select the menu item “Hours counter”. A connection is automatically established to the LOGO! and the current program is fetched.
2. An Info box pops up showing the data.

Note

The hours counter can be fetched without entering a password.

If your LOGO! without display is equipped with a red module you cannot fetch the hours counter, because the program of the LOGO! will be deleted when you remove the module (to connect the PC cable) .

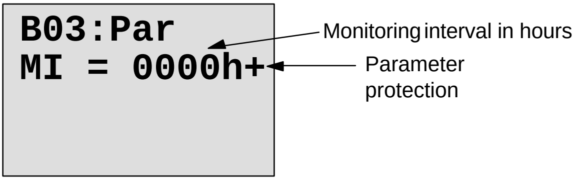
Limit value for OT

Elapsed operating hours are saved in OT when using the input R signal to reset the hours counter. The limit value for the OT counter is 99999 h.

When the hours counter reaches this value, no more hours are counted.

The OT value ensures retentivity of the hours counter.

Configuration of the Par parameter



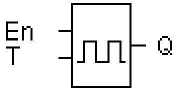
```
B03:Par
MI = 0000h+
```

MI is the specified time interval. It can lie between 0 and 9999.

4.4.13 Symmetric Clock Generator

Short description

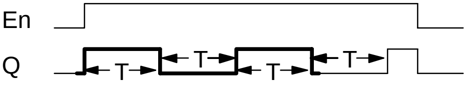
The period of the output clock signal is configurable.

Symbol in LOGO!	Wiring	Description
	Input En	Use the input En to switch the clock generator on and off.
	Parameter T	T is the time during which the output is switched on or off.
	Output Q	Q is toggled periodically depending on the clock cycle time T.

Parameter T

Note the value specifications in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the symmetric clock generator.

Description of the function

In parameter T you specify the length of the on and off times. Via input En (Enable) you can switch on the clock generator, that is, the generator toggles the output between 1 and 0, respectively for the duration of the time T, until the input status is 0 again.

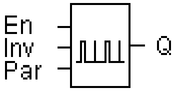
Note relating to relay outputs:

The output contacts of a relay wear slightly when switched under load. You can find information on the number of switching cycles an output of a LOGO! can safely carry out in the Chapter ’Technical Data’ (see Chapter A).

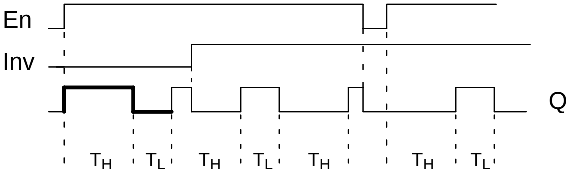
4.4.14 Asynchronous Pulse Generator

Short description

The pulse profile of the output can be customized via pulse/pause ratio.

Symbol in LOGO!	Wiring	Description
	Input En	You can use input EN to switch the asynchronous pulse generator on and off.
	Input INV	You can use input INV to invert the output signal of the active asynchronous pulse generator.
	Parameter Par	You can customize the period T_H and the pulse pause width T_L.
	Output Q	Q is toggled periodically, depending on the clock cycles T_H and T_L.

Timing diagram



Description of the function

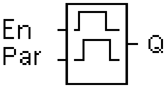
In the parameters T_H (Time High) and T_L (Time Low) you can adjust the period and the pause width.

With input INV you can also invert the output. The input block INV only negates the output if it is enabled via EN.

4.4.15 Random Generator

Short description

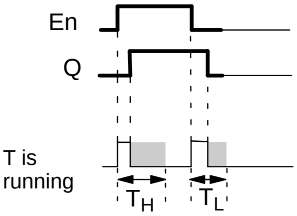
With a random generator the output is switched on and off again within a specified time.

Symbol in LOGO!	Wiring	Description
	Input En	You can start the on delay time of the random generator at the positive edge (0 to 1 transition) at the enable input En. You can start the off delay time of the random generator at the negative edge (1 to 0 transition).
	Parameter Par	The random on delay time is 0 s to T_H. The random on delay time is 0 s to T_L.
	Output Q	On expiration of the on delay time output Q is switched on, provided En is still set. On expiration of the off delay time it is switched off, provided En was not set again meanwhile.

Parameter T_H and T_L

Note the value specifications for the parameters T_H and T_L in Chapter 4.3.2.

Timing diagram



The bold printed section of the timing diagram is found again in the symbol for the off delay.

Description of the function

A random time (on delay) between 0 s and T_H is determined and started at the 0 to 1 transition of the status at input EN. The output is set to 1 on expiration of the on delay time, if the status at input En is 1 at least for the duration of the on delay time.

The time is reset if the status at input En returns to 0 before the on delay time has expired.

When the status at input En returns to 0, a random time (off delay) between 0s and T_L is determined and started.

The output is reset to 0 on expiration of the off delay time, if the status at input En is 0 at least for the duration of the off delay time.

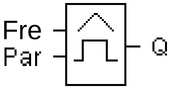
The time is reset if the status at input En returns to 1 before the on delay time has expired.

The time elapsed is reset after a power failure.

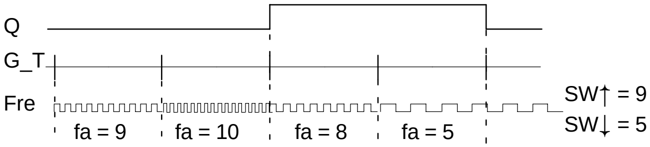
4.4.16 Frequency Threshold Trigger

Short description

The output is switched on and off, depending on two specified frequencies.

Symbol in LOGO!	Wiring	Description
	input Fre	At input Fre you connect the input that supplies the pulses to be counted. Use • inputs I5/I6 for fast counting operations (only LOGO! 12/24 RC/RCo and LOGO! 24): max. 1 kHz. • any other input or circuit component for counting low frequencies.
	Parameter Par: SW↑, SW↓ G_T	SW↑: on threshold SW↓: off threshold G_T: Time interval or gate time during which the pulses are measured.
	Output Q	Q is switched on and off depending on SW↑ and SW↓.

Timing diagram

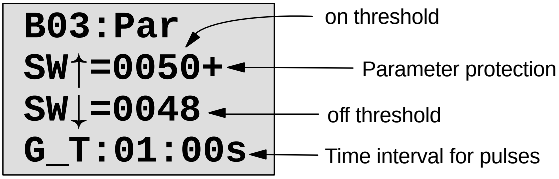


Description of the function

The threshold switch measures the signals at input Fre. The pulses are captured across a specified period G_T. Output Q is switched on if the value measured within the time G_T is **higher** then the on and off threshold.

Q is switched off again when the measured pulse rate is **equal to/lower than** the off threshold value.

Configuration of the Par parameter



```
B03:Par
SW↑=0050+
SW↓=0048
G_T:01:00s
```

SW↑ is the on threshold. The permitted range is 0000 to 9999.

SW↓ is the off threshold. The permitted range is 0000 to 9999.

G_T is the time interval during which the pulses at the Fre input are measured. The permitted range for G_T is 00.05 s to 99.95 s.

Note

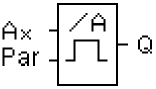
When you specify a time G_T of 1 s, the LOGO! returns the current frequency in parameter f_a in Hz.

f_a is always the sum of the measured pulses per time unit G_T.

4.4.17 Analog Threshold Switch

Short description

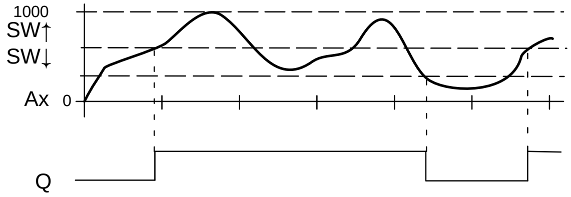
The output is switched on when the analog value exceeds a specified on threshold. The output is switched on when the analog value drops below a specified off threshold (hysteresis).

Symbol in LOGO!	Wiring	Description
	Input Ax	At input Ax you apply the analog signal you want to evaluate. Always use the terminals I7 (AI1) or I8 (AI2), only the LOGO! 12/24 RC/RCo and LOGO! 24 or those of an analog module. 0–10 V is equivalent to 0–1000 (internal value).
	Parameter Par: ‡, †, SW†, SW↓	‡ : Gain in % range of values 0..1000 % † : Offset range of values ±999 SW†: on threshold range of values ±19990 SW↓: off threshold range of values ±19990
	Output Q	Q is set and reset depending on the thresholds.

Gain and offset parameters

Note the information relating to the gain and offset parameters in Chapter 4.3.6.

Timing diagram



Description of the function

This function fetches the analog value of a signal at the analog input (AI1 ,AI2...AI8).

The offset parameter is then added to the analog value. The result is multiplied by the gain parameter.

Since this is given as a %–age, the value 1000% for instance is equivalent to a multiplication by 10. See Chapter 4.3.6.

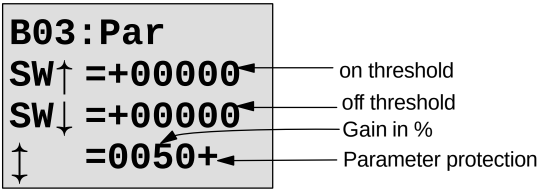
Output Q is set to 1 if this value exceeds the on threshold (**SW↑**).

Q is reset to 0 again after the value reaches or drops below the off threshold (**SW↓**).

Configuration of the Par parameter

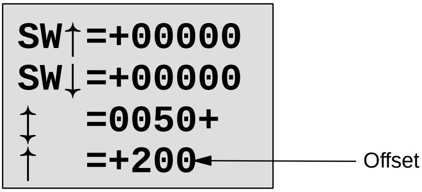
The gain and offset parameters are used to adapt the used sensors to the respective application.

Parameter assignment:



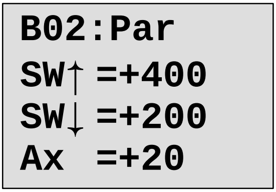
```
B03:Par
SW↑ =+00000
SW↓ =+00000
↕    =0050+
```

Press the key ►



```
SW↑=+00000
SW↓=+00000
↕   =0050+
↑   =+200
```

Display in parameter assignment mode (example):

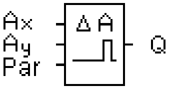


```
B02:Par
SW↑ =+400
SW↓ =+200
Ax  =+20
```

4.4.18 Analog Comparator

Short description

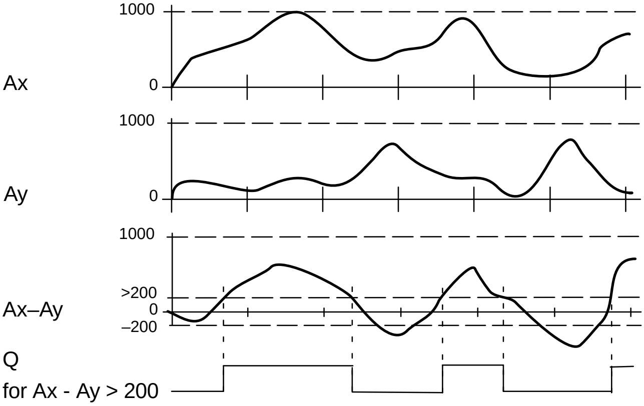
The output is switched on if the difference Ax – Ay exceeds the set threshold.

Symbol in LOGO!	Wiring	Description
	Inputs Ax and Ay	At the inputs Ax and Ay, apply the analog signals for which you want to evaluate the difference. Use the terminals I7 (AI1) and I8 (AI2), only the LOGO! 12/24 RC/RCo and LOGO! 24 or those of an analog module.
	Parameter Par: ‡, †, Δ	‡ : Gain in % range of values 0..1000 % † : Offset range of values ±999 Δ : threshold
	Output Q	Q is set to 1 if the difference Ax–Ay exceeds the threshold.

Gain and offset parameters

Note the information relating to the gain and offset parameters in Chapter 4.3.6.

Timing diagram



Description of the function

The analog comparator function carries out the following calculations:

1. The value configured in the offset parameter is added to Ax and Ay.
2. Ax and Ay are multiplied by the gain parameter. Since this is given as a %–age, the value 1000% for instance is equivalent to a multiplication by 10.
3. The function forms the difference of the analog values Ax–Ay

Output Q to 1 if this differential value exceeds the threshold you have configured under △ . Otherwise Q is reset to 0.

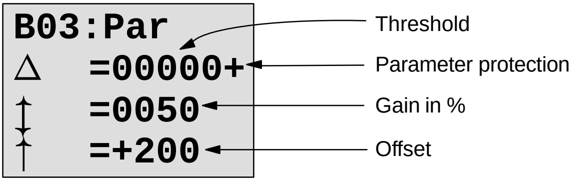
Calculation rules

Q = 1, if:

[(Ax + offset) · gain] – [(Ay + offset) · gain] > threshold

Configuration of the Par parameter

The gain and offset parameters are used to adapt the used sensors to the respective application.



```
B03:Par
△   =00000+
↕   =0050
↑   =+200
```

Example

For the controls of a heater, the supply and return line temperatures T_v (e.g. with a sensor at AI1) and T_r (e.g. with a sensor at AI2) are to be compared.

A switching operation is to be triggered (e.g. burner on) if the return line temperature deviates by more than 15 °C from the supply line temperature.

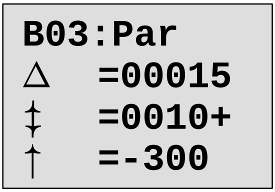
The physical temperature is to be displayed in parameter assignment mode.

Available are thermal elements with the following technical data: –30 to +70°C, 0 to 10 V DC.

Application	Internal mapping
–30 to +70 °C = 0 to 10V DC	0 to 1000
0 °C	300 → Offset = –300
Range of values: –30 to +70 °C = 100	1000 → Gain = 100/1000 = 0,1 = 10 %
Switching threshold = 15 °C	Threshold = 15

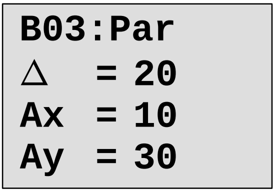
See also Chapter 4.3.6.

Parameter assignment:

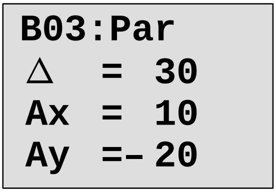


```
B03:Par
△   =00015
‡   =0010+
†   =-300
```

Display in parameter assignment mode (example):



```
B03:Par
△   = 20
Ax  = 10
Ay  = 30
```

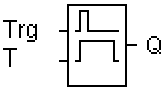


```
B03:Par
△   =  30
Ax  =  10
Ay  =– 20
```

4.4.19 Stairway Lighting

Short description

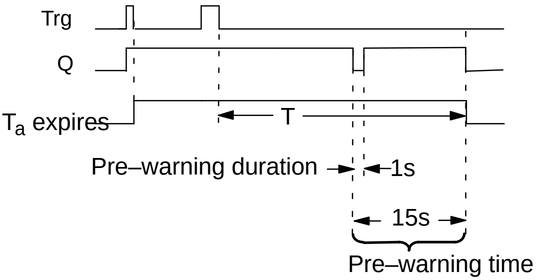
The input pulse (edge control) starts a specified time. The output is reset on expiration of this time. 15 s prior to the expiration of this time an off pre–warning is generated.

Symbol in LOGO!	Wiring	Description
	Input Trg	Use the input Trg (Trigger) to start the timer for the stairway lighting switch (off delay).
	Parameter T	T is the time after which the output is switched off (1 to 0 transition of the output status). Default timebase is the minute.
	Output Q	On expiration of the time T Q is switched off. 15 s prior to the expiration of this time the output is switched to 0 fro the duration of 1 s.

Parameter T

Note the value specifications in Chapter 4.3.2.

Timing diagram



Description of the function

The output Q is set to 1 on a 0 to 1 transition at input Trg. At the 1 to 0 transition of the status at input Trg the current time Ta starts. The output Q remains set.

15 s before T_a reaches the time T the output Q is reset to 0 for a time of 1 s.

When T_a = T, the output Q is reset to 0.

When input Trg is switched on and off again while T_a expires, T_a is reset (retriggering option).

The time elapsed is reset after a power failure.

How to change the timebase

You can also set other values for the pre–warning time and pre–warning period .

Timebase T	Pre–warning time	Pre–warning duration
Seconds*	750 ms	50 ms
minutes	15 s	1 s
hours	15 min	1 min

*Only feasible for programs with a cycle time < 25 ms

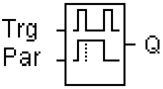
See also “Determining the cycle time” in Appendix B.

4.4.20 Multifunctional switch

Short description

Switch with two different functions:

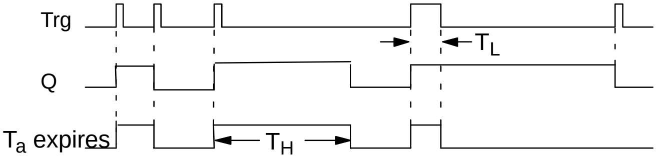
- Pulse switch with off delay
- Switch (continuous lighting)

Symbol in LOGO!	Wiring	Description
	Input Trg	Use input Trg (Trigger) to switch on the output Q (off delay or continuous lighting). The active output Q can be reset with Trg.
	Parameter Par	T_H is the time after which the output is switched off (1 to 0 transition of the output status). T_L is the period during which the input must be set in order to enable the continuous lighting function.
	Output Q	The output Q is switched on with Trg. Depending on the pulse width at the input Trg, it is switched off again on expiration of a specified time, or reset by setting Trg once again.

Parameter T_H and T_L

Note the value specifications in Chapter 4.3.2. (as a reminder: “Always specify a time T $\geq$ 0.10 s. The time T is not defined for T = 0.05 s and T= 0.00 s”)

Timing diagram



Description of the function

The current time T_a starts and the output Q is set to 1 at the 0 to 1 transition of the status at input Trg.

When T_a reaches the time T_H, the output Q is reset to 0.

The time elapsed is reset after a power failure.

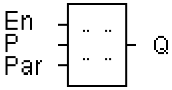
At the 0 to 1 transition of the status at input Trg and if the status ’1’ is set at least for the duration of the time T_L, the continuous lighting function is enabled and output Q is switched on continuously.

If the input is switched once again, Trg resets T_H nevertheless and the output Q is switched off.

4.4.21 Message Texts

Short description

Displaying a specified message text in RUN mode.

Symbol in LOGO!	Wiring	Description
	Input En	The 0 to 1 transition of the status at input En (Enable) starts the output of the message text.
	Parameter P	P represents the priority of the message text. Ack: Acknowledgment of the message text.
	Parameter Par	Par is the text for the message output.
	Output Q	Q is set as long as the message text is displayed.

Restriction

A maximum of five message text functions are possible.

Description of the function

On 0 to 1 transition of the status at input En the display shows in RUN mode your specified message text .

Acknowledgment disabled (Ack = Off):
On 1 to 0 transition of the status at input En the message text is hidden.

Acknowledgment enabled (Ack = On):
On a 1 to 0 transition of the status at input En, the message text is held until acknowledged with **OK**. When En is 1, you cannot acknowledge the message text.

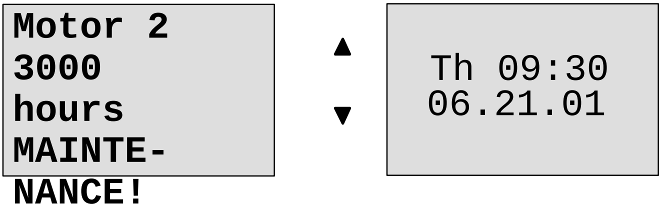
When multiple message text functions are triggered with En=1, the message text with the highest priority is shown (0=lowest, 9=highest).

You can toggle between the standard display and the message text display using the keys ▲ and ▼ .

Example

This is how a message text might be displayed:

En=1



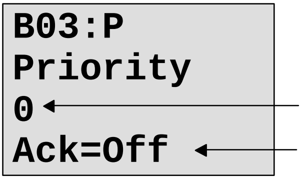
```
Motor 2
3000
hours
MAINTE-
NANCE!
```

▲ ▼

```
Th 09:30
06.21.01
```

Parameter assignment screen form

This is how to configure the priority and the acknowledgment:



```
B03:P
Priority
0
Ack=Off
```

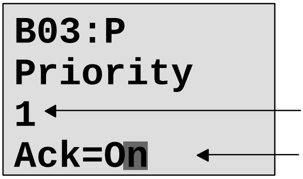
Parameter assignment screen form for P

Priority

Status of the acknowledgment

1. Increase priority to 1:	Cursor on ’0’ + ▲
2. Change to ’Ack’:	Press the key ▶
3. Enable ’Ack’:	per ▲ or ▼

LOGO! displays:



```
B03:P
Priority
1
Ack=On
```

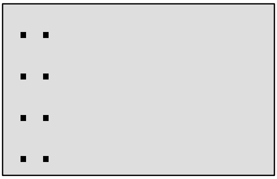
Parameter assignment screen form for P

Priority 1

Status of acknowledgment ’On’

4. Confirm messages with **OK**

This is how to configure the message text:



```
..
..
..
..
```

Parameter assignment screen form for Par

Using the key ► , select the row for the message text.

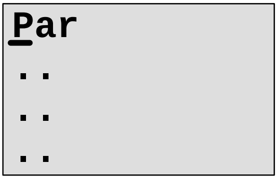
Confirm with **OK** to open the editing mode for this line.

Use the keys ▲ and ▼ to select the letter to be displayed. Move the cursor from one position to the other, using the keys ◄ and ►.

The list of available characters is the same as for the program name. You can find a character set in Chapter 3.6.4.

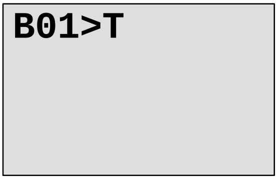
Confirm the changes with **OK**. Exit the editing mode with **ESC**.

In order to output a parameter (e.g.: the display of a measurement or function value) as message text in a line, select this line with the key ► and then press the key ▼:



```
Par
..
..
..
```

Confirm with **OK** to open editing mode:



```
B01>T
```

Use the keys ◄ and ► to select the blocks to be displayed and their corresponding parameters .

Use the keys ▲ and ▼ to select the block or the parameter you want to view.

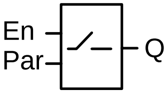
Select the parameter with **OK**.

Exit parameter assignment mode with **ESC**. Your changes are applied.

4.4.22 Softkey

Short description

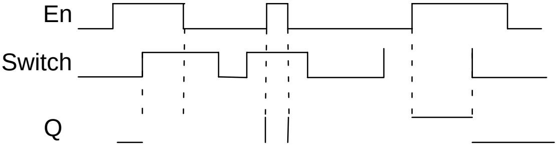
This logical function has the effect of a mechanical momentary switch or of a switch.

Symbol in LOGO!	Wiring	Description
	Input En	On a 0 to 1 transition of the status at input En (Enable) the output Q is switched on, provided 'Switch=On' was confirmed in parameter assignment mode.
	Parameter Par	When programming: Par gives you the option to use the function as momentary pushbutton in one cycle or to use it as switch. Ret: off = no retentivity on = the status can be saved retentive In RUN mode: Switch: switches the pushbutton or switch on or off.
	Output Q	Switches on if En=1 and if Switch=On was confirmed with **OK**.

Factory default

The factory default setting of 'Par' is 'Pushbutton'.

Timing diagram



Description of the function

The output is switched on after input En is set and, in parameter assignment mode, if ”On” is selected in the parameter ’Switch’ ’On’ and confirmed with **OK.** Whether the function was configured as pushbutton or switch is here of no concern.

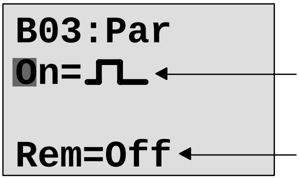
The output is reset to ’0’ at three events:

- At the 0 to 1 transition of the status at input En.
- When the function was configured as pushbutton and one cycle has expired since it was switched on.
- When the position ’Off’ was selected in the parameter ’Switch’ and confirmed with **OK** in parameter assignment mode.

Configuration of the Par parameter

In programming mode:

1. Select the ’Softkey’ function.
2. Select input En and confirm with **OK.** The cursor is now positioned below ’Par’.
3. Change to the input mode of ’Par’:   Confirm with **OK** (the cursor is now positioned to ’On’)



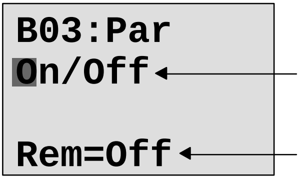
```
B03:Par
On=⎍
Rem=Off
```

The function is configured as ’pushbutton’

The status is not retentive

This is how to change ’Par’ to ’Switch’ and activate retentivity (Ret=On):

4. Toggling between the ’Pushbutton’ and ’Switch’ function:
   per ▲ or ▼

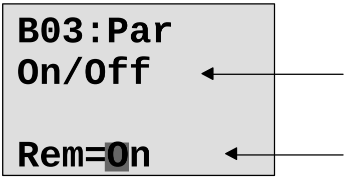


```
B03:Par
On/Off

Rem=Off
```

Function as ’Switch’

The status is not retentive

5. Change to retentivity: per ◀ or ▶
6. Enable retentivity: per ▲ or ▼



```
B03:Par
On/Off

Rem=On
```

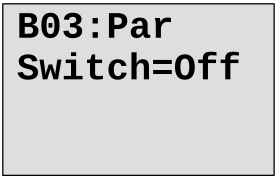
Function as ’Switch’

The status is retentive

7. Confirm your entries with with **OK**

In parameter assignment mode (RUN mode):

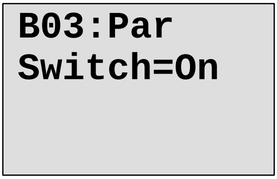
Here, you can switch the parameter ’Switch’ on and off (On/Off). In RUN mode LOGO! displays:



```
B03:Par
Switch=Off
```

Let us assume you want to activate ’Switch’ (On).

1. Change into editing mode: Confirm with **OK**
   (the cursor is now positioned to ’Off’)
2. Change from ’Off’ to ’On’: per ▲ or ▼
3. Confirm your entries with with **OK**



```
B03:Par
Switch=On
```

Here, for example,
the switch is On

5 Configuring LOGO!

We consider ’parameter assignment’ as the configuration of block parameters. You can set delay times for time functions, switching times for the timer switches, the threshold value of a counter, the monitoring interval of an operating hours counter and the on and off thresholds of the triggers.

You can configure the parameters:

- In programming mode
- In parameter assignment mode

In parameter assignment mode, the programmer configures the parameters.

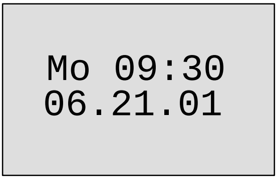
We introduced this parameter assignment mode to allow editing of the parameters without having to change the program. In this way, for example, a user can edit parameters without having to switch to programming mode. The advantage: The program (and thus the circuit) is protected but can still be modified by the user of the circuit to suit requirements.

Note

In parameter assignment mode, the LOGO! continues processing of the program.

5.1 Switching To Parameter Assignment Mode

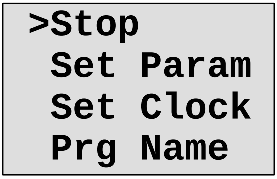
In RUN mode, you can switch to parameter assignment mode by pressing the **ESC** key:



```
Mo 09:30
06.21.01
```

...and press ESC

LOGO! switches to parameter assignment mode and displays Parameter assignment menu:



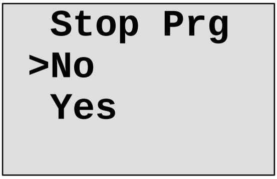
```
>Stop
 Set Param
 Set Clock
 Prg Name
```

Description of the four menu options in the parameter assignment menu

- **Stop**

You are going to use this menu item to stop your program and, as a result, open the main menu in programming mode. Proceed as follows:

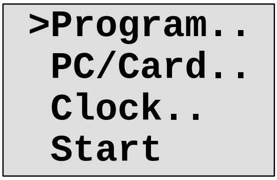
1. Move the '>' character to 'Stop': per ▲ or ▼
2. Confirm the 'Stop': **OK**



```
 Stop Prg
>No
 Yes
```

3. Move the '>' character to 'Yes': per ▲ or ▼
4. Confirm 'Yes': **OK**

LOGO! returns to the main menu:



```
>Program..
 PC/Card..
 Clock..
 Start
```

- **Set Param**

The diverse parameters are described in the following Chapters 5.1.1 to 5.1.3.

- **Set Clock**

The menu item ’Set Clock’ is only executed in a LOGO! equipped with a clock (LOGO!..C). In ’Set Clock’ you can set the internal clock of the LOGO!. Closer detail in section 5.2.

- **Prg Name**

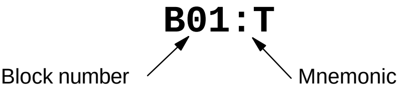
Under this menu item you can only **read** your program name. In parameter assignment mode it is not possible to change the program name.

5.1.1 Parameter

Parameters are:

- The delay times of a timer relay.
- The switching times (cams) of a timer switch.
- The threshold value of a counter
- The monitoring time for an operating hours counter
- The switching thresholds of a threshold switch.

Each one of the parameters is identified by its block number and mnemonics. Examples:

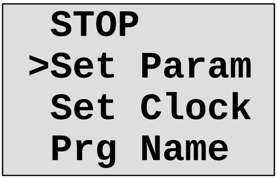


- T: ...is a configurable time.
- Cam 1: ...is the first cam of a timer switch.
- Par: ...denotes multiple counter parameters that can be monitored.

5.1.2 Selecting the Parameters

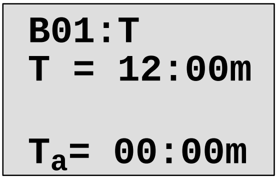
Select a parameter:

1. In the parameter assignment menu via 'Set Param' option
   ▼ or ▲



```
  STOP
>Set Param
  Set Clock
  Prg Name
```

2. Press **OK**
   LOGO! displays the first parameter. If parameters cannot be set, you can use ESC to return to the parameter assignment menu.



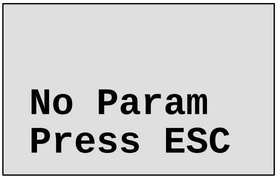
B01:T
T = 12:00m

T_a= 00:00m

Parameter

Value set for the parameter

the current time in the LOGO!



```
No Param
Press ESC
```

Parameters cannot be changed:
ESC returns you to the parameter assignment menu

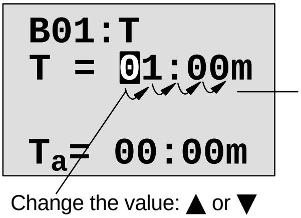
3. Now, Select the desired parameter:
   Use the ▲ or ▼
   LOGO! displays one parameter respectively in separate windows.
4. If you want to edit a parameter, select it and press **OK**.

5.1.3 Changing the Parameters

To change a parameter, you first have to select it (see ”Selecting a parameter).

You change the value of the parameter in the same way as you entered it in programming mode:

1. Move the cursor to the point at which you want to make the change: per ◀ or ▶
2. Change the value: per ▲ or ▼
3. Confirm the value: **OK**



B01:T
T = 01:00m

T_a= 00:00m

Move: ◀ or ▶

Done: **OK**

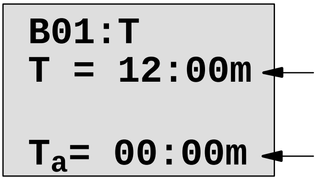
Change the value: ▲ or ▼

Note

In parameter assignment mode, you cannot change the unit of the delay time or the parameter protection for the parameter T. This is only possible in programming mode.

Current value of a time T

If you view a time T in parameter assignment mode, it look like this:



B01:T
T = 12:00m

T_a= 00:00m

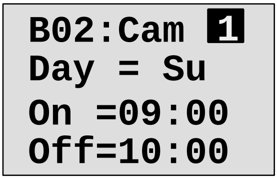
Set time T

Current time T_a

You can change the set time T (see ”Changing a parameter).

Current value of the timer switch

If you view a cam of a timer switch in parameter assignment mode, it looks like this, for example:



```
B02:Cam 1
Day = Su
On =09:00
Off=10:00
```

The circuit state of the timer switch is displayed:

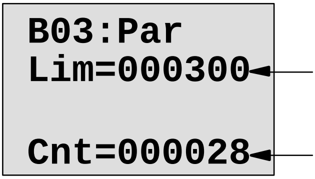
0 The timer switch is off (status ’0’ at the output)

1 The timer switch is on (status ’1’ at the output)

LOGO! displays the circuit state of the timer switch rather than the circuit state of a cam. The circuit state of the timer switch depends on all three cams (Cam 1, Cam 2 and Cam 3).

Current value of a counter

If you view the parameter of a counter in parameter assignment mode, it looks like this:



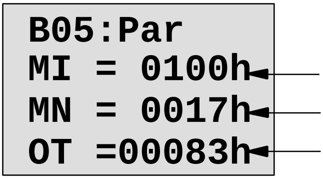
```
B03:Par
Lim=000300

Cnt=000028
```

Switching threshold

Current count value

Current value of an operating hours counter

If you view the parameter of an operating hours counter in parameter assignment mode, it looks like this:



```
B05:Par
MI = 0100h
MN = 0017h
OT =00083h
```

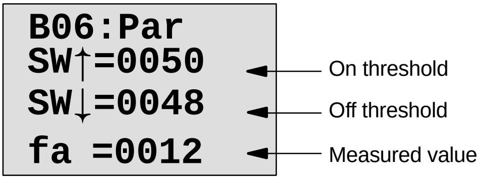
Monitoring time

time–to–go

Operating hours elapsed

Current value of a threshold switch

If you view the parameter of a threshold switch in parameter assignment mode, it looks like this:



```
B06:Par
SW↑=0050
SW↓=0048
fa =0012
```

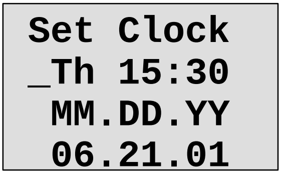
5.2 Setting the Time–of–day and the Date (LOGO! ... C)

You can set the TOD and the date

- In parameter assignment mode
- In programming mode.

How to set the TOD and the date in parameter assignment mode:

1. Open the parameter assignment mode (refer to Chapter 5.1)
2. Select ’**Set Clock**’ (▼ or ▲) and press **OK**.



```
 Set Clock
_Th 15:30
  MM.DD.YY
  06.21.01
```

The cursor position precedes the day of the week.

3. Select the day of the week: per ▲ or ▼
4. Move the cursor to the next position: per ◀ or ▶
5. Change the value: per ▲ or ▼
6. Set the correct TOD. Repeat steps 4 and 5.
7. Set the correct date. Repeat steps 4 and 5
8. Close your entries: **OK**

How to set the TOD and the date in programming mode:

1. Switch to programming mode: In RUN, execute the menu item ’Stop’. (see page 45)
2. Select ’Clock..’ (▼ or ▲) and press **OK**.
3. Select ’Set Clock’ (▼ or ▲) and press **OK**

Now you can set the day of the week and the time, as described above (as of step 3.).

6 LOGO! Program Modules

In LOGO! you can only keep one program stored in memory. If you want to modify the program or write another program without deleting the first one, you must archive it somewhere. You can use program modules/cards to do this.

You can copy the program stored in the LOGO! to a program module/card. You can then insert the program module/card in another LOGO! and copy the program to this LOGO! . You can use the program module/card to do the following:

- Archive programs
- Duplicate programs
- Mail programs
- Write and test programs out of the field at your office and then transfer it to a LOGO! in the switching cabinet.

LOGO! is supplied with a hood. You receive the program module/card separately.

Note

You do **not** require a module for storing your LOGO! program permanently.
The LOGO! program is already stored permanently when programming mode is closed.

Below we shall introduce the two modules that you can purchase for your LOGO! . Both of them can accommodate the entire program memory of a LOGO! .

Module	Order no.
Yellow module: for copying	6ED1 056–1BA00–0AA0
Red module: with know–how/ copy protection	6ED1 056–4BA00–0AA0

6.1 Overview of the Modules

Yellow program module

Programs can be transferred from the yellow module to the device and vice versa.

Red program module

A program is **protected** if it is transferred from a red module to the LOGO! .
Such a protected program can only run if the red module remains inserted in LOGO! during runtime.
A protected program cannot be edited.
A program is not protected anymore when the correct password is entered.
If you create a program for the red module and want to edit it at a later time you must assign it a password.

Compatibility

... under current versions (0BA3 devices):

A module written in one of the basic versions (0BA3 devices) can be read in all other basic versions.

... under previous versions (0BA0 to 0BA2 devices):

A module

- written in a standard version can be read in all the other versions.
- written in a LOGO! ...L version, can be read in all other LOGO! ...L versions; but not in a standard version.
- written in a LOGO! ...LB11 version, can be read in all other LOGO! ...LB11 versions; but not in a standard version or in a LOGO! ...L version.

... 0BA3 devices ––> 0BA0 to 0BA2 devices:

A module written in one of the basic versions (0BA3 devices) can **only** be read in 0BA3 devices.

Upward compatibility

The new 0BA3 devices support upward compatibility. A module written in one of the standard, long or bus versions (0BA0 to 0BA2 devices) can be read in all basic versions (0BA3 devices).

Note

Re upward compatibility: An adaptation of the program or an upgrade of the LOGO! Basic is required (and sensible) in some cases in order to achieve appropriate results. See the information on "*Fast inputs*" in Chapter 2.3.2.

6.2 Removing and Inserting Modules

When removing a red module (know–how/copy protection), note that: The program stored on this module can only run if the module remains inserted during runtime.
If the module is removed the LOGO! reports a 'No program' error. Removal of the red module during runtime leads to impermissible operate states.
Always heed the following warning:

Warning

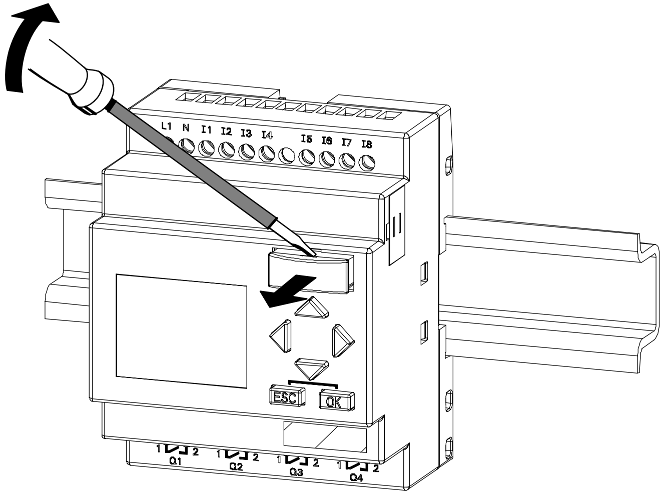
Do not put your finger or objects made of metal or any other conductive material in the open slot of the program module/card.

The socket for the program module/card may be live if L1 and N have been incorrectly wired.

The program module/card must always be replaced by a skilled technician.

Removing the module

This how to remove the program module/card:



Carefully insert a screwdriver into the slot at the upper end of the program module/card and ease it out of the slot a little.

You can now remove the program module/card:

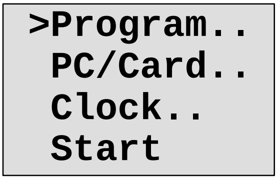
Inserting the program module/card

The slot for the program module/card is chamfered at the lower right edge. The program module/card also has a chamfered edge. This prevents you from inserting the program module/card the wrong way around. Insert the program module/card into the slot until it engages.

6.3 Copying from the LOGO! to the Module

This is how you copy a program to the program module/ card:

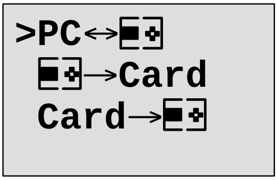
1. Insert the program module/card into the slot.
2. Switch the LOGO! to programming mode. In RUN mode: Press **ESC** and execute the menu item ’Stop’. (see page 45)



```
>Program..
 PC/Card..
 Clock..
 Start
```

LOGO! main menu

3. Move the ’>’ to ”PC/Card”: Press the key ▼
4. Press **OK**. The transfer menu opens.



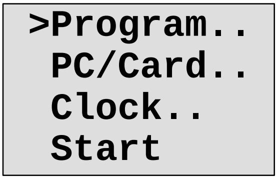
```
>PC↔▣
 ▣→Card
 Card→▣
```

▣ = LOGO!

5. Move the ’>’ to ’**LOGO** → **Card**’: Press the key ▼
6. Press **OK**.

LOGO! copies the program to the program module/card.

When LOGO! has finished copying, it automatically returns to the main menu:



```
>Program..
 PC/Card..
 Clock..
 Start
```

The program is now also stored on the program module/card. You can now remove the program module/card: **Do not forget** to replace the cover .

If power is lost while LOGO! is copying the program you must copy it once again when power is returned.

Note

If the program in the LOGO! is protected with a password X, the copied program in the module/card is also protected with the same password.

6.4 Copying from the Module to LOGO!

You have a program module/card containing your program. You can copy the program to LOGO! in two ways :

- Automatic copying when LOGO! starts up (POWER ON) or
- via the PC/Card menu in LOGO!.

Note

Íf the program in the module/Card is protected with the password X, the copied program in the LOGO! is also protected with the same password.

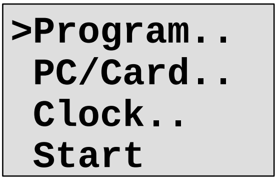
Before you copy a module written in another device type, refer once again to the information on ’Compatibility of LOGO! versions or devices’ in Chapter 6.1.

Automatic copying when LOGO! starts up

Proceed as follows:

1. Switch off the power supply to the LOGO! (POWER OFF)
2. Remove the slot cover.
3. Insert the program module/card into the appropriate slot.
4. Switch off the power supply to the LOGO! .

Result: LOGO! copies the program from the program module/card to LOGO!. When LOGO! has finished copying, it displays the main menu:



```
>Program..
 PC/Card..
 Clock..
 Start
```

Note

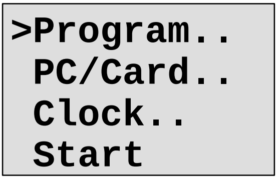
Before you switch the LOGO! to RUN, you must ensure that the system you are controlling with LOGO! does not represent a source of hazard.

1. Move the ’>’ character to Start: per ▲ or ▼
2. Press OK.

Using the PC/Card menu to copy

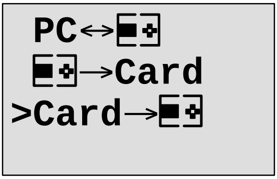
Read the note about changing the program module/card.
This is how you copy a program from the program module/card to LOGO!:

1. Insert the program module/card
2. Switch the LOGO! to programming mode. In RUN mode: Press **ESC** execute the menu item ’Stop’. (see page 45)



```
>Program..
 PC/Card..
 Clock..
 Start
```

3. Move the ’>’ to ”PC/Card”: Press the key ▼
4. Press **OK**. The transfer menu opens.
5. Move the ’>’ to ’**Card** → **LOGO**’:
   ▲ or ▼



```
 PC↔▣
 ▣→Card
>Card→▣
```

▣ = LOGO!

6. Press **OK**.

LOGO! copies the program from the program module/card to LOGO!. When LOGO! has finished copying, it automatically returns to the main menu.

7 LOGO! Software

The program LOGO!Soft Comfort is available as a programming package for the PC. This software includes the following features:

- Offline program generation for your application
- Simulation of your circuit (or program) on the computer
- Generation and printing of a block diagram
- Saving the program to the hard disk or other storage media
- Program transfer
  - from the LOGO! to the PC
  - From the PC to LOGO!
- Reading the operating hours counter
- Setting the TOD
- Summertime/Wintertime conversion

The LOGO! alternative

Thus, LOGO!Soft Comfort offers you an alternative to conventional means of planning:

1. First you develop your applications at your desktop.
2. You simulate the application in your computer and test whether or not it functions properly before the circuit is actually put to use.
3. You print out the entire circuit in one or several block diagrams, sorted according to outputs.
4. You archive your circuits in your PC file system. In this way you can retrieve a circuit directly for future changes.
5. You transfer the program to LOGO! at a touch with just a few key operations. Your LOGO! is quickly retooled.

LOGO!Soft Comfort

In LOGO!Soft Comfort you can create your circuit programs efficiently and in a comfortable, well arranged way (”wiring per keyboard“). Programs are created on the PC desktop per the drag&drop routine. Once you have created you program, you can have the system evaluate your program in order to determine the required LOGO! version, or you can determine this before you start programming.

One particularly user–friendly feature is the offline program simulation facility, which enables the simultaneous status display of multiple special functions and permits extensive documentation of the programs created. This optional programming software also offers a comprehensive Online Help on CD ROM.

LOGO!Soft Comfort runs under Windows 95/98, Windows NT 4.0, Windows Me®, Windows 2000®, Linux®, and Mac OS X®. It is capable of server operation and offers all the freedom and comfort for programming you could expect.

LOGO!Soft Comfort V3.0

This is the current version of LOGO!Soft Comfort. As of Version 3.0 you will find all the functions and functionality included in the new devices, exactly in the way they are described in this manual.

Upgrade from LOGO!Soft Comfort V1.0 and V2.0

If you own an old version of LOGO!Soft Comfort you can transfer the old program to the new devices, however, you cannot use the new functions in such programs. In such cases you must upgrade to the current version.

You can only install the upgrade on a full version of LOGO!Soft Comfort LOGO!Soft Comfort V1.0 or V2.0.

Upgrades & Infos

At our Internet URL

http://www.ad.siemens.de/logo/html_00/softcomfort.htm, you can download the software upgrades and demo versions free of costs.

7.1 Connecting the LOGO! to a PC

Connecting a PC cable

To connect the LOGO! to a PC you require the LOGO!-to–PC link.
(Order no. 6ED1 057–1AA00–0BA0).

Remove the cover or the program module/Card of your LOGO! and connect the cable. Connect the other end of the cable to the serial port of your PC.

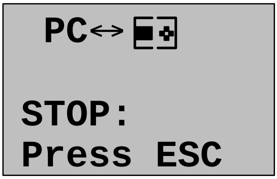
LOGO! to PC – PC↔ LOGO mode

There are two ways of communication between the PC and the LOGO!. LOGO! to transfer mode in RUN state or automatically when the LOGO! power supply is switched on, provided the link is plugged in.

This is how you switch the LOGO! to the mode PC ↔ LOGO:

1. Switch the LOGO! to programming mode: In RUN mode, press **ESC** and execute the menu item 'Stop'. (see page 152)
2. Select 'PC/Card': per ▼ or ▲
3. Confirm with **OK**
4. Select 'PC ↔ LOGO': per ▼ or ▲
5. Confirm with **OK**

LOGO! is now in PC ↔ LOGO and displays:



```
 PC↔▣

STOP:
Press ESC
```

▣ = LOGO!

This is how the LOGO! is switched automatically to mode PC ↔ LOGO:

1. Switch off the power supply to LOGO!
2. Remove the cover or the program module/card and connect the cable.
3. Switch on power.

LOGO! switches automatically to PC ↔ LOGO mode.

The PC can now communicate with the LOGO!   See how this is done directly in the Online Help of LOGO!Soft Comfort.

Use the **ESC** key on the LOGO! if you want to interrupt the PC communication.

Note

If the program you have created in LOGO!Soft Comfort is password protected, the ’PC → LOGO’ function transfers the program and the password to the LOGO! . The password prompt is switched on when the device exits the transfer mode.

The upload of a password protected program created in LOGO! is only possible after the correct password is entered in LOGO!Soft Comfort.

8 Applications

We have provided a small collection of applications in this manual to give you an impression of the versatile use of LOGO!. . For these examples we have recorded once again the original solution of the circuit diagram and compared it with the LOGO! solutions.

You can find solutions for the following tasks:

Note

The LOGO! applications are freely available to all our customers. The examples they contain are not binding and are included to provide general information on the fields of application for LOGO!. Customer–specific solutions may be different.

The user undertakes to ensure proper operation of the system. We refer to the standards and system–related installation regulations of the respective country.

Errors are excepted and the right to make changes reserved.

These applications – as well as tips for other applications – are also found at our Internet URL:
http://www.ad.siemens.de/logo

8.1 Staircase or Corridor Lighting

8.1.1 Demands on a Staircase Lighting System

The basic requirements for a staircase lighting system are as follows:

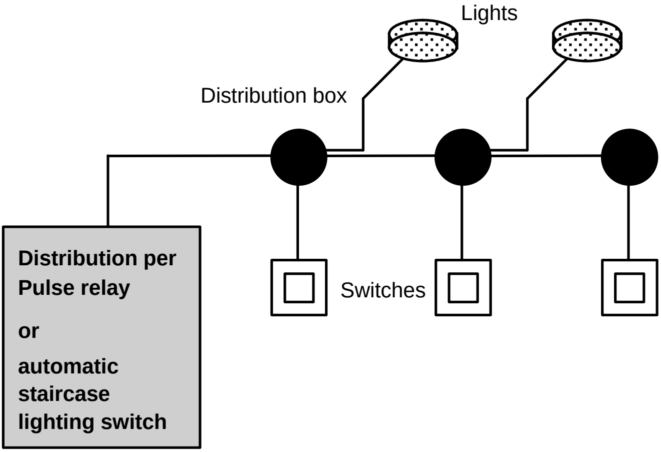
- When someone is using the staircase, the lighting should be switched on.
- If no–one is in the staircase the lights should be switched off in order to save energy.

8.1.2 Previous Solution

The two conventional options for switching the lights:

- The pulse relay
- The automatic staircase time switch

The wiring for these two lighting systems is identical.


Lights
Distribution box
Distribution per Pulse relay
or
automatic staircase lighting switch
Switches

Components used

- Switches
- Automatic staircase time switch or pulse relay

Lighting system with pulse relay

Function of a lighting system with pulse relay:

- Actuate any pushbutton: The lighting is switched on
- Actuate any of the pushbuttons once again: The lighting is switched off.

Disadvantage: One often forgets to switch off the lights.

Lighting system with an automatic staircase time switch

When an automatic staircase time switch is used, the lighting system behaves as follows:

- Actuate any pushbutton: The lighting is switched on
- On expiration of the preset time the lights switch off automatically.

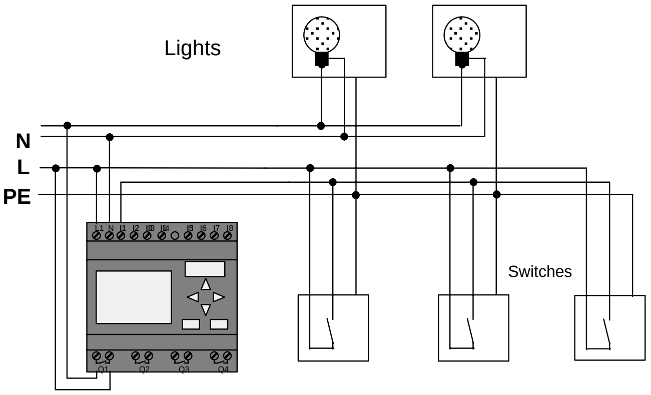
Disadvantage: The light cannot be switched on for a longer period of time (e.g. when cleaning the staircase). The switch for continuous lighting is usually installed on the automatic staircase time switch that may be difficult or impossible to access.

8.1.3 Lighting System with LOGO!

With the LOGO! you can replace the automatic staircase time switch or the pulse relay. You can also implement both functions (timed off delay and pulse relay) in a single unit. What is more, you can incorporate extra functions without making any alterations to the wiring. Here are some examples:

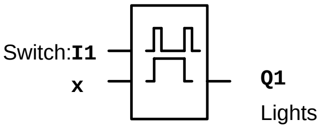
- Pulse relay with LOGO!
- Automatic staircase time switch with LOGO!
- Multifunctional switch with LOGO!
  - Switch light on
  - Switch on continuous lighting
  - Switch light off

Wiring of the lighting system with LOGO! 230 RC



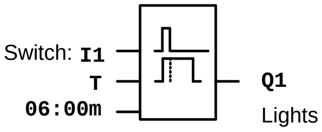
The external wiring of a lighting system with a LOGO! is no different than it is for a conventional staircase and corridor lighting system. Only the automatic staircase time switch/ pulse relay is replaced. Supplementary functions are entered directly in LOGO!.

Pulse relay with LOGO!



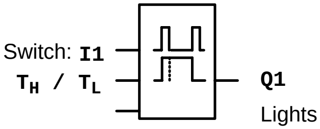
Output Q1 is toggled with a gate pulse at input I1.

Automatic staircase time switch with LOGO!



Output Q1 is switched on for the duration of 6 minutes with a gate pulse at input I1.

Multifunctional switch with LOGO!



Output Q1 is switched on for a specified time T_H with a gate pulse at input I1.
The continuous lighting function is enabled by holding down the pushbutton for a specified time T_L.

8.1.4 Special Features and Expansion Options

Other options for increasing comfort or saving energy are, for example:

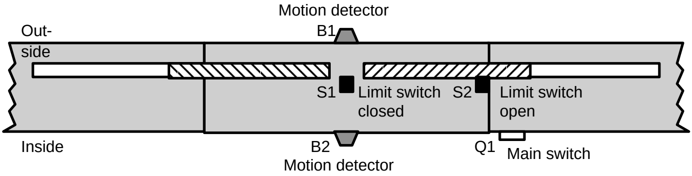
- A flashing function that indicates that the light is about to be switched off automatically.
- You can integrate various central functions:
  - Central off
  - Central on (panic button)
  - Control of all lamps or individual circuits via a daylight control switch
  - Control via integrated timer switch (e.g. continuous lighting only until 24.00 h; disabling at specific times)
  - Automatic off for the continuous lighting on expiration of a preset time (e.g. after 3 hours)

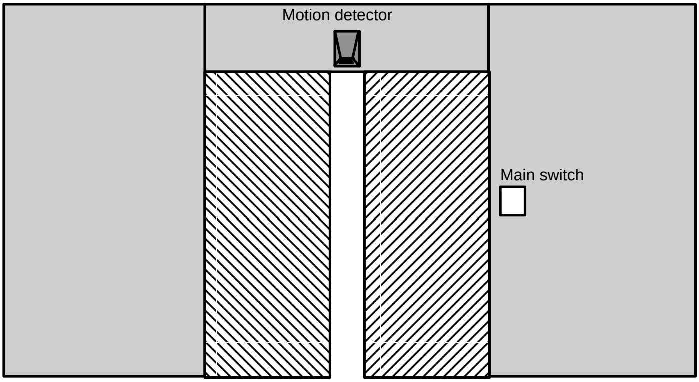
8.2 Automatic Door

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

8.2.1 Demands on an Automatic Door

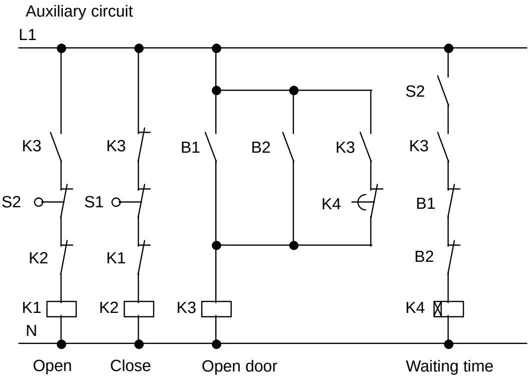
- When somebody approaches the door, it must open automatically.
- The door must remain open until the doorway is cleared.
- When the doorway is cleared, the door must close automatically after a short time.





The door is usually motor–driven and equipped with a slip coupling. This prevents people from being squeezed in and injured. The control system is connected to the mains via a master switch.

8.2.2 Previous Solution



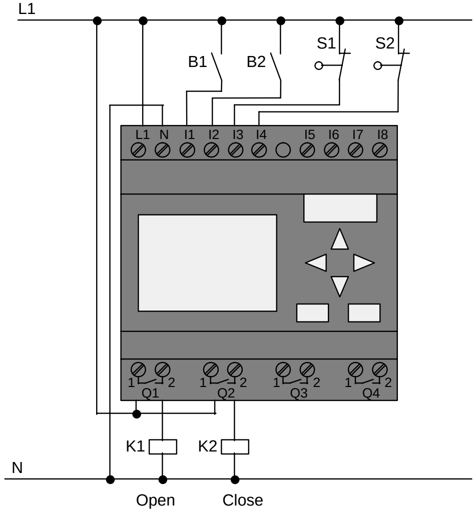
When someone enters the detection range of the motion sensors B1 or B2, the door is opened via K3.

After the detection range of the two motion sensors has been cleared for a minimum period, K4 enables the closing motion.

8.2.3 Door Control System with LOGO!

With LOGO! you can simplify this circuit considerably. What is left to do is to connect the motion sensors, limit switches and power contactors to the LOGO! .

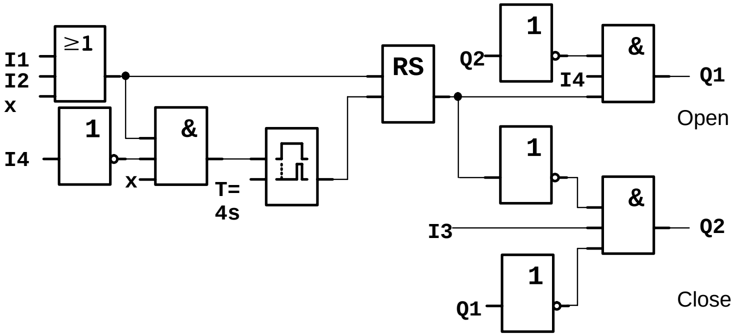
Wiring the door control system with LOGO! 230 RC



Components used

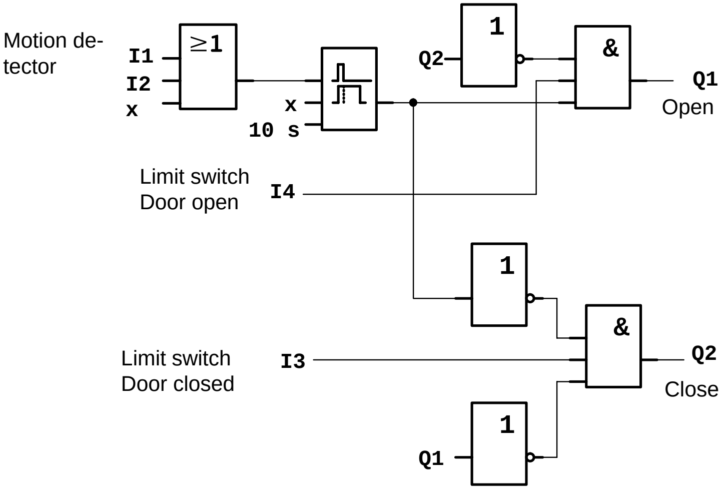
• K1	Main contactor *Open*
• K2	Main contactor *Close*
• S1 *(n.c. contact)*	Limit switch *Closed*
• S2 *(n.c. contact)*	Limit switch *Open*
• B1 *(n.o. contact)*	Infrared motion detector *outdoor*
• B2 *(n.o. contact)*	Infrared motion detector *indoor*

Door Control System with LOGO! , Block Diagram



This is what the circuit diagram of the conventional solution looks like.

You can simplify this circuit if you make use of the LOGO! functions. You can use the off delay to replace the latching relay and the on delay. The block diagram below illustrates this simplification:



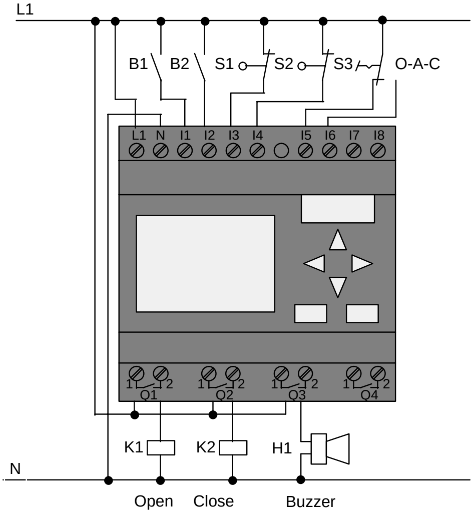
8.2.4 Special Features and Expansion Options

Options for increasing comfort and user friendliness are, for example:

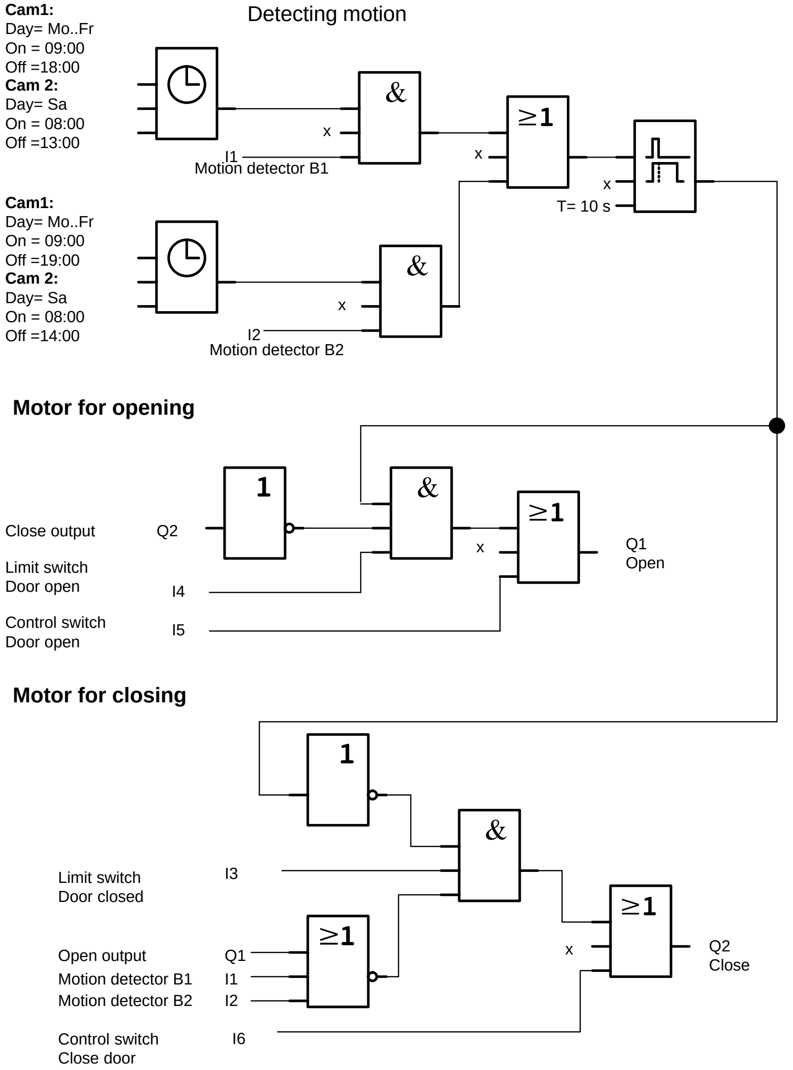
- You can connect an additional control switch with the positions: Open – Automatic – Closed (O-A-C)
- You can connect a buzzer to an output of the LOGO! to warn of the closing of the door.
- You can implement time and direction dependent enable functions for opening of the door (e.g. opening only during business hours; after business hours to be opened only from inside).

8.2.5 Enhanced solutions with LOGO! 230 RC

Wiring the LOGO! expansion



Block diagram of the enhanced LOGO! solution



Detecting motion

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

After closing time, the motion detector B2 continues to be used to open the door for 1 hour to allow the customers to leave the shop.

Motor for opening

Output Q1 is switched on to open the door when the following occurs:

- The control switch at 15 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 fully open (limit switch at I4).

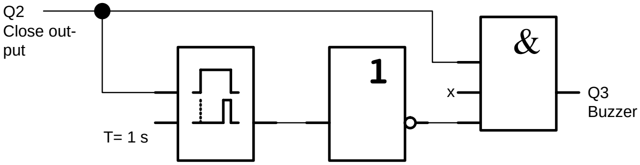
Motor for closing

Output Q2 is switched on to close the door when the following occurs:

- The control switch at 16 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

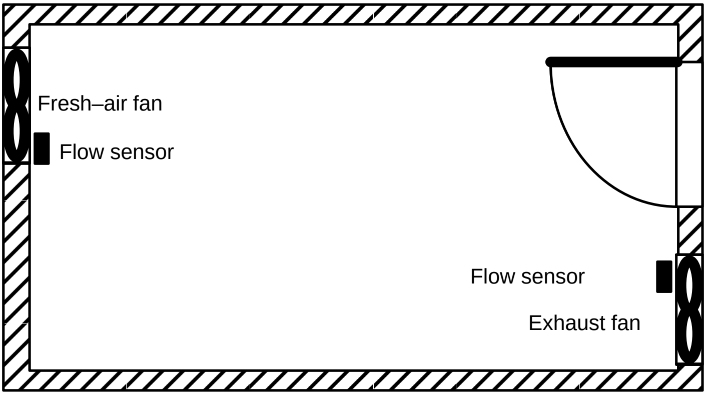
Connect the buzzer to output Q3. The buzzer sounds for a short time (in this case 1 second) when the door is closed. Enter the following circuit at Q3 in the block diagram:



8.3 Air–conditioning System

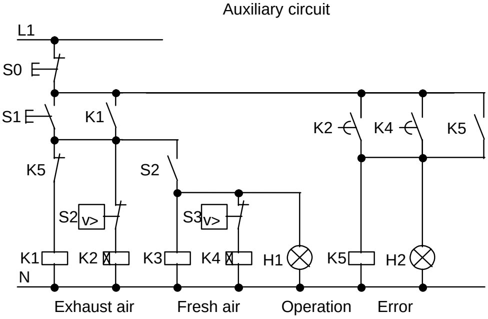
8.3.1 Demands on an air–conditioning System

The air–conditioning system is used for the controlled supply of fresh air to a room and to exhaust the contaminated air in the room. Let us examine following example:



- The room is equipped with an exhaust fan and a fresh–air fan.
- Both fans are monitored by a flow sensor.
- The pressure in the room must not be allowed to rise above the atmospheric pressure.
- The fresh–air fan must only be switched on if reliable functioning of the exhaust fan is signaled by the flow sensor.
- A warning lamp indicates if one of the fans fails.

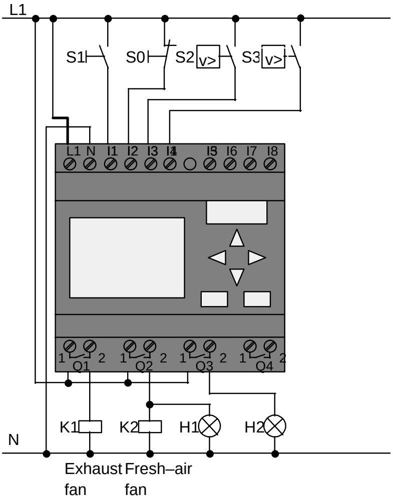
The circuit diagram for conventional solutions is as follows:



The fans are monitored by flow sensors. If, after a short delay, no air flow is measured the system is switched off and an error is reported. Acknowledge this by pressing the off pushbutton.

Fan monitoring requires an evaluation circuit with several switching devices in addition to the flow sensors. The evaluation circuit can be replaced by a single LOGO! unit.

Wiring the air–conditioning system with LOGO! 230 RC

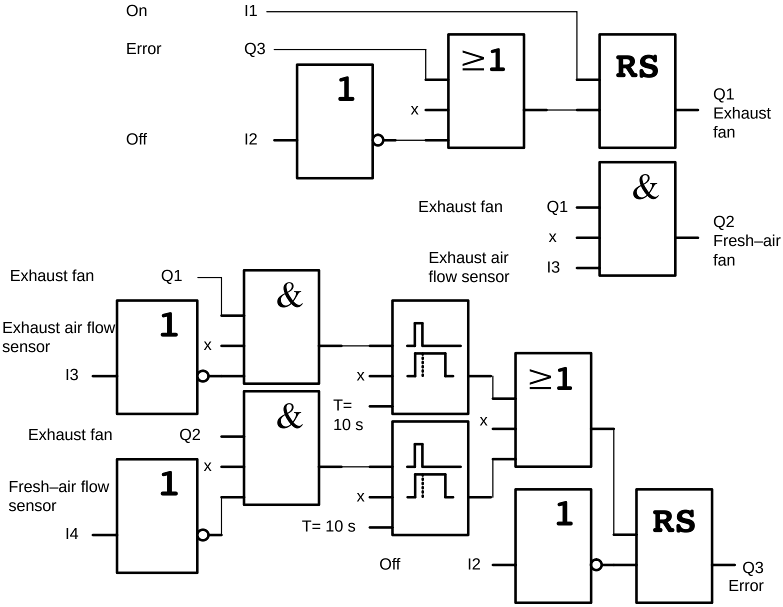


Components used

K1	Main contactor
K2	Main contactor
S0 *(n.c. contact)*	STOP pushbutton
S1 *(n.o. contact)*	Start pushbutton
S2 *(n.o. contact)*	Flow sensor
S3 *(n.o. contact)*	Flow sensor
H1	Indicator lamp
H2	Indicator lamp

Circuit diagram of the LOGO! solution

This is what the circuit diagram of the air–conditioning system looks like with a LOGO! :



8.3.2 Advantages of Using LOGO!

When using the LOGO!, you require less switchgear. That saves you installation time and space in the control cabinet. You might even be able to use a smaller control cabinet.

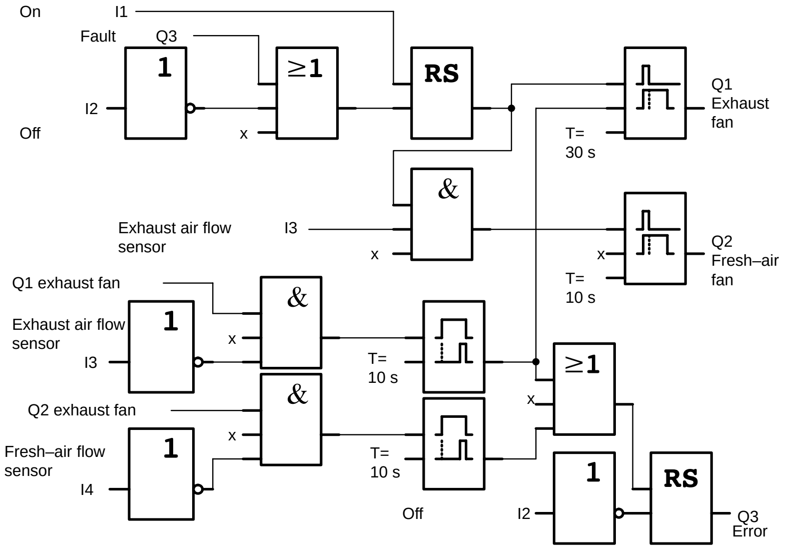
Additional options when using LOGO!

- The free output (Q4) can be used as a potential–free contact for signaling a fault or a power failure.
- It is possible to switch off of the fans via sequential circuit.

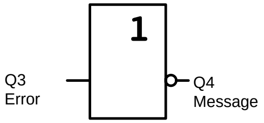
These functions can be incorporated without additional switchgear.

Block diagram of the enhanced LOGO! solution

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

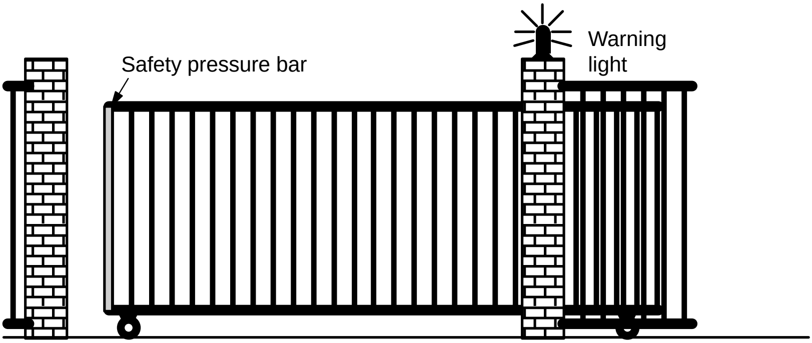


You can also generate a message at output Q4:



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

8.4 Industrial Gate



The entrance to a company's premises is often closed with a gate. The gate is only opened to let vehicles in and out.

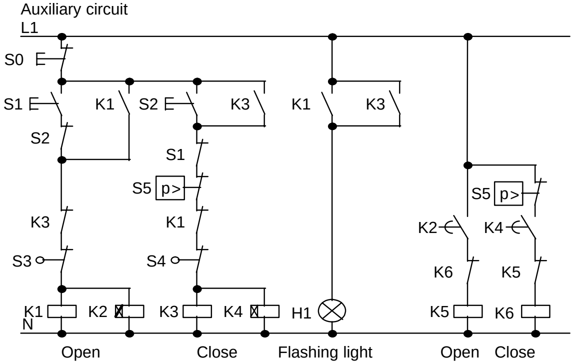
The gate is controlled by the gateman.

8.4.1 Demands on the Gate Control System

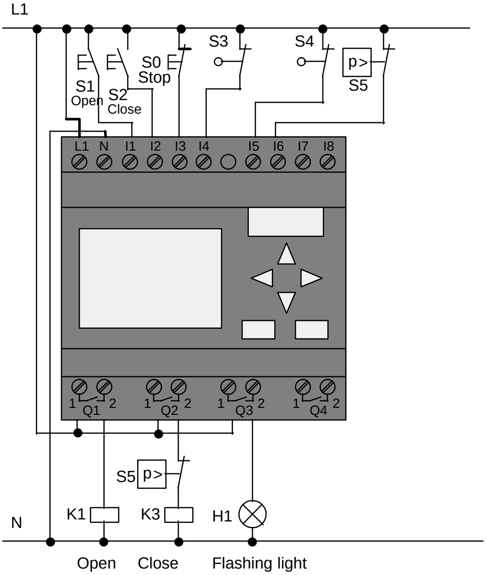
- The gate is opened and closed by operating a pushbutton in the gatehouse. The gateman can monitor the operation of the gate at the same time.
- The gate is normally fully opened or closed. However, the gate motion can be interrupted at any time.
- A flashing light is activated 5 seconds before the gate begins to move and continues for as long as the gate is in motion.
- A safety pressure bar prevents harm to persons and objects from getting trapped or damaged when the gate closes.

8.4.2 Previous Solution

Diverse kinds of control systems are used to operate automatic gates. The gate control circuit diagram shows *one* option.



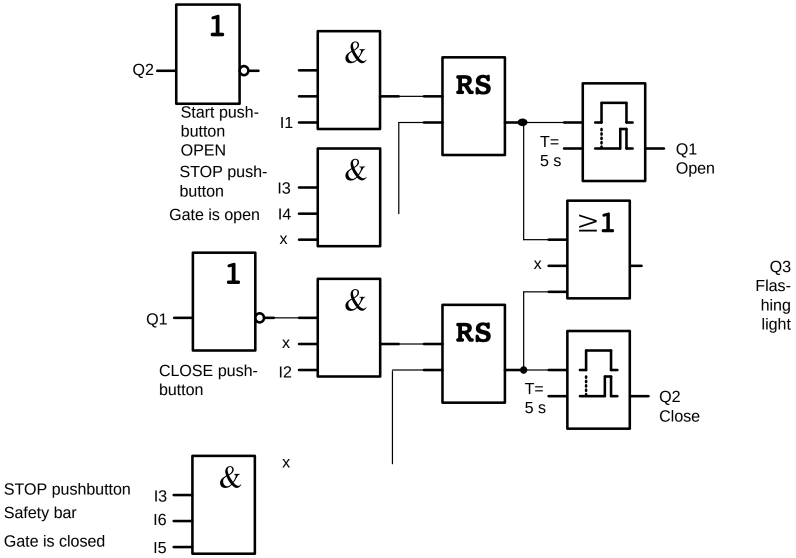
Wiring the gate controls with LOGO! 230 RC



Components used

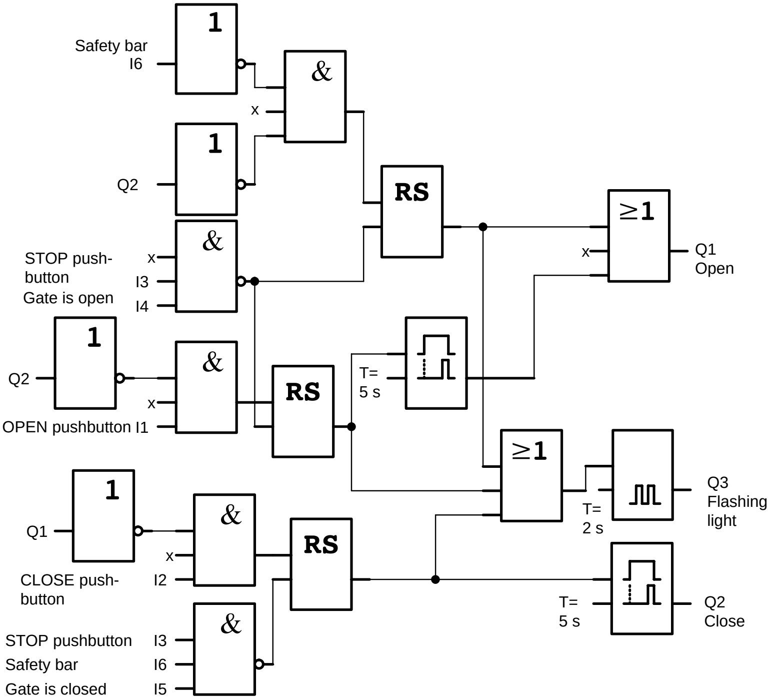
K1	Main contactor
K2	Main contactor
S0 *(n.c. contact)*	STOP pushbutton
S1 *(n.o. contact)*	Open switch
S2 *(n.o. contact)*	CLOSE pushbutton
S3 *(n.c. contact)*	OPEN position switch
S4 *(n.c. contact)*	CLOSED position switch
S5 *(n.c. contact)*	Safety pressure bar

Block diagram of the LOGO! solution

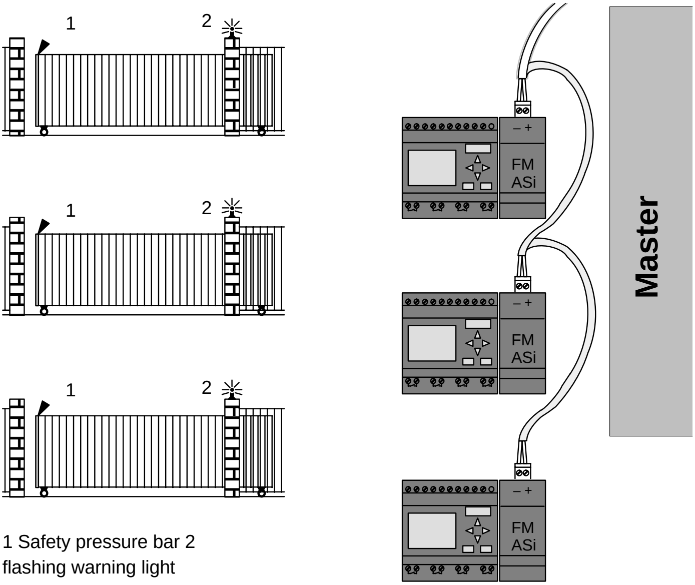


8.4.3 Wiring the LOGO! solution

In our enhanced solution the gate will automatically open again when the safety bar is operated.



8.5 Centralized Control and Monitoring of Several Industrial Gates



1 Safety pressure bar 2 flashing warning light

Often, a company's premises can be entered at several locations. Not all of the gates can always be monitored locally by personnel. They must therefore be able to be monitored and operated by the gateman who sits in a central gatehouse.

It must also be possible for a member of staff to open and close the gate locally.

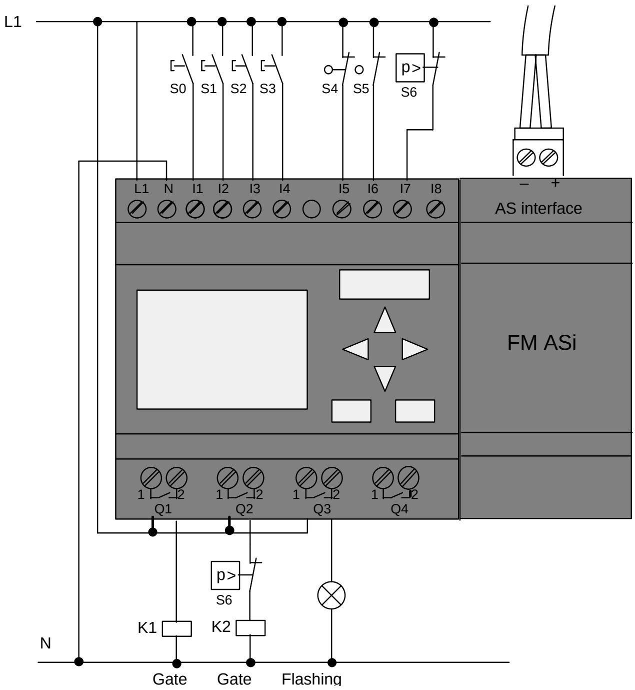
For **every** gate we implement one LOGO! 230 RC and one AS interface function module. The bus interconnects the modules and the master.

In this chapter, we will describe a gate control system. The structure of the other gate control systems is identical.

8.5.1 Demands on the Gate Control System

- Every gate is opened and closed by means of a cord–operated switch. The gate is here fully opened or closed.
- Every gate can also be opened and closed per local pushbutton.
- The gate can be opened and closed via the bus link to the gatehouse. The GATE OPEN or GATE CLOSED status is indicated.
- A flashing light is activated 5 seconds before the gate begins to move and continues for as long as the gate is in motion.
- A safety pressure bar prevents harm to persons and objects from getting trapped or damaged when the gate closes.

Wiring the gate controls with LOGO! 230 RC and FM ASi



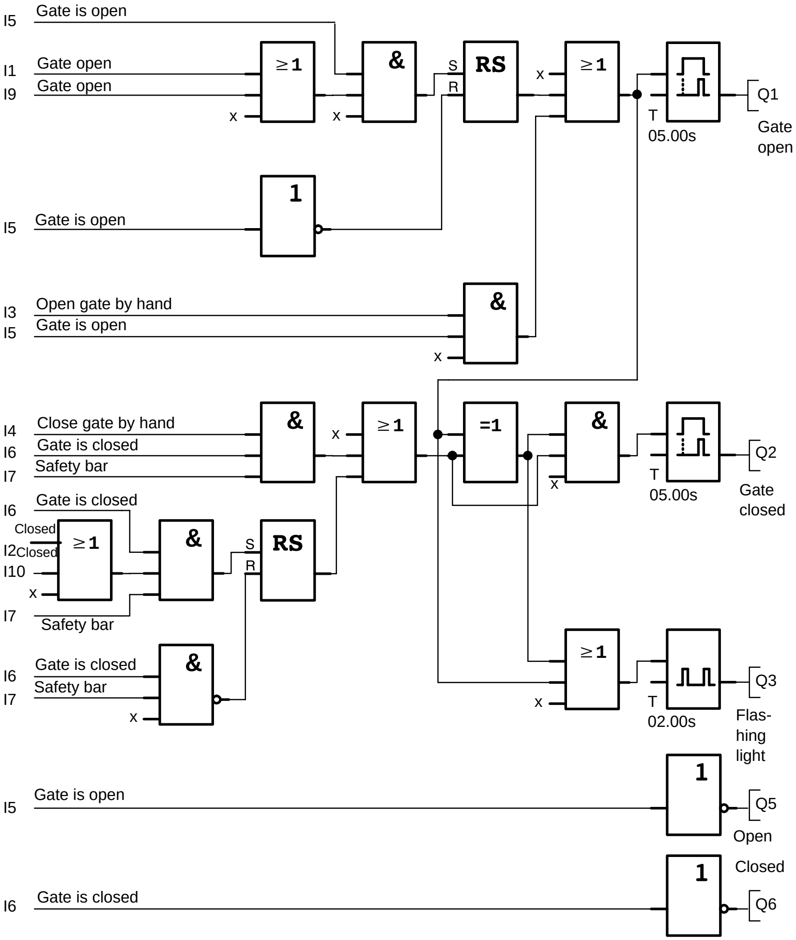
Components used

• K1	Main contactor for opening
• K2	Main contactor for closing
• S0 *(n.o. contact)*	Cord–operated switch OPEN
• S1 *(n.o. contact)*	Cord–operated switch CLOSE
• S2 *(n.o. contact)*	Open switch
• S3 *(n.o. contact)*	CLOSE pushbutton
• S4 *(n.c. contact)*	OPEN GATE position switch
• S5 *(n.c. contact)*	CLOSE GATE position switch
• S6 *(n.c. contact)*	Safety pressure bar

Higher–level control system

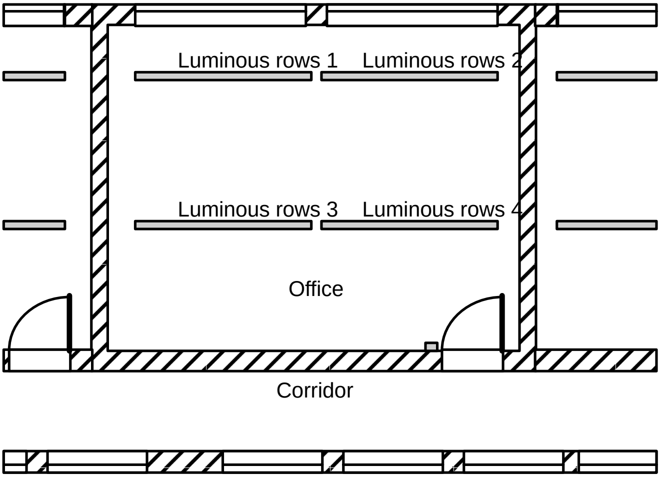
• Q5	OPEN GATE position switch
• Q6	CLOSE GATE position switch
• I9	External OPEN GATE pushbutton
• I10	External CLOSE GATE pushbutton

Block diagram of the LOGO! solution



The OPEN GATE and CLOSE GATE start pushbuttons move the gate in the appropriate direction provided it is not already moving in the other direction. The gate motion ends at the respective limit switch. Closing of the gate is also interrupted by the safety bar.

8.6 Luminous rows

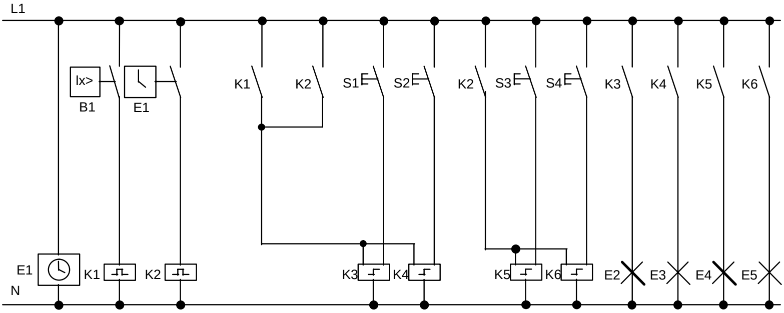


When planning lighting systems for commercial locations, the type and number of lamps used is determined by the illuminance required. For reasons of cost efficiency, fluorescent tubes arranged in luminous rows are often used. They are divided into separate switching circuits, according to the way the room is used.

8.6.1 Demands on the Lighting System

- These separate luminous rows are switched on and off locally.
- If there is sufficient daylight, the rows on the window side of the room are automatically switched off via daylight control switch.
- The lights are switched off automatically at 20.00.
- It must be possible at all times to switch the lights on and off locally.

8.6.2 Previous Solution



The lamps are switched on and off with a pulse relay that is controlled per pushbuttons at the door. Regardless of this, they are reset by the time switch or by the daylight control switch via the *central off* input. The length of the off commands must be reduced per wiping relays in order to make it possible to switch the lights on and off locally after they have been switched off.

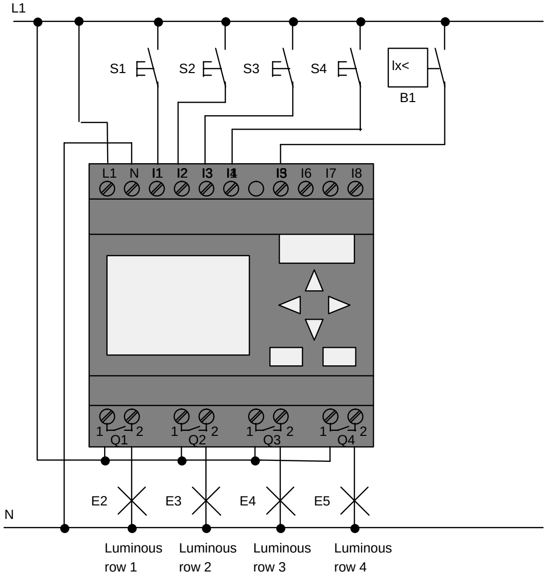
Components required:

- Switches S1 to S4
- Daylight control switch B1
- Timer switch E1
- Wiping relays K1 and K2
- Pulse switches with central off K3 to K6

Disadvantages of the previous solution

- A substantial amount of switchgear is required in order to implement these functions.
- Due to the high proportion of mechanical components, high wear and tear and maintenance expenditure is to be expected.
- Changing the function demands considerable efforts.

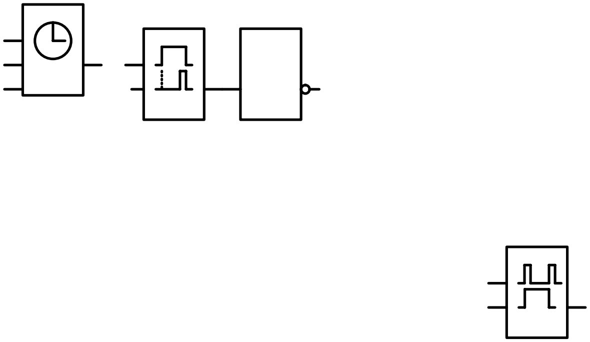
8.6.3 Luminous row control with LOGO! 230 RC



Components used

• S1 to S4 *(n.o. contact)*	Switches
• B1 *(n.o. contact)*	Daylight control switch

Block diagram of the LOGO! solution

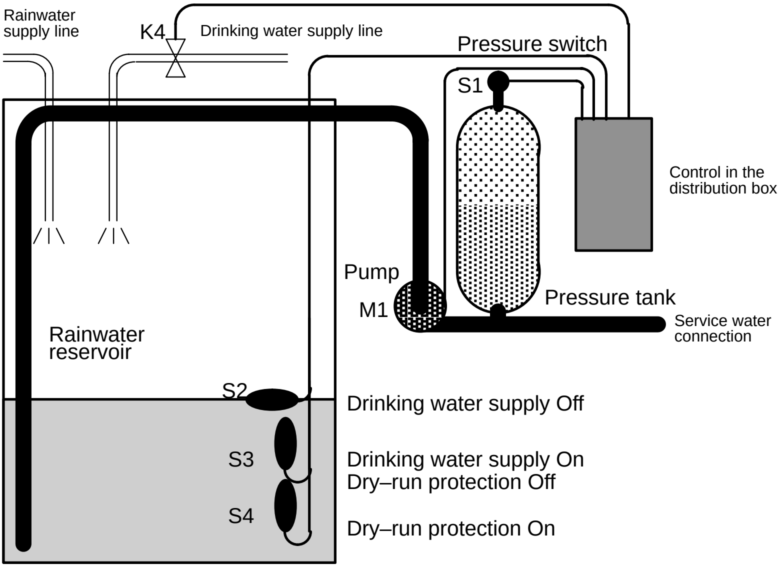


8.7 Service water pump

The use of rainwater as an addition to the drinking water supply is gaining importance in the domestic housing area. This saves money and helps protect the environment. For example, rainwater can be used for:

- Washing clothes
- Irrigation system for gardens
- Watering indoor plants
- Car wash
- Toilet flushing installations

The sketch below illustrates how such a rainwater utilization system is operated:

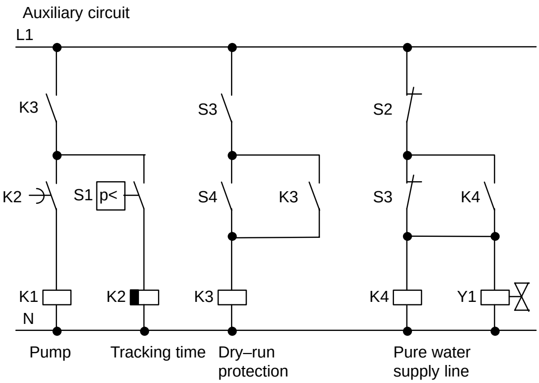


The rainwater is collected in a reservoir. From the reservoir a pumping station supplies a respective line system. From there it can be tapped in the same way as normal drinking water. If the reservoir should run dry it can be topped up with drinking water.

8.7.1 Demands on the control system of a service water pump

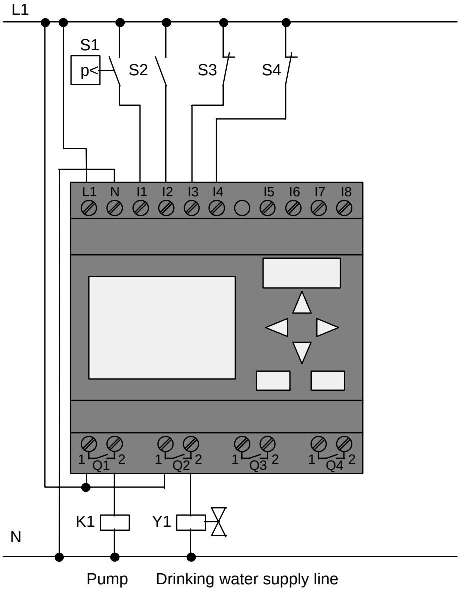
- The system must be capable of supplying service water at all times. In case of emergency, the control system must automatically switch over to drinking water supply.
- When switching over to the drinking water supply an ingress of rainwater into the mains system must be prevented.
- The service water pump must not be switched on if rainwater is low in the reservoir (dry–run protection).

8.7.2 Previous Solution



The pump and a solenoid valve are controlled by means of a pressure switch and 3 float switches installed in the rainwater reservoir. The pump must be switched on when the pressure level in the cylinder drops below minimum. Once the operating pressure has been reached, the pump is switched off again after a tracking time of a few seconds. The tracking time prevents an oscillation of the water pump if water is drawn off over any length of time.

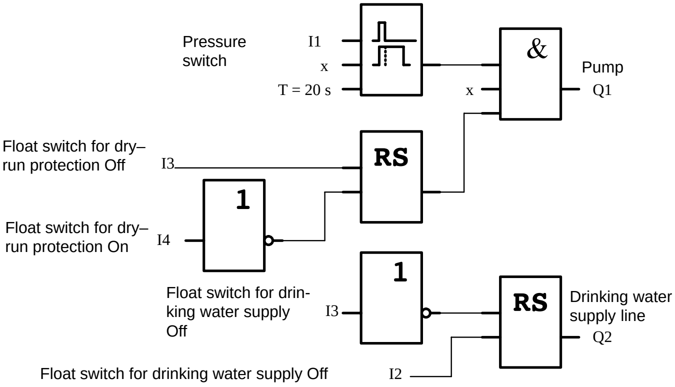
8.7.3 Service water pump with LOGO! 230 RC



Apart from the LOGO!, all you need is a pressure switch and the float switches to control the pump. If you are using a 3–phase AC motor, you must use a power contactor for switching the pump. For single–phase AC pump systems you must provide a contactor if the current consumption of the AC motor exceeds the capacity of the output relay Q1. The power of a solenoid valve is low enough to allow direct controlling.

• K1	Main contactor
• Y1	Solenoid valve
• S1 *(n.o. contact)*	Pressure switch
• S2 *(n.o. contact)*	Float switch
• S3 *(n.c. contact)*	Float switch
• S4 *(n.c. contact)*	Float switch

Circuit diagram of the LOGO! solution


Pressure switch
I1
x
T = 20 s
&
x
Pump
Q1
Float switch for dry–run protection Off
I3
RS
1
Float switch for dry–run protection On
I4
1
Float switch for drinking water supply Off
I3
RS
Drinking water supply line
Q2
Float switch for drinking water supply Off
I2

8.7.4 Special Features and Expansion Options

The circuit diagram shows how you can wire the pump controls and the solenoid valve. The layout corresponds to that of the circuit diagram. You also have the option to integrate further functions for specific applications that could otherwise only be realized in conventional technology under additional expenditure of switchgear, e.g.:

- Enabling the pump at specific times
- Indication of imminent or existing shortage of water
- Reporting of system faults

8.8 Further Application options

Apart from the shown samples, we have also published a collection of applications on the web (www.ad.siemens.de/logo/html_00/application.htm).

There you can find amongst other things:

- Irrigation system for greenhouse plants
- Controlling of conveyor systems
- Controlling of a bending machine
- Shop window lighting
- Bell system (e.g. in a school)
- Parking lot surveillance
- Outdoor lighting
- Control system for shutters
- Domestic outdoor and indoor lighting
- Control system for a cream stirrer
- Sports hall lighting
- Constant load on 3 consumers
- Sequential control system for cable–welding machines for large cross–sections
- Step switch (e.g. for fans)
- Sequential control for a boiler
- Control system for several pump sets with centralized operation
- Cutting device (e.g. for detonating fuses)
- Monitoring periods of utilization, e.g. of a solar energy system
- Intelligent foot switches, e.g. for speed preselection)
- Controlling an elevating platform
- Impregnation of textiles; controlling the heating and conveyor belts
- Silo–filling system

And lots more.

On the Web you can also find descriptions and the corresponding circuit diagrams of the applications. You can read these *.pdf files with the Adobe AcrobatReader. And if you have installed the LOGO!Soft or LOGO!Soft Comfort programming software on your PC, you can simply download the relevant circuit diagrams at the touch of a button, adapt them to your requirements, transfer them into LOGO! via the PC cable and start to use them .

Advantages of using LOGO!

The use of LOGO! is highly beneficial, especially in areas

- in which you can use the LOGO! to replace multiple auxiliary switchgear with the integrated functions,
- where you want to economize wiring and installation efforts – because LOGO! keeps the wiring ”in its head”.
- where you want to reduce component space in the control cabinet/distribution – you might even be able to reduce the size of your control cabinet/distribution box.
- in which you can add or change functions subsequently, without having to install an additional switchgear or change the wiring.
- where you want to offer your customers additional functions for domestic and commercial housing installation. Examples:
  - Domestic security systems: With LOGO! to switch a lamp on regularly or open and close your shutters while you are on holiday.
  - Central heating: With LOGO! run the circulation pump only when you actually require water or heating.
  - Refrigerating systems: With LOGO! defrost your refrigerating systems at regular intervals; this is more lenient on energy costs.
  - you can illuminate aquaria and terraria on a time–dependent basis.

Last not least you can:

- Use commonly available switches and pushbuttons, which makes it easy to install a domestic system.
- LOGO! directly to your house installation; the integrated power supply makes it possible.

Do you want more Info?

You can find more info relating to the topic LOGO! on our Internet site: http://www.ad.siemens.de/logo.

Do you have any suggestions?

There are definitely many more useful applications for the LOGO! . If you know of one, why not write to us? We will collect all the suggestions made and distribute as many of them as we can. It does not matter how unusual or simple your LOGO! might be. Just write to us. We shall be delighted to receive all your suggestions.

Write to:

Siemens AG
A&D AS MVM – LOGO!
PO–Box 48 48

D–90327 Nuremberg

A Technical Data

A.1 General Technical Data

Criterion	Complies with	Values
LOGO!Basic:		
Dimensions (WxHxD)		72 x 90 x 55 mm
Weight		Approx. 190 g
Installation		on a 35 mm profile rail 4 module widths or wall mounting
LOGO! Expansion module:		
Dimensions (WxHxD)		36 x 90 x 55 mm
Weight		Approx. 90 g
Installation		on a 35 mm profile rail 4 module widths or wall mounting
Climatic environmental conditions		
Ambient temperature Horizontal installation Vertical installation	Cold: IEC 60068-2-1 Heat: IEC 60068-2-2	 0 ... 55 ˚C 0 ... 55 ˚C
Storage/transport		– 40 ˚C ... +70 ˚C
Relative humidity	IEC 60068-2-30	From 10 to 85 % no condensation
Air pressure		795 ... 1080 hPa
Pollutants	IEC 60068-2-42 IEC 60068-2-43	SO_2 10 cm^3 /m^3, 4 days H_2S 1 cm^3 /m^3, 4 days
Mechanical environmental conditions		
Type of protection		IP20
Vibrations:	IEC 60068-2-6	5 ... 9 Hz (constant amplitude 3.5 mm) 9 ... 150 Hz (constant acceleration 1 g)

Criterion	Complies with	Values
Shock	IEC 60068-2-27	18 shocks (Half–sine wave 15g/11 ms)
Drop	IEC 60068-2-31	Drop height 50 mm
Free fall (packaged)	IEC 60068-2-32	1 m
Electromagnetic compatibility (EMC)		
Interference emission	EN 55011	Limit class B group 1 Limit class for ASi operation
Electrostatic discharge	IEC 61000-4-2 Severity 3	8 kV air discharge 6 kV contact discharge
Electromagnetic fields	IEC 61000-4-3	Field strength 10 V/m
HF conductance on cables and cable shields according	IEC 61000-4-6	10 V
Burst pulses	IEC 61000-4-4 Severity 3	2 kV (supply and signal lines)
Energy carriers Single pulse (surge) (applies only to LOGO! 230 ...	IEC 61000-4-5 Severity 2	0.5 kV (power lines) symmetrical 1 kV (power lines) asymmetrical
Information on IEC – / VDE – safety		
Measurement of clearance and creepage distance	IEC 60664, IEC 61131-2, EN 50178 UL 508, CSA C22.2 No.142 With LOGO! 230 R/RC also VDE 0631	Fulfilled
Insulation strength	IEC 61131-2	Fulfilled

A.2 Technical Data: LOGO! 230... and LOGO! DM8 230R

	LOGO! 230 RC **LOGO! 230 RCo**	**LOGO! DM8 230R**
Power supply		
Input voltage	115/240 V AC/DC	115/240 V AC/DC
Permissible range	85 ... 253 V AC 85 ... 253 V DC	85 ... 253 V AC 85 ... 253 V DC
Permissible mains frequency	47 ... 63 Hz	47 ... 63 Hz
Power consumption		
• 115 V AC	10 ... 30 mA	10 ... 30 mA
• 240 V AC	10 ... 20 mA	10 ... 20 mA
• 115 VDC	5 ... 15 mA	5 ... 15 mA
• 240 V DC	5 ... 10 mA	5 ... 10 mA
Voltage failure buffering		
• 115 V AC/DC	typ. 10 ms	typ. 10 ms
• 240 V AC/DC	typ. 20 ms	typ. 20 ms
Power loss at		
• 115 V AC	1.1 ... 3.5 W	1.1 ... 3.5 W
• 240 V AC	2.4 ... 4.8 W	2.4 ... 4.8 W
• 115V DC	0.5 ... 1.8 W	0.5 ... 1.8 W
• 240 V DC	1.2 ... 2.4 W	1.2 ... 2.4 W
Buffering the clock at 25 °C	typ. 80h	
Accuracy of the real–time clock	max. ± 5 s / Tag	
Digital inputs		
Number	8	4
Electrical isolation	No	No

	LOGO! 230 RC **LOGO! 230 RCo**	**LOGO! DM8 230R**
Input voltage L1		
• Signal 0	< 40 V AC	< 40 V AC
• Signal 1	> 79 V AC	> 79 V AC
• Signal 0	< 30 V AC	< 30 V AC
• Signal 1	> 79 V AC	> 79 V AC
Input current at		
• Signal 0	< 0.03 mA	< 0.03 mA
• Signal 1	> 0.08 mA	> 0.08 mA
Delay time at		
• 0 to 1	typ. 50 ms	typ. 50 ms
• 1 to 0	typ. 50 ms	typ. 50 ms
Line length (unshielded)	100 m	100 m
Digital outputs		
Number	4	4
Output type	Relay outputs	Relay outputs
Electrical isolation	Yes	Yes
In groups of	1	1
Activation of digital input	Yes	Yes
Continuous current I_{th}	max. 10 A per relay	max. 10 A per relay and max. 20 A across all 4 relays
Incandescent lamp load (25,000 switching cycles) at		
230/240 V	1000 W	1000 W
115/120 V	500 W	500 W
Fluorescent tubes with choke (25,000 switching cycles)	10 x 58 W (at 230/240 V AC)	10 x 58 W (at 230/240 V AC)

	LOGO! 230 RC **LOGO! 230 RCo**	**LOGO! DM8 230R**
Fluorescent tubes, conventionally compensated (25,000 switching cycles)	1 x 58 W (at 230/240 V AC)	1 x 58 W (at 230/240 V AC)
Fluorescent tubes, uncompensated (25,000 switching cycles)	10 x 58 W (at 230/240 V AC)	10 x 58 W (at 230/240 V AC)
Short circuit–proof cos 1	Power protection B16 600A	Power protection B16 600A
Short–circuit proof cos 0.5 to 0.7	Power protection B16 900A	Power protection B16 900A
Derating	none; across the total temperature range	none; across the total temperature range
Parallel switching of outputs to increase power	Not permitted	Not permitted
Protection of output relay (if desired)	max. 16 A, characteristic B16	max. 16 A, characteristic B16
Switching rate		
Mechanical	10 Hz	10 Hz
Ohmic load/lamp load	2 Hz	2 Hz
Inductive load	0.5 Hz	0.5 Hz

A.3 Technical Data: LOGO! 24... and LOGO! DM8 24

	LOGO! LOGO! 24 **DM8 24**	**LOGO! 24 RC (AC)** **LOGO! 24 RCo (AC)**
Power supply		
Input voltage	24 V DC	24 V AC
Permissible range	20.4 ... 28.8 V DC	20.4 ... 26.4 V AC
Reverse polarity protection	Yes	
Permissible mains frequency		47 ... 63 Hz
Power consumption from 24 V DC	**LOGO! 24** 10 ... 25 mA **LOGO! DM8 24** 30 ... 45 mA 0.3 A per output	120 ... 20 mA
Voltage failure buffering		typ. 5 ms
Power loss at 24 V	**LOGO!24** 0,2 ... 0,6 W **LOGO! DM8 24** 0.8 ... 1.1 W	0.5 ... 2.9 W (AC)
Buffering the clock at 25 °C		typ. 80h
Accuracy of the real–time clock		max. ±5 s / Tag
Digital inputs		
Number	**LOGO! 24**: 8 **LOGO! DM8 24**: 4	8
Electrical isolation	No	No
Input voltage	L+	L
• Signal 0	< 5 V DC	< 5 V AC
• Signal 1	> 8 V DC	> 12 V AC

	LOGO! LOGO! 24 **DM8 24**	**LOGO! 24 RC (AC)** **LOGO! 24 RCo (AC)**
Input current at		
- Signal 0	< 1.0 mA (I1...I6) < 0.05 mA (I7, I8)	< 1.0 mA
- Signal 1	> 1.5 mA (I1... I6) > 0.1 mA (I7, I8)	> 2.5 mA
Delay time at		
- 0 to 1	typ. 1.5 ms (I1...I4) <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 1.5 ms
- 1 to 0	typ. 1.5 ms (I1...I4) <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 15 ms
Line length (unshielded)	100 m	100 m
Analog inputs		
Number	only **LOGO! 24**: 2 (I7 and I8)	
Range	0 ... 10 V DC	
max. Input voltage	28,8 V DC	
Digital outputs		
Number	4	4
Output type	Transistor, current–sourcing	Relay outputs
Electrical isolation	No	Yes
In groups of		1
Activation of digital input	Yes	Yes
Output voltage	≙ Supply voltage	
Output current	max. 0.3 A	
Continuous current I_{th}		max. 10 A

	LOGO! LOGO! 24 DM8 24	**LOGO! 24 RC (AC) LOGO! 24 RCo (AC)**
Incandescent lamp load (25,000 switching cycles) at		1000 W
Fluorescent tubes with choke (25,000 switching cycles)		10 x 58 W
Fluorescent tubes, conventionally compensated (25,000 switching cycles)		1 x 58 W
Fluorescent tubes, uncompensated (25,000 switching cycles)		10 x 58 W
Short circuit–proof and overload–proof	Yes	
Short–circuit current limitation	Approx. 1 A	
Derating	none; across the total temperature range	none; across the total temperature range
Short circuit–proof cos 1		Power protection B16 600A
Short–circuit proof cos 0.5 to 0.7		Power protection B16 900A
Parallel switching of outputs to increase power	Not permitted	Not permitted
Protection of output relay (if desired)		max. 16 A, characteristic B16
Switching rate		
Mechanical		10 Hz
Electrical	10 Hz	
Ohmic load/lamp load	10 Hz	2 Hz
Inductive load	0.5 Hz	0.5 Hz

A.4 Technical Data: LOGO! 12/24... and LOGO! DM8 12/24R

	LOGO! LOGO! 12/24 RC LOGO!	**LOGO! DM8 12/24R**
Power supply		
Input voltage	12/24 V DC	12/24 V DC
Permissible range	10.8 ... 15.6 V DC 20.4 ... 28.8 V DC	10.8 ... 15.6 V DC 20.4 ... 28.8 V DC
Reverse polarity protection	Yes	Yes
Power consumption • 12 V DC • 24 V DC	10 ... 100 mA 10 ... 75 mA	30 ... 100 mA 30 ... 75 mA
Voltage failure buffering • 12 V DC • 24 V DC	typ. 2 ms typ. 5 ms	typ. 2 ms typ. 5 ms
Power loss • 12 V DC • 24 V DC	0.1 ... 1.2 W 0.2 ... 1.8 W	0.4 ... 1.2 W 0.8 ... 1.8 W
Buffering of the clock at 25 °C	typ. 80h	
Accuracy of the real–time clock	max. ±5 s / day	
Electrical isolation	No	No
Digital inputs		
Number	8	4
Electrical isolation	No	No
Input voltage L+ • Signal 0 • Signal 1	< 5 V DC > 8 V DC	< 5 V DC > 8 V DC

	LOGO! LOGO! 12/24 RC LOGO!	**LOGO! DM8 12/24R**
Input current at		
• Signal 0	< 1.0 mA (I1...I6) < 0.05 mA (I7, I8)	< 1.0 mA
• Signal 1	> 1.5 mA (I1... I6) > 0.1 mA (I7, I8)	> 1.5 mA
Delay time at		
• 0 to 1	typ. 1.5 ms <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 1.5 ms
• 1 to 0	typ. 1.5 ms <1.0 ms (I5, I6) typ. 300 ms (I7,I8)	typ. 1.5 ms
Line length (unshielded)	100 m	100 m
Analog inputs		
Number	2 (I7, I8)	
Range	0 ... 10 V DC	
max. Input voltage	28,8 V DC	
Digital outputs		
Number	4	4
Output type	Relay outputs	Relay outputs
Electrical isolation	Yes	Yes
In groups of	1	1
Activation of digital input	Yes	Yes
Output voltage		
Output current		
Continuous current I_{th} (per terminal)	max. 10 A per relay	max. 10 A per relay and max. 20 A across all 4 relays

	LOGO! LOGO! 12/24 RC LOGO!	**LOGO! DM8 12/24R**
Incandescent lamp load (25,000 switching cycles) at	1000 W	1000 W
Fluorescent tubes with choke (25,000 switching cycles)	10 x 58 W	10 x 58 W
Fluorescent tubes, conventionally compensated (25,000 switching cycles)	1 x 58 W	1 x 58 W
Fluorescent tubes, uncompensated (25,000 switching cycles)	10 x 58 W	10 x 58 W
Short circuit–proof and overload–proof		
Short–circuit current limitation		
Derating	none; across the total temperature range	none; across the total temperature range
Short circuit–proof cos 1	Power protection B16 600A	Power protection B16 600A
Short–circuit proof cos 0.5 to 0.7	Power protection B16 900A	Power protection B16 900A
Parallel switching of outputs to increase power	Not permitted	Not permitted
Protection of output relay (if desired)	max. 16 A, characteristic B16	max. 16 A, characteristic B16
Switching rate		
Mechanical	10 Hz	10 Hz
Electrical		
Ohmic load/lamp load	2 Hz	2 Hz
Inductive load	0.5 Hz	0.5 Hz

A.5 Technical Data: LOGO! AM 2

	LOGO! AM 2
Power supply	
Input voltage	12/24 V DC
Permissible range	10.8 ... 15.6 V DC 20.4 ... 28.8 V DC
Power consumption	25 ... 50 mA
Voltage failure buffering	typ. 5 ms
Power loss at	
• 12 V	0.3 ... 0.6 W
• 24 V	0.6 ... 1.2 W
Electrical isolation	No
Reverse polarity protection	Yes
Ground terminal	for connecting ground and shielding of the analog measuring line.
Analog inputs	
Number	2
Type	Unipolar
Input range	0–10 V or 0–20 mA
Resolution	10 bit, standardized to 0–1000
Cycle time for analog value generation	50 ms
Electrical isolation	No
Line length (shielded and twisted)	10m
Encoder supply voltage	none
Error limit	+/– 1.5 %
Interference frequency suppression	55 Hz

Switching capacity and service life of the relay outputs

Ohmic load

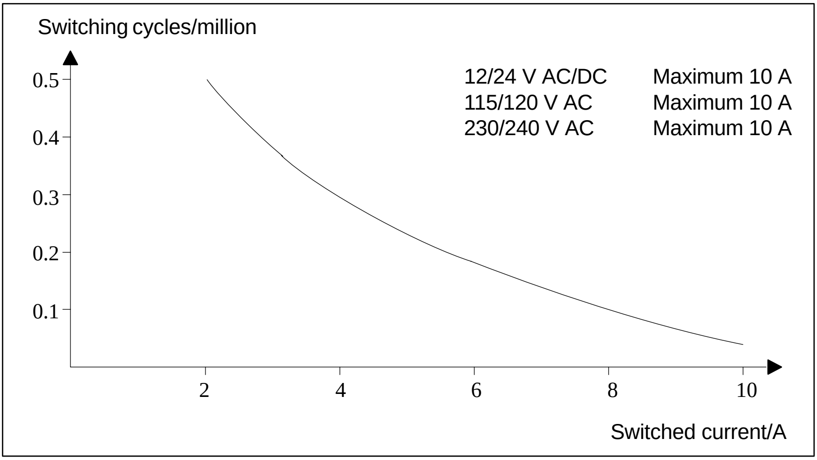


Figure A Switching capacity and service life of the contacts at ohmic load (heating)

Inductive load

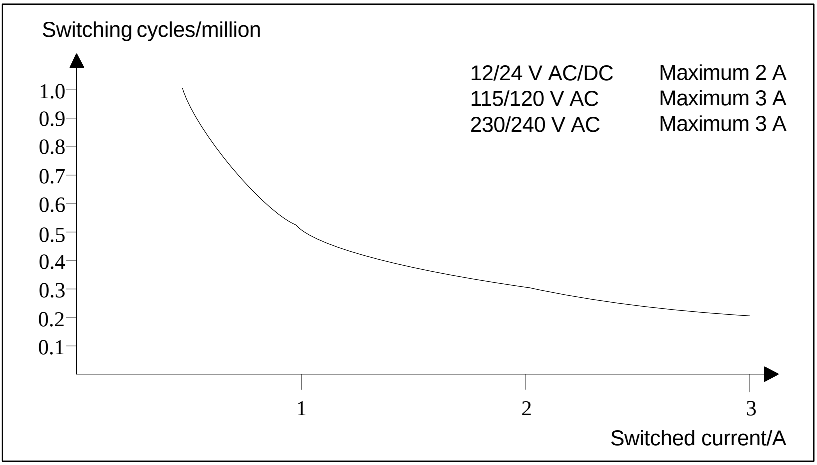


Figure B Switching capacity and service life of the contacts at highly inductive load to IEC 947-5-1 DC 13/AC 15 (contactors, solenoid coils, motors)

A.6 Technical Data: LOGO!Power 12 V

LOGO! Power 12 V is a switched–mode primary power supply unit for LOGO! devices. Two current intensities are available.

	LOGO! Power 12 V / 1.9 A	**LOGO! Power 12 V / 4.5 A**
Input data		
Input voltage	120 ... 230 V AC	
Permissible range	85 ... 264 V AC	
Permissible mains frequency	47 ... 63 Hz	
Voltage failure buffering	> 40 ms (at 187 V AC)	
Input current	0.3 ... 0.18 A	0.73 ... 0.43 A
Make current (25˚C)	≤ 15 A	≤ 30 A
Device protection	Internal	
Recommended circuit breaker (IEC 898) in mains infeed	> 6 A characteristic D > 10 A characteristic C	
Output data		
Output voltage	12 V DC	
Overall tolerance	+/- 3 %	
Adjustment range	11.1 ... 12.9 V DC	
Residual ripple	< 200 mV$_{pp}$	
Output current	1.9 A	4.5 A
Overcurrent limiting	2.4 A	4.5 A
Efficiency	≥ 80 %	
Parallel switching to increase power	Yes	
Electromagnetic compatibility		
Interference suppression	EN 50081–1, EN 55022 Class B	
Interference immunity	EN 50082-2	

	LOGO! Power 12 V / 1.9 A	**LOGO! Power 12 V / 4.5 A**
Safety		
Electrical isolation, primary/ secondary	Yes, SELV (to EN 60950/VDE 0805)	
Safety class	II (to IEC 536/VDE 0106 T1)	
Type of protection	IP 20 (to EN 60529/VDE 470 T1)	
CE marking	Yes	
UL/CSA certification	Yes; UL 508 / CSA 22.2	
FM approval	In preparation	
General details		
Ambient temperature range	–20 ... +55°C, natural convection	
Storage and transport temperature	- 40 ... +70°C	
Connections on input	respectively on terminal (1 x. 2.5 ^{mm2} o. 2 x 1.5 mm^2), each for L1 and N	
Connections on output	Two terminals (1x.2.5 mm^2 o. 2x 1.5 mm^2), each for L+ and M	
Installation	On 35 mm DIN rail, snap–on	
Dimensions in mm (WxHxD)	72 x 80 x 55	126 x 90 x 55
Approx. weight	0.2 kg	0.4 kg

A.7 Technical Data: LOGO!Power 24 V

LOGO! Power 24 V is a switched–mode primary power supply unit for LOGO! devices. Two current intensities are available.

	LOGO! Power 24 V / 1,3 A	**LOGO! Power 24 V / 2.5 A**
Input data		
Input voltage	120 ... 230 V AC	
Permissible range	85 ... 264 V AC	
Permissible mains frequency	47 ... 63 Hz	
Voltage failure buffering	40 ms (at 187 V AC)	
Input current	0.48 ... 0.3 A	0.85 ... 0.5 A
Make current (25˚C)	< 15 A	< 30 A
Device protection	Internal	
Recommended circuit breaker (IEC 898) in mains in-feed	> 6 A characteristic D > 10 A characteristic C	
Output data		
Output voltage	24 V DC	
Overall tolerance	+/- 3 %	
Adjustment range	22.2 ... 25.8 V DC	
Residual ripple	< 250 mV_{pp}	
Output current	1.3 A	2.5 A
Overcurrent limiting	1.6 A	2.8 A
Efficiency	> 80 %	
Parallel switching to increase power	Yes	
Electromagnetic compatibility		
Interference suppression	EN 50081–1, EN 55022 Class B	
Interference immunity	EN 50082-2	

	LOGO! Power 24 V / 1,3 A	**LOGO! Power 24 V / 2.5 A**
Safety		
Electrical isolation, primary/ secondary	Yes, SELV (to EN 60950/VDE 0805)	
Safety class	II (to IEC 536/VDE 0106 T1)	
Type of protection	IP 20 (to EN 60529/VDE 470 T1)	
CE marking	Yes	
UL/CSA certification	Yes; UL 508 / CSA 22.2	
FM approval	yes; C 6052, DivL	

A.8 Technical Data: LOGO! Contact 24/230

LOGO! Contact 24 and LOGO! Contact 230 are switching modules for direct switching of ohmic loads up to 20 A and motors up to 4 kW (without noise emission, hum–free).

	LOGO! Contact 24	**LOGO! Contact 230**
Operating voltage	24 V DC	230 V AC; 50/60 Hz
Switching capacity		
Utilization category AC-1: Switching of ohmic loads at 55˚C		
Operating current at 400 V	20 A	
Output of three–phase loads at 400 V	13 kW	
Utilization category AC-2, AC-3: Motor with slip ring induction/cage armature		
Operating current at 400 V	8.4 A	
Output of three–phase loads at 400 V	4 kW	
Short–circuit protection:		
Assignment type 1	25 A	
Assignment type 2	10 A	
Connecting leads	Finely stranded with wire end ferrules single–core 2x (0.75 to 2.5) mm^2 2x (1 to 2.5) mm^2 1 x 4 mm^2	
Dimensions (WxHxD)	36 x 72 x 55	
Ambient temperature	-25 ... +55˚C	
Storage temperature	-50 ... +80˚C	

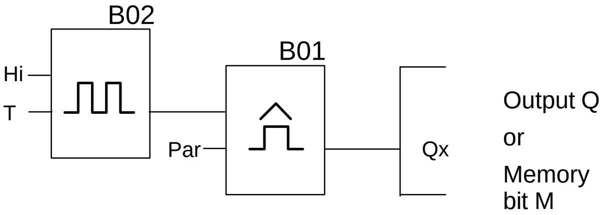
B Determining the Cycle Time

The program cycle is the complete execution of the program, that is, primarily the reading in of the inputs, the processing of the program and the subsequent reading out of the outputs. The cycle time is the time required to execute a program once in full.

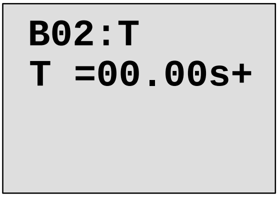
The time required for a program cycle can be determined using a short test program. This test program is generated in LOGO!. In parameter assignment mode it outputs a value used to calculate the actual cycle time.

Test program

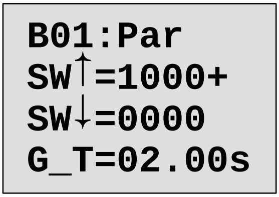
1. Start to create the test program by linking an output or memory bit to a threshold switch. At the input of the switch you can then connect a clock generator that is switched on with a hi signal.



2. Configure the two blocks as shown below. Due to the pulse rate of a 0 seconds a pulse is generated in every program cycle. The time interval of the threshold switch is set to 2 seconds.

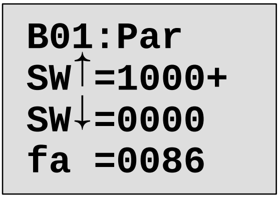


```
B02:T
T =00.00s+
```



```
B01:Par
SW↑=1000+
SW↓=0000
G_T=02.00s
```

3. Then start the program and switch the LOGO! to parameter assignment mode. You can view the parameters of the threshold switch in this parameter assignment mode.



```
B01:Par
SW↑=1000+
SW↓=0000
fa =0086
```

fa= is the sum of the pulses measured per time unit G_T

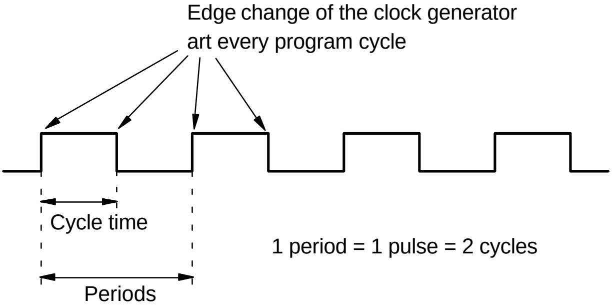
4. The reciprocal value of Fe is equal to the cycle time of the LOGO! with the program currently in its memory.

   1/Fe = cycle time in s

Explanation

The output signal of the clock pulse generator (T=0) is toggled at every program cycle. Thus, one logic level (high or low) width is exactly equivalent to the length of one cycle. Hence, a period lasts 2 cycles.

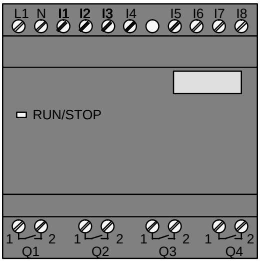
The threshold switch indicates the ratio of periods per 2 seconds which results in the ratio of cycles per second.


Edge change of the clock generator
art every program cycle
Cycle time
1 period = 1 pulse = 2 cycles
Periods

C LOGO! without display

The LOGO! version without display is intended for use in specific applications not requiring operating elements such as a keyboard or a display 12/24 RCo, LOGO! 24 RCo and LOGO! 230 RCo.

For example, this is what a LOGO! 230 RCo looks like:



Less is definitely more!

Your benefits:

- Improved economies without the operating element.
- Requires less switch cabinet space than conventional hardware.
- Substantial benefits with regard to flexibility and prime costs compared to stand–alone electronic switchgear.
- Of advantage even for applications in which merely two or three conventional switching devices can be replaced.
- Very easy to use.
- Cannot be used by unauthorized persons.
- Compatible with LOGO! basic variants.
- Offers the option to read data via LOGO!Soft Comfort,

Programming without an operating element

You can program the LOGO! without display in two ways:

- On the PC, create a program with LOGO!Soft Comfort and transfer it to the LOGO!
- Use a LOGO! program module/card and transfer the program contained in this device to the LOGO! Without display

Operating characteristics

The LOGO! is ready for operation when power is switched on. Switching off a LOGO! without display is equivalent to disconnecting the power supply, e.g. as if you remove the plug.

LOGO! RCo versions cannot be prepared for data transfer per keyboard and the programs cannot be started or stopped per pushbutton. This is why the startup behavior of LOGO! RCo versions has been slightly modified:

Startup characteristics

The program in a module/card that is plugged into the LOGO! is copied immediately to the LOGO! after power is switched on. An existing program is overwritten.

If a PC cable is connected the LOGO! switches automatically to PC ↔ LOGO mode at startup. The PC software LOGO!Soft Comfort can be used to read the program of the LOGO! or to save them to the LOGO!,

After power is switched on, the LOGO! automatically switches from STOP to RUN if a valid program exists in memory.

Operating Status Indicator

Operating states, e.g. Power On, RUN and STOP are indicated by an LED on the front hood.

• Red LED:	Power On/STOP
• Green LED:	Power On/RUN

The red LED is lit after Power On and in all LOGO! states other than RUN. The green LED is lit when LOGO! is in RUN mode.

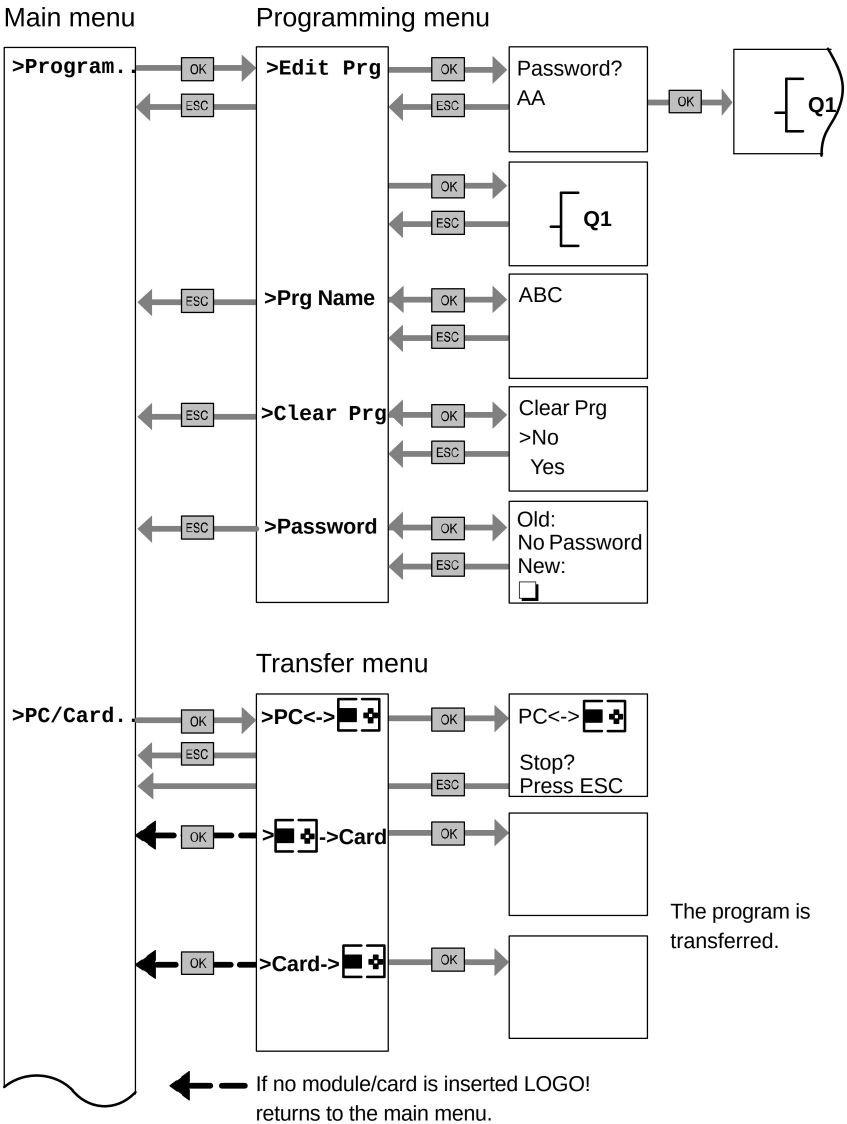
Reading the operating hours counter in STOP mode

Prerequisites: The PC link must be plugged in prior to Power On.

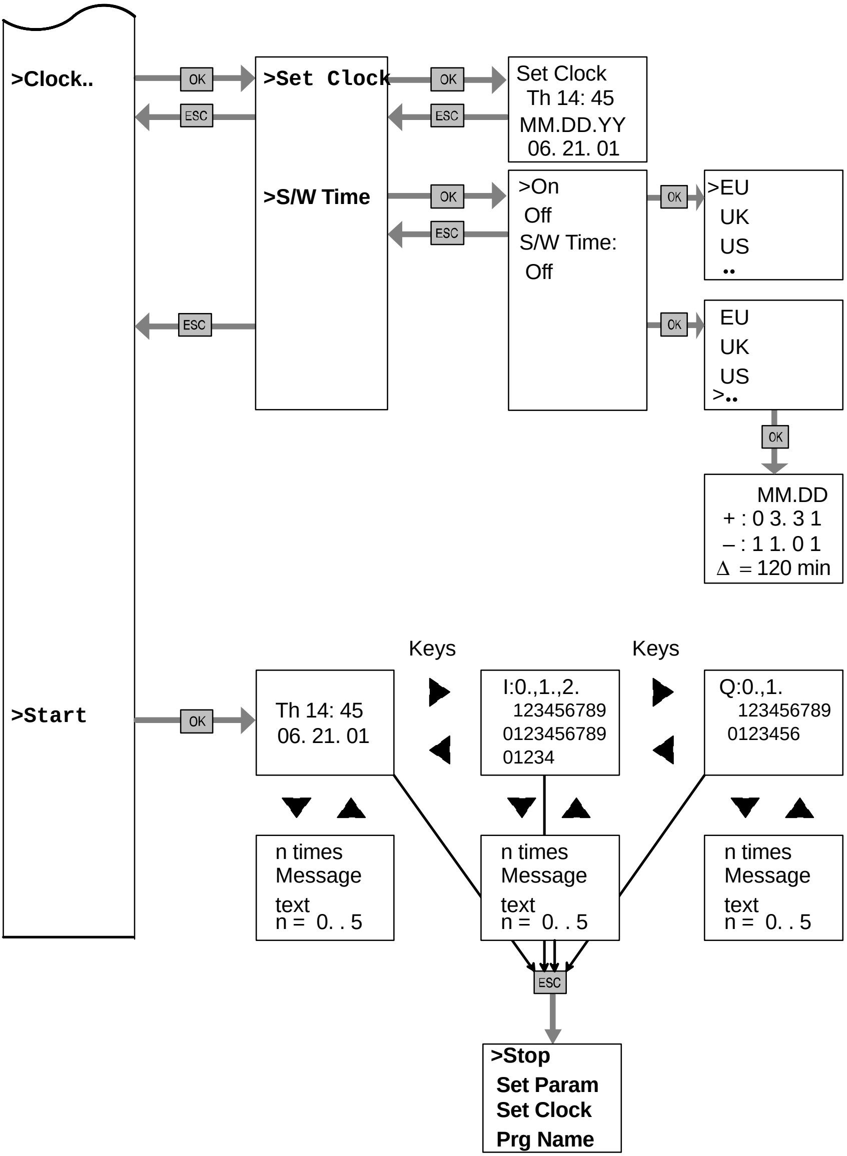
In LOGO!Soft Comfort as of V 3.0 (refer to Chapter 7) you can read the MN and OT values of the hours counter. The hours counter values can be fetched without having to enter a password.

If your LOGO! without display is equipped with a red module you cannot fetch the values of the hours counter, because when you remove the module (in order to connect the PC link) you delete the program in the LOGO!. .

D LOGO! Menu structure

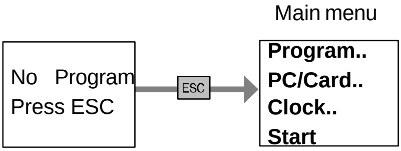


If no module/card is inserted LOGO! returns to the main menu.

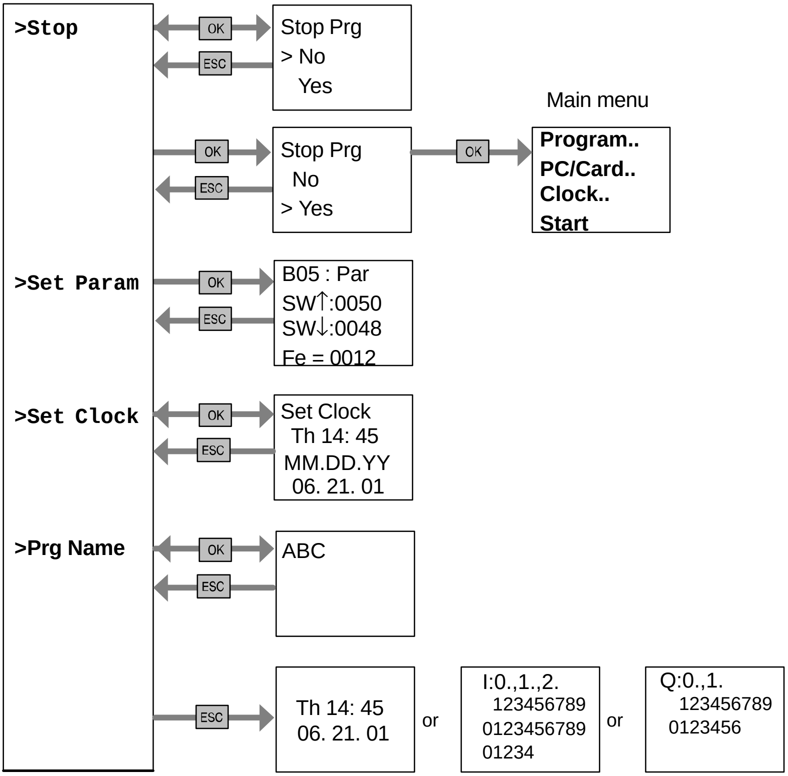


Parameter assignment menu

No program after Power on



Parameter assignment menu



Order Numbers

Table A

Variant	Designation	Order number
basic	LOGO! 12/24 RC * LOGO! 24): LOGO! 24 RC (AC) LOGO! 230 RC	6ED1 052–1MD00–0BA3 6ED1 052–1CC00–0BA3 6ED1 052–1HB00–0BA3 6ED1 052–1FB00–0BA3
Basic without display	LOGO! 12/24 RCo * LOGO! 24 RCo (AC) LOGO! 230 RCo	6ED1 052–2MD00–0BA3 6ED1 052–2HB00–0BA3 6ED1 052–2FB00–0BA3
Digital module	LOGO! DM8 12/24R LOGO! DM8 24 LOGO! DM8 230R	6ED1 055–1MB00–0BA0 6ED1 055–1CC00–0BA0 6ED1 055–1FB00–0BA0
Analog module	LOGO! AM2	6ED1 055–1MA00–0BA0

*: Also with analog inputs

Table B

Accessories	Designation	Order number
Software	LOGO!Soft Comfort V3.0 Upgrade Comfort V1.0, V2.0 to V3.0	6ED1 058–0BA00–0YC2 6ED1 058–0CA00–0YC1
Program modules	Yellow card Red card	6ED1 056–1BA00–0AA0 6ED1 056–4BA00–0AA0
Switching module	LOGO!Contact 24 V LOGO!Contact 230 V	6ED1 057–4CA00–0AA0 6ED1 057–4EA00–0AA0
Power modules	LOGO!Power 12V/1.9A LOGO!Power 12V/4.5A LOGO!Power 24V/1.3A LOGO!Power 24V/2.5A	6EP1 321–1SH01 6EP1 322–1SH01 6EP1 331–1SH01 6EP1 332–1SH41
Others	PC cable Manual	6ED1 057–1AA00–0BA0 6ED1 050–1AA00–0BE4

Abbreviations

AM	Analog module
B01	Block number B01
BN	Block number
C	in the LOGO! device designation: integrated clock
Cnt	Count = input for counter
Co	Connector
Dir	Direction (e.g. for counter)
DM	Digital module
En	Enable (e.g. for switching on the clock pulse generator)
BF	Basic functions
No	Cams (time switch parameters)
o	in the LOGO! device designation: **without** display
Par	Parameter
R	Reset
R	in the LOGO! device designation: Relay outputs
S	Set (e.g. setting the latching relay)
SF	Special functions
T	Time (parameter)
S	Segment
Trg	Trigger (parameter)

0BA3 devices: the latest LOGO! Basic version, described in this Manual.

Index