# LOGO! Manual

This manual has the order number:
6ED1050-1AA00-0BE7

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Safety Guidelines
This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring to property damage only have no safety alert symbol. The notices shown below are graded according to the degree of danger.

Warning
indicates that death or severe personal injury may result if proper precautions are not taken.

Caution
with a safety alert symbol indicates that minor personal injury can result if proper precautions are not taken.

Caution
without a safety alert symbol indicates that property damage can result if proper precautions are not taken.

Notice
indicates that an unintended result or situation can occur if the corresponding notice is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel
The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by qualified personnel. Within the context of the safety notices in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage
Note the following:

Warning
This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks
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Disclaimer of Liability
We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.
Preface

Dear customer

We thank you for purchasing LOGO! and congratulate you on your decision. With 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 easy operation, LOGO! offers you the utmost efficiency for almost any application.

Purpose of this manual

This LOGO! manual provides you with information about the creation of circuit programs, about the installation and use of LOGO! 0BA6 basic modules, the LOGO! TD (Text Display) and the LOGO! expansion modules, and about their compatibility with the previous 0BA0-0BA5 versions (0BAX are the last four characters of the order number of the basic modules and differentiate the device series).

LOGO!'s place in information technology

The wiring information in your LOGO! manual is also found in the LOGO! Product Info included with all devices. For further information on programming the LOGO! on your PC, refer to the Online Help for LOGO!Soft Comfort.

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

Guide

The manual is divided into 8 chapters:

- Getting started with LOGO!
- LOGO! installation and wiring
- Programming LOGO!
- LOGO! functions
- Configuring LOGO!
- LOGO! memory and battery cards
- LOGO! software
- Applications

The manual also includes appendices A - F, which follow the chapters.
Valid range of this manual
The manual applies to devices of series 0BA6.

New features of the LOGO! 0BA6 device series

- The LOGO! TD (Text Display) provides an additional display device for messages, and contains four cursor keys and four functions keys that can be used in the circuit program.
- The new LOGO! Battery Card and the LOGO! Combined Memory/Battery Card provide up to two years of backup time for the real-time clock.
- Additional optional analog inputs and fast digital inputs are available on some of the LOGO! 0BA6 basic modules.
- LOGO! 0BA6 basic module menus can be displayed in ten supported languages. You have a configuration choice to specify the language for LOGO! menus.
- New instruction blocks are available: Pulse Width Modulator (PWM) and Analog Math.
- A Modem interface between a PC and LOGO! 0BA6 basic module is supported.
- USB PC cable between a PC and LOGO! basic module is provided.
- An expansion cable for connecting expansion modules over two racks is available, and can be ordered separately. All 0BA6 series expansion modules provide an interface for this expansion cable.
- This series supports 0/4-20 mA for the AM2 AQ analog outputs. Note that the LOGO! AM2 AQ module that supports 0/4-20 mA outputs will be released some time later than LOGO! 0BA6 basic module.
- You can now have up to 200 program blocks in your circuit program.

Additional differences compared to previous devices (0BA0 to 0BA5)

- Enhancements to message texts.
- Extended set of reference parameters for function blocks.
- Enhancements to up/down counter, hours counter, yearly timer and analog watchdog instruction blocks.

Additional support

http://www.siemens.com/logo

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Fax: +49 (0)180 5050-223
E-Mail: adsupport@siemens.com
# LOGO! Manual

## Preface

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Getting started with LOGO!

Here’s LOGO!

LOGO! is a universal logic module made by Siemens that integrates:

- Controls
- Operator and display panel with background lighting
- Power supply
- Interface for expansion modules
- Interface for the memory card, battery card, combined memory/battery card, or a PC cable
- Interface for an optional text display (TD) module
- Pre-configured standard functions, for example, on- and off-delays, pulse relay and softkey
- Timers
- Digital and analog flags
- Inputs and outputs, according to the device type

What LOGO! can do for you

LOGO! offers solutions for domestic and installation engineering applications such as stairway lighting, external lighting, sun blinds, shutters, shop window lighting and more; switch cabinet engineering, as well as for mechanical and apparatus engineering such as gate control systems, air-conditioning systems, and air-water pumps.

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

Special versions without operator panel and display unit are available for series production applications in small machine, apparatus, switching cabinet and installation engineering.
Getting started with LOGO!

**Which devices are available?**

LOGO! Basic is available in two voltage classes:

- **Class 1 ≤ 24 V**, i.e. 12 V DC, 24 V DC, 24 V AC
- **Class 2 > 24 V**, i.e. 115...240 V AC/DC

LOGO! Basic is available in two versions:

- **With display**: 8 inputs and 4 outputs
- **Without display** ("LOGO! Pure"): 8 inputs and 4 outputs

Each version is integrated into four subunits, is equipped with an expansion interface and LOGO! TD interface and provides pre-configured standard and special function blocks for the creation of your circuit program.

**Which expansion modules are available?**

- **LOGO! digital modules DM8...** are available for operation with 12 V DC, 24 V AC/DC and 115...240 V AC/DC, and are equipped with four inputs and four outputs.
- **LOGO! digital modules DM16...** are available for operation with 24 V DC and 115...240 V AC/DC, and are equipped with eight inputs and eight outputs.
- **LOGO! analog modules** are available for operation with 24 V DC and some with 12 V DC, depending on the specific module. Each is equipped with two analog inputs, two Pt100 inputs or two analog outputs.

The digital/analog modules are integrated in two or four subunits. Each one is equipped with two expansion interfaces for connecting additional modules.

You can also use a LOGO! expansion cable to install expansion modules on two or more separate rails. This feature can be helpful when installation space is limited. See Appendix E for the expansion cable order number, and chapter 2 for connection information.

**Which display modules are available?**

- **LOGO! Basic with display**
- **LOGO! TD**

The LOGO! TD is available with the 0BA6 series. It provides an additional and wider display than the Basic module. It has four function keys that you can program in your circuit program. Like the LOGO! Basic module, it has four cursor keys, an ESC and OK key that you can also program in your circuit program and use for navigation on the LOGO! TD.
Which communication modules are available?

- LOGO! communication module (CM) AS interface, which is described in more detail in a separate documentation.
  
The communication module has four virtual inputs and outputs, and acts as an interface between an AS-Interface system and a LOGO! system. The module enables four data bits to be transferred from the LOGO! Basic to the AS-Interface system and vice versa.

- LOGO! communication module (CM) EIB/KNX, which is described in more detail in a separate documentation.

  CM EIB/KNX is a communication module (CM) for connecting the LOGO! to the EIB.

  As an interface to EIB, CM EIB/KNX makes it possible to communicate with other EIB devices. To do this, you store a configuration in the CM EIB/KNX that specifies the inputs/outputs of the LOGO! to the EIB bus that are to be mapped. You can interconnect the corresponding inputs/outputs using LOGO! functions.
It’s your choice

The various LOGO! Basic versions, expansion modules, LOGO! TD and communication modules offer you a highly flexible and adaptive system to suit your specific tasks.

The LOGO! system offers you many solutions such as for small domestic installations, simple automation tasks, and even complex engineering tasks involving its integration into a bus system (e.g. communication module AS interface).

Note

LOGO! Basic may only be equipped with expansion modules of the same voltage class. Mechanical encoding pins in the housing prevent you from connecting devices of a different voltage class.

Exception: The left-hand interface of an analog module or communication module is galvanically isolated.

This type of expansion module can therefore be connected to devices of a different voltage class. See also Chapter 2.1.

A LOGO! TD, if used, can be connected only to a LOGO! 0BA6 Basic module.

Each LOGO! Basic provides the following connections for the creation of the circuit program, regardless of the number of connected modules:

- Digital inputs I1 to I24
- Analog inputs AI1 to AI8
- Digital outputs Q1 to Q16
- Analog outputs AQ1 and AQ2
- Digital flag blocks M1 to M27:
  - M8: Startup flag
  - M25: Backlight flag: LOGO! Display
  - M26: Backlight flag: LOGO! TD
  - M27: Message text character set flag
- Analog flag blocks AM1 to AM6
- Shift register bits S1 to S8
- 4 cursor keys
- 16 blank outputs X1 to X16
The LOGO! structure

1. Power supply
2. Inputs
3. Outputs
4. Module slot with cap
5. Control panel (not for RC0)
6. LCD (not for RC0)
7. RUN/STOP indicator
8. Expansion interface
9. Mechanical coding pins
10. Mechanical coding sockets
11. Slide
12. LOGO! TD Cable connector
Getting started with LOGO!

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

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

LOGO! expansion module (e.g.: DM16 24R)

1. Power supply
2. Inputs
3. Outputs
4. Module slot with cap

5. Control panel (not for RCo)
6. LCD (not for RCo)
7. RUN/STOP indicator
8. Expansion interface
9. Mechanical coding pins
10. Mechanical coding sockets
11. Slide
12. LOGO! TD Cable connector

13. Power supply
14. RUN/STOP indicator
15. Slide
16. Mechanical coding pins
17. Mechanical coding sockets
18. Expansion interface
Getting started with LOGO!

LOGO! AM 2

1. Power supply
2. Inputs
3. RUN/STOP indicator
4. Expansion interface
5. Mechanical coding pins
6. Mechanical coding sockets
7. PE terminal, for connecting earth and the shielding of analog measuring cables.
8. Slide
9. Power supply
10. Outputs
11. RUN/STOP indicator
12. Expansion interface
13. Mechanical coding pins
14. Mechanical coding sockets
15. PE terminal, for connecting earth
Getting started with LOGO!

LOGO! CM EIB/KNX

1. Power supply
2. EIB bus connection
3. RUN/STOP indicator
4. Expansion interface
5. Mechanical coding pins
6. Mechanical coding sockets
7. LED for status display of EIB/KNX
8. Programming button
9. Slide
LOGO! TD

1) Communication interface
2) Power supply

The LOGO! TD includes a wider display area than the LOGO! Display. It includes four programmable cursor keys, four programmable function keys, and an ESC and OK key. You use the included LOGO! TD cable to connect from the communication interface on the right side of the LOGO! TD to the corresponding interface on the left side of the LOGO! Basic module.

How to identify LOGO!

The LOGO! identifier informs you of various properties:

- 12/24: 12/24 V DC version
- 230: 115...240 V AC/DC version
- R: Relay outputs (without R: solid-state outputs)
- C: Integrated weekly timer
- o: Version without display (“LOGO! Pure”)
- DM: Digital module
- AM: Analog module
- CM: Communication module (e.g. EIB/KNX module)
- TD: Text Display
Symbols

- Version with display unit is equipped with 8 inputs and 4 outputs
- Version without display unit is equipped with 8 inputs and 4 outputs
- The digital module is equipped with 4 digital inputs and 4 digital outputs
- The digital module is equipped with 8 digital inputs and 8 digital outputs
- The analog module is equipped with 2 analog inputs or two analog outputs, according to the device type
- The communication module (CM); for example, AS Interface is equipped with 4 virtual inputs and 4 virtual outputs
- The LOGO! TD module
## Versions

The following LOGO! versions are available:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Designation</th>
<th>Supply voltage</th>
<th>Inputs</th>
<th>Outputs</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOGO! 12/24 RC</td>
<td>12/24 V DC</td>
<td>8 digital (1)</td>
<td>4 relays (10 A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOGO! 24</td>
<td>24 V DC</td>
<td>8 digital (1)</td>
<td>4 solid state 24V / 0.3A</td>
<td>no clock</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24RC (3)</td>
<td>24 V AC/24 V DC</td>
<td>8 digital</td>
<td>4 relays (10 A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOGO! 230RC (2)</td>
<td>115...240 V AC/DC</td>
<td>8 digital</td>
<td>4 relays (10 A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOGO! 12/24RCo</td>
<td>12/24 V DC</td>
<td>8 digital (1)</td>
<td>4 relays (10 A)</td>
<td>no display unit</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24o</td>
<td>24 V DC</td>
<td>8 digital (1)</td>
<td>4 solid state 24 V / 0.3A</td>
<td>no display unit</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24RCo (3)</td>
<td>24 V AC/24 V DC</td>
<td>8 digital</td>
<td>4 relays (10 A)</td>
<td>no display unit</td>
</tr>
<tr>
<td></td>
<td>LOGO! 230RCo (2)</td>
<td>115...240 V AC/DC</td>
<td>8 digital</td>
<td>4 relays (10 A)</td>
<td>no display unit</td>
</tr>
</tbody>
</table>

(1): Of those can be used alternatively: 4 analog inputs (0 ... 10V) and 4 fast digital inputs.
(2): 230 V AC versions: Two groups consisting of 4 inputs each. Each input within a group must be connected to the same phase. It is possible to interconnect groups with a different phase.
(3): The digital inputs can be operated with P or N action.

## Expansion modules

The following expansion modules can be connected to LOGO!:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Power supply</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOGO! DM 8 12/24R</td>
<td>12/24 V DC</td>
<td>4 digital</td>
<td>4 relays (5A)</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 8 24</td>
<td>24 V DC</td>
<td>4 digital</td>
<td>4 solid state 24V / 0.3A</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 8 24R (3)</td>
<td>24 V AC/DC</td>
<td>4 digital</td>
<td>4 relays (5A)</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 8 230R</td>
<td>115...240 V AC/DC</td>
<td>4 digital (1)</td>
<td>4 relays (5A)</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 16 24</td>
<td>24 V DC</td>
<td>8 digital</td>
<td>8 solid state 24V / 0.3A</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 16 24R</td>
<td>24 V DC</td>
<td>8 digital</td>
<td>8 relays (5A)</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 16 230R</td>
<td>115...240 V AC/DC</td>
<td>8 digital (4)</td>
<td>8 relays (5A)</td>
</tr>
<tr>
<td></td>
<td>LOGO! AM 2</td>
<td>12/24 V DC</td>
<td>2 analog 0 ... 10V or 0 ... 20mA (2)</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>LOGO! AM 2 PT100</td>
<td>12/24 V DC</td>
<td>2 Pt100 -50 °C to +200 °C</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>LOGO! AM 2 AQ</td>
<td>24 V DC</td>
<td>none</td>
<td>2 analog 0 ... 10 V DC 0/4...20mA (5)</td>
</tr>
</tbody>
</table>

(1): Different phases are not allowed within the inputs.
(2): 0 ... 10 V, 0 ... 20 mA can be connected optionally.
(3): Digital inputs can be operated either with P or with N action.
(4): Two groups consisting of 4 inputs each. Each input within a group must be connected to the same phase. It is possible to interconnect groups with a different phase.
(5): 0 ... 10 V, 0/4...20mA can be connected optionally.
Communication modules

The following communication modules can be connected to LOGO!:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Power supply</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
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<tr>
<td>![LOGO! CM AS Interface]</td>
<td>LOGO! CM AS Interface</td>
<td>30 V DC</td>
<td>the next four inputs after the physical inputs of LOGO! (I_n ... I_{n+3})</td>
<td>the next four outputs after the physical outputs of LOGO! (Q_n ... Q_{n+3})</td>
</tr>
<tr>
<td>![LOGO! CM EIB/KNX]</td>
<td>LOGO! CM EIB/KNX</td>
<td>24 V AC/DC</td>
<td>max. 16 virtual digital inputs (I) max. 8 virtual analog inputs (AI)</td>
<td>max. 12 virtual digital outputs (Q) max. 2 virtual analog outputs (AQ)</td>
</tr>
</tbody>
</table>

Text Display Module

The following LOGO! TD module is available:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Supply voltage</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>![LOGO! TD]</td>
<td>LOGO! TD</td>
<td>24 V AC/DC</td>
<td>LCD (128 x 64)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 V DC</td>
<td>4-row display</td>
</tr>
</tbody>
</table>

Certification and approvals

LOGO! is certified to cULus and FM.

- cULus Haz. Loc.
  - Underwriters Laboratories Inc. (UL) to
    - UL 508 (Industrial Control Equipment)
    - CSA C22.2 No. 142 (Process Control Equipment)
    - UL 1604 (Hazardous Location)
    - CSA-213 (Hazardous Location)
    APPROVED for use in
      - Class I, Division 2, Group A, B, C, D Tx
      - Class I, Zone 2, AEx, nC, IIC, Tx
      - Class I, Zone 2, Ex, nC, IIC, Tx

- FM Approval
  - Factory Mutual Research (FM) to Approval Standard Class Number 3611, 3600, 3810
    APPROVED for use in
      - Class I, Division 2, Group A, B, C, D Tx
      - Class I, Zone 2, Group IIC Tx

Note

You will find current approvals on the rating plate of the relevant module.
Warning
Risk of personal injury and material damage:
In potentially explosive atmospheres, there is a risk of personal injury or damage to material if you disconnect connectors when the system is in RUN.
In potentially explosive atmospheres, always switch off the power supply to LOGO! and its components before you disconnect any connectors.

LOGO! is issued with the CE Certificate of Conformity. It is compliant with VDE 0631 and IEC 61131-2 and interference-proof to EN 55011, Limit Class B.

Marine certification has been requested.
- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)
- Class NK (Nippon Kaiji Kyokai)
- PRS (Polski Rejestr Statkow)

LOGO! is therefore suitable for use both in industry and in the domestic area.

ID for Australia
- Our products carrying the label shown at the side are compliant with AS/NZS 2064:1997 (Class A) standard.

Recycling and Disposal
- LOGO! units can be fully recycled, due to their low-pollutant equipment. Contact a certified electronic waste disposal center for environmentally acceptable recycling and disposal of your old devices.
LOGO! installation and wiring

General guidelines

Please note the following guidelines for installing and wiring your LOGO!:

- Always ensure that the wiring of your LOGO! is compliant with current rules and standards. Also, conform with all national and regional regulations when you install and operate the devices. For information on standards and regulations that apply to your specific case, contact your local authorities.
- Always switch off power before you wire or install/remove a module.
- Always use cables with appropriate conductor cross-sections for the relevant current. You can wire LOGO! with cable conductor cross-sections from 1.5 mm$^2$ to 2.5 mm$^2$; see Chapter 2.3.
- Do not exceed the screw torque of the terminals. The maximum torque is: 0.5 N/m, see Chapter 2.3.
- Keep the cabling as short as possible. If longer cables are necessary, you should use shielded versions. You should always route your cables in pairs: i.e. one neutral conductor plus one phase conductor or signal line.
- Always keep separate:
  - The AC wiring
  - High-voltage DC circuits with high-frequency switching cycles
  - Low-voltage signal wiring
  - The EIB bus cable may also be laid in parallel to other signal lines
- Ensure that the wires are installed with appropriate strain relief.
- Provide a suitable lightning surge arrester for cables installed in hazardous areas.
- Do not connect an external power supply in parallel to the output load of a DC output. This could develop a reverse current at the output if you have not installed a diode or similar barrier device.
- Reliable functioning of the equipment is only ensured with certified components!

Note

LOGO! devices may only be installed and wired by skilled personnel who are familiar with and follow general engineering rules and relevant regulations and standards.
What you must note when installing

LOGO! is designed for fixed and enclosed installation in the housing or the control cabinet.

---

Warning

Death, serious bodily injury or considerable damage to property can occur.

Modules of a LOGO! are open facilities. This means that you must install LOGO! only in a housing or cabinet.

Allow access to the housings or cabinets only with the use of a key or a tool and only allow access to authorized or approved personnel.

It is permissible to operate LOGO! from the front at any time.

---

Safety of electronic control equipment

Introduction

The notes below apply regardless of the type or manufacturer of the electronic control.

Reliability

Maximum reliability of LOGO! devices and components is achieved by implementing extensive and cost-effective measures during development and manufacture.

This includes the following:

- Use of high-quality components
- Worst-case design of all circuits
- Systematic and computer-aided testing of all components
- Burn-in of all large-scale integrated circuits (e.g. processors, memory, etc.)
- Measures preventing static charge when handling MOS ICs
- Visual checks at different stages of manufacture
- Continuous heat-run test at elevated ambient temperature over a period of several days
- Careful computer-controlled final testing
- Statistical evaluation of all returned systems and components to enable the immediate initiation of suitable corrective measures
- Monitoring of major control components, using online tests (cyclic interrupt for the CPU, etc.)

These measures are referred to as basic measures.

Carrying out tests

You must, however, ensure safety in your plant.

Before finally commissioning a system, carry out complete functional testing as well as all the necessary safety testing.

In testing, also include any predictable faults that can occur. This means that you will avoid any danger to the plant or to people during operation.
Risks
In all cases where the occurrence of failures can result in material damage or injury to persons, special measures must be taken to enhance the safety of the installation - and therefore also of the situation. System-specific and special regulations exist for such applications. They must be observed on installing the control system (for example, VDE 0116 for burner control systems).

For electronic control equipment with a safety function, the measures that have to be taken to prevent or rectify faults are based on the risks involved in the installation. Beyond a certain degree of hazard the basic measures mentioned above are not sufficient. Additional measures must be implemented and approved for the controller.

Important information
The instructions in the operating manual must be followed exactly. Incorrect handling can render measures intended to prevent dangerous faults ineffective, or generate additional sources of danger.

2.1 Modular LOGO! setup

2.1.1 Maximum setup

Maximum setup of a LOGO! with analog inputs
(LOGO! 12/24 RC/RCo and LOGO! 24/24o)

LOGO! Basic, 4 digital modules and 2 analog modules (example)

In addition, you can plug in an analog output module.

Maximum setup of a LOGO! without analog inputs
(LOGO! 24 RC/RCo and LOGO! 230 RC/RCo)

LOGO! Basic, 4 digital modules and 4 analog modules (example)

In addition, you can plug in an analog output module.
High-speed/optimal communication performance

For optimal and high-speed communication performance between LOGO! Basic and the various modules, we recommend that you install the digital modules first, then the analog modules (examples above). (The special function PI controller is an exception: the AI used for the value PV should be on the LOGO! Basic or an analog input module adjacent to the LOGO! Basic).

We recommend that you position the CM AS Interface on the far right-hand side. (If the AS Interface voltage fails, communication between the LOGO! system and expansion modules that are arranged to the right of the LOGO! CM AS Interface expansion module is interrupted).

The LOGO! TD module is installed separately. You connect it to the LOGO! Basic module with the included LOGO! TD cable.

Note

CM EIB/KNX must always be installed as the last module on the right-hand side of LOGO! as no further interface modules may be connected to the CM EIB/KNX.

2.1.2 Setup with different voltage classes

Rules

Digital modules can only be directly connected to devices of the same voltage class.

You can connect analog and communication modules to devices of any voltage class.

You can replace two similar DM8 expansion modules by one appropriate DM16 expansion module (and vice versa) without having to change the circuit program.

Note

Two DM8 12/24R can be replaced by one DM16 24R only if operated with a power supply of 24 V DC.

Two DM8 24R can be replaced by one DM16 24R only if operated with DC and P action.
Overview:
Connecting an expansion module to LOGO! Basic

In the following tables, “X” means that the connection is possible; “-” means that the connection is not possible.

<table>
<thead>
<tr>
<th>LOGO!Basic</th>
<th>Expansion modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DM8 12/24R, DM16 24</td>
</tr>
<tr>
<td></td>
<td>DM8 24, DM16 24</td>
</tr>
<tr>
<td></td>
<td>DM 8 24R</td>
</tr>
<tr>
<td></td>
<td>DM8 230R, DM16 230R</td>
</tr>
<tr>
<td></td>
<td>AM2, AM2 PT100, AM2 AQ</td>
</tr>
<tr>
<td></td>
<td>CM</td>
</tr>
<tr>
<td>LOGO! 12/24 RC</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 24</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 24 RC</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 230 RC</td>
<td>-        -          -        x        x        x</td>
</tr>
<tr>
<td>LOGO! 12/24RCo</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 24o</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 24RCo</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>LOGO! 230 RCo</td>
<td>-        -          -        x        x        x</td>
</tr>
</tbody>
</table>

Overview:
Connecting an additional expansion module to an expansion module

<table>
<thead>
<tr>
<th>Expansion module</th>
<th>Additional expansion modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DM8 12/24R, DM16 24</td>
</tr>
<tr>
<td></td>
<td>DM8 24, DM16 24</td>
</tr>
<tr>
<td></td>
<td>DM 8 24R</td>
</tr>
<tr>
<td></td>
<td>DM8 230R, DM16 230R</td>
</tr>
<tr>
<td></td>
<td>AM2, AM2 PT100, AM2 AQ</td>
</tr>
<tr>
<td></td>
<td>CM</td>
</tr>
<tr>
<td>DM 8 12/24R, DM16 24R</td>
<td>x        x          x        -       x        x</td>
</tr>
<tr>
<td>DM 8 24, DM16 24</td>
<td>x        x          x        -       x        x</td>
</tr>
</tbody>
</table>
You can also use the LOGO! expansion cable (ordered separately) to connect expansion modules. By connecting expansion modules with an expansion cable, you can install a full complement of LOGO! modules in a small space. You use the cable to connect the last expansion module on the top rail to the first expansion module on the second rail, as shown below:

<table>
<thead>
<tr>
<th>Expansion module</th>
<th>Additional expansion modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DM8 12/24R, DM16 24R</td>
</tr>
<tr>
<td>DM 8 24 R</td>
<td>x</td>
</tr>
<tr>
<td>DM 8 230R, DM 16 230R</td>
<td>-</td>
</tr>
<tr>
<td>AM 2, AM 2 PT100, AM 2 AQ</td>
<td>x</td>
</tr>
<tr>
<td>CM AS Interface</td>
<td>x</td>
</tr>
</tbody>
</table>

1.) Cabinet  
2.) LOGO! Basic module  
3.) Expansion cable  
4.) Expansion modules
2.1.3 Compatibility

The LOGO! TD module can only be used with equipment series 0BA6. When using the LOGO! AM 2 AQ analog module with equipment series 0BA4 or 0BA5, the functions are limited to the ones available on this equipment. You cannot use the module with equipment series 0BA3 or earlier.

All other expansion modules are completely compatible with the basic modules of equipment series 0BA3, 0BA4, 0BA5, and 0BA6.

2.2 Installing/removing LOGO!

Dimensions

The LOGO! installation dimensions are compliant with DIN 43880.

LOGO! can be snap-mounted to 35 mm DIN rails to EN 50022 or on the wall.

LOGO! width:

- LOGO! TD has a width of 128.2 mm, which corresponds to 8 subunits
- LOGO! Basic has a width of 72 mm, which corresponds to 4 subunits
- LOGO! expansion modules have a width of 36 mm or 72 mm (DM16...), which corresponds to 2 or 4 subunits

Note

The figure below shows you an example of the installation and removal of a LOGO! 230 RC and a digital module. The measures shown apply to all other LOGO! Basic versions and expansion modules.

Warning

Always switch off power before you “remove” and “insert” an expansion module.
2.2.1 DIN rail mounting

Mounting

How to mount a LOGO! Basic module and a digital module onto a DIN rail:

LOGO! Basic:

1. Hook the LOGO! Basic module onto the rail.
2. Push down the lower end to snap it on. The mounting interlock at the rear must engage.

LOGO! digital module:

3. On the right side of the LOGO! Basic/LOGO! expansion module, remove the connector cap.
4. Place the digital module onto the DIN rail on the right-hand side of the LOGO! Basic.
5. Slide the digital module towards the left until it contacts the LOGO! Basic.
6. Using a screwdriver, push the interlock to the left. In its end position the slide interlock engages in LOGO! Basic.

Repeat steps 3 through 6 to mount further expansion modules.

---

Note
The expansion interface on the last expansion module must be covered.
Removal

To remove LOGO!:

...... if you have installed only one LOGO! Basic:

Part A

1. Insert a screwdriver into the eyelet at the bottom of the slide interlock and move the latch downward.

2. Swing the LOGO! Basic off the DIN rail.

...... if you have connected at least one expansion module to LOGO! Basic:

Part B

1. Using a screwdriver, push the integrate slide interlock to the right.

2. Slide the expansion module off towards the right.

3. Insert a screwdriver into the eyelet at the bottom of the slide interlock and lever it downward.

4. Swing the expansion module off the profile rail.

Repeat steps 1 to 4 for all other expansion modules.

Note

If you have connected more than one expansion module, it is advisable to start removal with the last module at the right-hand side.

Make sure the slide interlock of the module to be installed/removed is not engaged in the next module.
2.2.2 Wall-mounting

For wall-mounting, first slide the mounting slides on the rear side of the devices towards the **outside**. You can now wall-mount LOGO! by means of two mounting slides and two Ø M4 screws (tightening torque 0.8 to 1.2 N/m).

![Mounting slides diagram]

**Drilling template for wall-mounting**

Before you can wall-mount LOGO!, you need to drill holes using the template shown below.

![Drilling template diagram]

All dimensions in mm
Bore hole for Ø M4 screw, tightening torque 0.8 to 1.2 N/m
1) LOGO! Basic
2) LOGO! expansion modules, DM *..., AM...
3) LOGO! expansion modules, DM 16...
2.2.3 Mounting the LOGO! TD

To prepare the mounting surface for the optional LOGO! TD and mount it, follow these steps:

1. Cut a 119.5 mm x 78.5 mm hole in the mounting surface.

2. Fit the LOGO! TD into the cutout you made in the mounting surface.

3. Attach the mounting brackets (included) to the LOGO! TD.

4. Tighten the mounting screws on the mounting brackets to secure the LOGO! TD.

You can then use the included cable to connect the LOGO! TD to the LOGO! Basic module up to a distance of 2.5 meters. You can extend this distance to up to ten meters by using a standard Sub-D cable together with the LOGO! TD cable.

2.2.4 Labeling LOGO!

The gray rectangular areas on the LOGO! modules are intended for labeling. In the case of expansion modules, you can use the gray areas for labeling the inputs and outputs, for example. In this connection, you can enter a delta factor of +8 for the inputs or +4 for the outputs if the basic module already has 8 inputs or 4 outputs.
2.3 Wiring LOGO!

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

You do not need wire ferrules for the terminals. You can use conductors with cross-sections of up to the following thicknesses:

- $1 \times 2.5 \text{ mm}^2$
- $2 \times 1.5 \text{ mm}^2$ for each second terminal chamber

Tightening torque: $0.4...0.5 \text{ N/m or 3...4 lbs/in}$

---

**Note**

Always cover the terminals after you have completed the installation. To protect LOGO! adequately from impermissible contact to live parts, comply with local standards.

---

2.3.1 Connecting the power supply

The 230-V versions of LOGO! are suitable for operation with rated voltages of 115 V AC/DC and 240 V AC/DC. The LOGO! 24-V and 12-V versions can be operated with a 24 VDC, 24 V AC or 12 V DC power supply. For information on permissible voltage tolerances, line frequencies and power consumption, refer to the installation instructions in the Product Information supplied with your device and to the technical data in Appendix A.

The CM EIB/KNX has been designed as a communication module for the LOGO! controller and must be supplied with a mains voltage of 12/24 V AC/DC.

The AS Interface bus requires a special AS Interface power supply (30 V DC) that enables simultaneous transmission of data and power for the encoders via a single line.

The LOGO! TD must be supplied with a voltage of 12 V DC or 24 V AC/DC.

---

**Note**

A power failure might cause an additional edge triggering signal at the special functions.

The stored data will be from the last uninterrupted cycle.
Connecting LOGO!

To connect LOGO! to the power supply:

LOGO! ..... with DC power supply

LOGO! ..... with AC power supply

Protection with safety fuse if required (recommended) for:
12/24 RC...: 0.8 A
24: 2.0 A
EIB/KNX 0.08 A

To suppress surge voltages, install varistors (MOV) with an operating voltage at least 20 % above the rated voltage.

Note

LOGO! is a double-insulated switchgear. You do not need to connect an equipment grounding conductor.

Circuit protection with AC voltage

To suppress voltage peaks on the power supply lines, you can install a metal oxide varistor (MOV). Make sure the operating voltage of the varistor (MOV) used lies at least 20 % above the rated voltage (for example S10K275).
2.3.2 Connecting the LOGO! TD power supply

The LOGO! TD must be connected to an external power supply that supplies a voltage of 12 V DC or 24 V AC/DC. A power connector is included with the LOGO! TD.

1) Power supply
2) Communication interface

The power connection is non-polar; the ground can be connected on either the left or right side.
2.3.3 Connecting LOGO! inputs

Requirements

At the inputs you connect sensor elements such as: momentary switches, switches, light barriers, daylight control switches etc.

Sensor characteristics for LOGO!

<table>
<thead>
<tr>
<th></th>
<th>LOGO! 12/24 RC/RCo</th>
<th>LOGO! 24/24o</th>
<th>LOGO! DM8 12/24 R / LOGO! DM8 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>I3 ... I6</td>
<td>&lt; 5 V DC</td>
<td>&lt; 5 V DC</td>
<td>&lt; 5 V DC</td>
</tr>
<tr>
<td>I1, I2, I7, I8</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 0.05 mA</td>
<td>&lt; 0.05 mA</td>
</tr>
<tr>
<td>Signal status 0</td>
<td></td>
<td></td>
<td>&lt; 5 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td></td>
<td></td>
<td>&lt; 0.5 mA</td>
</tr>
<tr>
<td>Signal status 1</td>
<td></td>
<td></td>
<td>&gt; 8 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td></td>
<td></td>
<td>&gt; 0.1 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>LOGO! 24 RC/RCo (AC)</th>
<th>LOGO! 24 RC/RCo (DC)</th>
<th>LOGO! DM8 24 R (AC)</th>
<th>LOGO! DM8 24 R (DC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal status 0</td>
<td>&lt; 5 V AC</td>
<td>&lt; 5 V DC</td>
<td>&lt; 40 V AC</td>
<td>&lt; 30 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 0.03 mA</td>
<td>&lt; 0.03 mA</td>
</tr>
<tr>
<td>Signal status 1</td>
<td>&gt; 12 V AC</td>
<td>&gt; 12 V DC</td>
<td>&gt; 79 V AC</td>
<td>&gt; 79 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td>&gt; 2.5 mA</td>
<td>&gt; 2.5 mA</td>
<td>&gt; 0.08 mA</td>
<td>&gt; 0.08 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal status 0</td>
<td>&lt; 5 V DC</td>
<td>&lt; 5 V DC</td>
<td>&lt; 40 V AC</td>
<td>&lt; 30 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 0.05 mA</td>
<td>&lt; 0.05 mA</td>
</tr>
<tr>
<td>Signal status 1</td>
<td>&gt; 12 V DC</td>
<td>&gt; 12 V DC</td>
<td>&gt; 79 V AC</td>
<td>&gt; 79 V DC</td>
</tr>
<tr>
<td>Input current</td>
<td>&gt; 2.0 mA</td>
<td>&gt; 2.0 mA</td>
<td>&gt; 0.08 mA</td>
<td>&gt; 0.08 mA</td>
</tr>
</tbody>
</table>

Note

The digital inputs of LOGO! 230 RC/RCo and of expansion module DM16 230R are divided into two groups, each consisting of four inputs. Within the same 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.

Inputs within the LOGO! DM8 230R may not be connected to different phases.
Sensor connections

Connecting glow lamps and 2-wire proximity switches (Bero) to LOGO! 230 RC/230 RC0 or LOGO! DM8 230 R (AC) and LOGO! DM16 230R (AC)

The figure below shows how you connect a switch with a glow lamp to LOGO! The current that flows through the glow lamp allows LOGO! to detect a “1” signal even though the switch contact is not closed. If, however, you use a switch the glow lamp of which is fitted with a power supply, this response does not occur.

Take into account the quiescent current of any 2-wire proximity switches used. The level of the quiescent current of some 2-wire proximity switches is high enough to trigger a logical “1” signal at the LOGO! input. You should therefore compare the quiescent current of the proximity switches with the technical data of inputs in Appendix A.

Remedy

To suppress this response, use an X capacitor rated at 100 nF and 2.5 kV. In a destructive situation, this type of capacitor safely disconnects. You must choose the voltage level for which the capacitor is rated such that it is not destroyed in the case of overvoltage!

At 230 V AC, the voltage between N and an input I(n) must not be greater than 40 V to guarantee a “0” signal. You can connect approximately ten glow lamps to the capacitor.

Restrictions

Signal status transitions 0 → 1 / 1 → 0:

After a 0 to 1 or 1 to 0 transition, the signal must remain constant at the input at least for the duration of one program cycle, so that LOGO! can detect the new signal status.

The program execution time is determined by the size of the circuit program. Appendix B contains a benchmark test routine that you can use to determine the current scan cycle time.
LOGO! installation and wiring

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

Fast digital inputs: I3, I4, I5 and I6:
These versions are also equipped with fast digital inputs (up/down counters, threshold triggers). The restrictions mentioned earlier do not apply to these fast digital inputs.

Note
The fast digital inputs I3, I4, I5 and I6 are the same as in the previous versions 0BA0 to 0BA5; therefore, a circuit program that is written in these versions can be transferred to the new 0BA6 devices with the programming software LOGO! SoftComfort, without any changes to these features. In contrast to this, you need to modify circuit programs written for a LOGO!...L version (fast digital inputs I11/I12). The fast digital inputs have increased from 2 kHz to 5 kHz with the 0BA6 series.
Expansion modules do not have fast digital inputs.

Analog inputs: I1 and I2, I7 and I8:
The inputs I1, I2, I7 and I8 of LOGO! versions 12/24RC/RCo and 24/24o can be used both as standard digital inputs and as analog inputs. The input mode is defined in the LOGO! circuit program.
The inputs I1, I2, I7 and I8 provide digital functions, and the inputs AI3, AI4, AI1 and AI2 provide analog functions.
See also Chapter 4.1.
When using inputs I1, I2, I7 and I8 as analog inputs, only the range from 0 to 10 V DC is available.

Connecting a potentiometer to inputs I1, I2, I7 and I8
To allow you to achieve 10 V as the maximum value when you completely turn the potentiometer once, you must connect a series resistor on the potentiometer’s input side regardless of the input voltage (see figure below).
We suggest the following sizes of potentiometers and associated series resistors:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Potentiometer</th>
<th>Series Resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V</td>
<td>5 kΩ</td>
<td>-</td>
</tr>
<tr>
<td>24 V</td>
<td>5 kΩ</td>
<td>6.6 kΩ</td>
</tr>
</tbody>
</table>

When using a potentiometer and 10 V input voltage as the maximum value, you must ensure that with a connected input voltage of 24 V, 14 V must release via the series resistor so that a maximum of 10 V are supplied when you turn the potentiometer one full rotation. With a voltage of 12 V, this can be neglected.
Note

The LOGO! AM 2 expansion module provides additional analog inputs. The LOGO! AM 2 PT100 expansion module provides Pt100 inputs.

Always use twisted and shielded cables for analog signals, and keep these as short as possible.

Sensor connections

To connect sensors to LOGO!:

LOGO! 12/24 ....

The inputs of these devices are not isolated and therefore require a common reference potential (chassis ground).

With LOGO! 12/24RC/RCo and LOGO! 24/24o modules, you can tap analog signals between the supply voltage and chassis ground (* = series resistor with 24 V DC).

LOGO! 230 ....

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

Warning

Current safety regulations (VDE 0110, ... and IEC 61131-2, ... as well as cULus) do not permit the connection of different phases to an AC input group (I1 to I4 or I5 to I8) or to the inputs of a digital module.
The illustration above shows an example of four-wire current measurement and two-wire voltage measurement.

**Connecting a two-wire sensor to the LOGO! AM 2**

Wire up the two-wire sensor’s connecting wires as follows:

1. Connect the sensor’s output to connection U (0 ... 10 V voltage measurement) or to connection I (0 ... 20 mA current measurement) of the AM 2 module.
2. Connect the plus connector on the sensor to the 24 V supply voltage (L+).
3. Connect the ground connection on the sensor to the corresponding M input (M1 or M2) on the AM 2 module.
LOGO! AM 2 PT100

You can connect either a 2- or 3-wire Pt100 resistive thermocouple to the module.

For a **2-wire** connection, you need to short-circuit terminals M1+ and IC1 or M2+ and IC2. Errors caused by the ohmic resistance of the measuring line are not compensated for this type of connection. A line resistance of 1 Ω is proportional to a measuring error of +2.5 °C.

A **3-wire** technique suppresses the influence of the cable length (ohmic resistance) on the result of the measurement.

**Note**

Fluctuating analog values are due to screening on the connecting wire from the analog valuator device to the analog AM 2 / AM 2 PT100 LOGO! expansion module (encoder wire) that has either been mounted incorrectly or not at all.

To avoid fluctuating analog values when using these expansion modules, proceed as follows:

- Use only shielded encoder wires.
- Shorten the encoder wire as much as possible. The encoder wire must not be more than 10 meters long.
- Clamp the encoder wire on one side only and clamp it only to the PE terminal on the AM 2 / AM 2 PT100 / AM 2 AQ expansion module.
- Connect ground on the encoder supply to the PE terminal on the expansion module.
- Avoid operating the LOGO! AM 2 PT100 expansion module with a power supply that is not grounded (potential-free). If you cannot avoid this, connect the negative output/ground output on the power supply to the shielding on the resistance thermometer’s measuring wires.
2.3.4 Connecting outputs

LOGO! ...R...

The LOGO! ...R... version is equipped with relay outputs. The potential of the relay contacts is isolated from the power supply and the inputs.

Requirements for relay outputs

You can connect various loads to the outputs, e.g. lamps, fluorescent lamps, motors, contactor relays etc. For information on the properties required for the loads connected to LOGO! ...R..., refer to Appendix A.

Connecting

This is how you connect the load to LOGO! ...R...:

![Diagram of LOGO! installation and wiring]

Protection with automatic circuit-breaker, max. 16 A, characteristics B16, e.g.: Power circuit-breaker 5SX2 116-6 (if required)

LOGO! with solid-state outputs

LOGO! versions with solid-state outputs can be identified by the fact that the letter R is missing from their type name. The outputs are short circuit-proof and overload-proof. An auxiliary load voltage supply is not necessary, because LOGO! supplies the load voltage.
Requirements for solid-state outputs

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

- The maximum switched current is 0.3 A per output.

Connecting

This is how you connect the load to a LOGO! with solid-state outputs:

Load: 24 V DC, 0.3 A max.

LOGO! AM 2 AQ

The illustration above shows an example of how to connect the voltage or current load.
2.3.5 Connecting the EIB bus

The connection is carried out via the two-pole screw terminal (+ and -).

![Diagram of EIB connection]

Only the red-black core pair is used, the white-yellow core pair is not connected.

Press the button “Prog ↓” to switch the CM EIB/KNX to programming mode.

---

Note

The button “Prog ↓” should not be pressed too firmly.

If the bus connection is OK, the LED lights up green.

In programming mode, the LED lights up orange.

---

Networking on the EIB bus

The CM EIB/KNX takes over the communication between LOGO! and EIB and makes communication available via EIB inputs/outputs.

The application of the CM EIB/KNX fills the complete LOGO! process image; that is, inputs or outputs which are not occupied on LOGO! can be occupied on the EIB.

---

Note

For detailed information about the networking of LOGO! on the EIB bus please refer to the LOGO! CM EIB/KNX documentation, in particular the Micro Automation Set 8.
2.3.6 Connecting the AS interface bus

To set the address of the module on the AS interface bus, you need an addressing unit.
Valid addresses are in the range of 1 to 31. Use each address once only.
You can set the address on the AS interface bus before or after installation.
If the installed module is addressed via the address socket, the AS-Interface voltage must be disconnected beforehand. This is necessary for safety reasons.

Networking on the AS interface bus

To make the connection to the AS interface bus, you need a communications-capable LOGO! variant:

- LOGO! basic module + CM AS-I.

To be able to send data across the AS interface bus to LOGO! and to receive data from it in the same way, you also need:

- an AS interface power supply and
- an AS interface master (e.g. an S7-200 with a CP243-2 or a DP/AS-I Link 20 E).
LOGO! can only be accepted as a slave on the AS interface bus. This means that it is not possible to directly exchange data between two LOGO! devices. Data is always exchanged across the AS interface master.
Warning
The AS-Interface and LOGO! systems must **never** be connected together electrically!

Use safe isolation acc. to IEC 61131-2, EN 50178, UL 508, CSA C22.2 No. 42.

Logic Assignments

<table>
<thead>
<tr>
<th>LOGO! system</th>
<th>AS Interface system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs</strong></td>
<td><strong>Output data bits</strong></td>
</tr>
<tr>
<td>$I_n$</td>
<td>D0</td>
</tr>
<tr>
<td>$I_{n+1}$</td>
<td>D1</td>
</tr>
<tr>
<td>$I_{n+2}$</td>
<td>D2</td>
</tr>
<tr>
<td>$I_{n+3}$</td>
<td>D3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Outputs</strong></th>
<th><strong>Output data bits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_n$</td>
<td>D0</td>
</tr>
<tr>
<td>$Q_{n+1}$</td>
<td>D1</td>
</tr>
<tr>
<td>$Q_{n+2}$</td>
<td>D2</td>
</tr>
<tr>
<td>$Q_{n+3}$</td>
<td>D3</td>
</tr>
</tbody>
</table>

"n" depends on the plug-in position of the expansion module relative to the LOGO! Basic. It indicates the number of the input or output in LOGO! program code.

Note

Ensure that there is enough space for the inputs/outputs of the AS interface in the LOGO!‘s address space. If you are already using more than 12 physical outputs or more than 20 physical inputs, it is no longer possible to operate the CM AS interface!

For detailed information about the networking of LOGO! on the AS interface bus please refer to the LOGO! CM AS Interface documentation, in particular the Micro Automation Sets 7 and 16.
2.4 Putting into operation

2.4.1 Switching on the LOGO!/Power On

LOGO! does not have a power switch. The reaction of LOGO! during startup depends on the following:

- Whether a circuit program is stored in LOGO!
- Whether a memory card or combined memory/battery card is inserted
- Whether this is a LOGO! version without display unit (LOGO!...o)
- The status of LOGO! at the time of power failure.

All possible reactions of LOGO! are described on the following page.

To ensure that the expansion module on LOGO! changes to RUN mode, check the following:

- Has the sliding contact between LOGO! and the expansion module snapped into place properly?
- Is the power supply connected to the expansion module?
- In addition, always ensure that you switch on the power supply to the expansion module first before activating the power supply to the LOGO! basic module (or activate both power supplies at the same time); if you do not do this, the system does not detect the expansion module when you start up the LOGO! basic module.
You can also memorize four simple rules for starting LOGO!:

1. If neither LOGO! nor the inserted memory card or combined memory/battery card contains a circuit program, LOGO! (with display unit) reports: 'No Program / Press ESC'.

2. A circuit program on the memory card or combined memory/battery card is automatically copied to LOGO!. The circuit program in LOGO! is overwritten.

3. If there is a circuit program in LOGO! or on the memory card or combined memory/battery card, LOGO! adopts the operational state it had prior to POWER-OFF. Versions without display unit (LOGO!...o) automatically change from STOP to RUN (LED changes from red to green).

4. If you have enabled retentivity for at least one function, or a function is permanently retentive, the current values are retained at POWER-OFF.
Note

When a power failure occurs while you are entering a circuit program, the program in LOGO! will be deleted after power is returned.

Before you modify the circuit program, save a backup copy of your original to a memory card, a combined memory/battery card or to a computer (LOGO!Soft Comfort).

2.4.2 Putting a CM EIB/KNX into operation

1. Bus voltage and supply voltage must be present.
2. Connect the PC to the serial EIB interface.
4. Configure the application program in ETS2, V 1.2.
5. The application program is loaded into the devices via the EIB interface. The application program is available on the LOGO! home page (http://www.siemens.de/logo).
6. Click on "Program Physical Address" in ETS.
7. Press the button of the CM EIB/KNX to switch the CM EIB/KNX to programming mode; LED lights up orange.

Note

The button “Prog ↓” should not be pressed too firmly.

If the bus connection is OK, the LED lights up green.

In programming mode, the LED lights up orange.

8. If the LED is extinguished, the programming of the physical address has finished. You can now mark the physical address on the device. Composition of the physical address:

Area / Line / Device XX / XX / XXX

9. The application program can now be run. The device is then ready for operation.

10. If several CM EIB/KNX are installed in an EIB system, steps 1 to 9 must be repeated for each CM EIB/KNX.

11. Any further details about EIB commissioning can be found in the corresponding documentation.
2.4.3 Operating states

LOGO! Basic operating states

LOGO! Basic/Pure knows has two operating states: STOP and RUN.

<table>
<thead>
<tr>
<th>STOP</th>
<th>RUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The display shows: ‘No Program’ (not LOGO!...o)</td>
<td>• Display: Screen mask for monitoring I/Os and messages (after START in the main menu) (not LOGO!...o)</td>
</tr>
<tr>
<td>• Switching LOGO! to programming mode (not LOGO!...o)</td>
<td>• Switching LOGO! to parameter assignment mode (not LOGO!...o)</td>
</tr>
<tr>
<td>• LED is red (only LOGO!...o)</td>
<td>• LED is green (only LOGO!...o)</td>
</tr>
</tbody>
</table>

Action of LOGO!:

<table>
<thead>
<tr>
<th>STOP</th>
<th>RUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The input data is not read.</td>
<td>• LOGO! reads the status of the inputs.</td>
</tr>
<tr>
<td>• The circuit program is not executed.</td>
<td>• LOGO! uses the circuit program to calculate the status of the outputs.</td>
</tr>
<tr>
<td>• The relay contacts are permanently open or the solid-state outputs are switched off.</td>
<td>• LOGO! switches the relay/solid-state outputs on or off.</td>
</tr>
</tbody>
</table>

Note

After switching the power on, the system briefly switches through the outputs on the LOGO 24/24o. With an open circuit, a voltage of > 8 V can occur for up to approximately 100 ms; when loaded, this time reduces to a matter of microseconds.

LOGO! expansion modules, operating states

LOGO! expansion modules have three operating states: The LED (RUN/STOP) is lit green, red or orange.

<table>
<thead>
<tr>
<th>LED (RUN/STOP) is lit</th>
<th>Green (RUN)</th>
<th>Red (STOP)</th>
<th>Orange/Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>The expansion module communicates with the device to the left.</td>
<td>The expansion module does not communicate with the device to its left.</td>
<td>Initialization phase of the expansion module</td>
<td></td>
</tr>
</tbody>
</table>
CM AS Interface, communication states

The CM AS Interface has three communication states: The LED is lit green, red or flashes red/yellow.

<table>
<thead>
<tr>
<th>LED AS-I is lit</th>
<th>Green</th>
<th>Red</th>
<th>Red/Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS Interface communication OK</td>
<td>AS Interface communication failed</td>
<td>Slave has address “0”.</td>
<td></td>
</tr>
</tbody>
</table>

CM AS Interface, behavior on communication failure

- If the AS Interface voltage fails, communication between the LOGO! system and the expansion modules, which are arranged to the right of the LOGO! CM AS Interface expansion module, is interrupted. Recommendation: Position LOGO! CM AS Interface on the far right side.
- If communication is interrupted, the switching outputs are reset after about 40 to 100 ms.

CM EIB/KNX, communication states

The CM EIB/KNX has three communication states: The LED is lit green, red or orange.

<table>
<thead>
<tr>
<th>LED BUS is lit</th>
<th>Green</th>
<th>Red</th>
<th>Orange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus connection OK, communication OK, no programming mode</td>
<td>Bus connection interrupted</td>
<td>Programming mode active and bus connection OK</td>
<td></td>
</tr>
</tbody>
</table>

CM EIB/KNX, behavior on communication failure

- LOGO! voltage failure
  If there is a power failure of LOGO! or a disruption in the communication to the LOGO! master or to the communication partner on the left side, the outputs are set to 0. The RUN/STOP LED lights up red after a second.
- LOGO! voltage recovery
  LOGO! starts up again, CM EIB/KNX sends the parameterized states.
- CM EIB/KNX voltage failure
  All the inputs of the LOGO! master on the EIB are set to 0 by the LOGO! master.
- CM EIB/KNX voltage recovery
  All the outputs of the LOGO! master on the EIB are updated. The inputs are read by the EIB depending on the parameterization.
- Short circuit on the bus or bus interruption
  The behavior can be parameterized in the LOGO! configuration window of the application program in ETS (EIB Tool Software). The red light is set after 5 s.
- Bus recovery
  The behavior can be parameterized in the LOGO! configuration window.
Programming LOGO!

Getting started with LOGO!

Programming refers to creating a circuit program from the LOGO! Basic module.

In this chapter you will learn how to use LOGO! to create the LOGO! circuit programs for your application.

LOGO!Soft Comfort is the LOGO! programming software that you can use on your PC to quickly and easily create, test, modify save and print the circuit programs. The topics in this manual, however, relate only to the creation of circuit programs on the actual LOGO! Basic module. The programming software LOGO!Soft Comfort contains extensive online help. See also Chapter 7 for additional information.

Note

LOGO! versions without a display unit; that is, the LOGO! 24o, LOGO! 12/24RCo, LOGO! 24RCo and LOGO! 230RCo versions, do not have an operator panel and display unit. They are primarily designed for use in small machine and process equipment engineering systems for series production.

LOGO!...o versions are not programmed directly on the device. Instead, the circuit program is downloaded to the device from LOGO!Soft Comfort or from memory cards or combined memory/battery cards from other LOGO! devices.

LOGO! versions without a display cannot write data to memory cards or combined memory/battery cards.

See Chapters 6, 7 and Appendix C.

A small example in the first part of this chapter introduces the operating principles of LOGO!:

- You will learn the meaning of two basic terms, namely the **connector** and the **block**.
- As the next step, you will create a circuit program based on a simple conventional circuit.
- Lastly, you will enter this program directly in LOGO!

It will take you only a few pages of this manual to store your first executable circuit program in the LOGO! unit. With suitable hardware (switches etc.), you will then be able to carry out initial tests.
3.1 Connectors

LOGO! is equipped with inputs and outputs

Example of a configuration with several modules:

Each input is identified by the letter I plus a number. When you look at LOGO! from the front, you can see the input terminals at the top. Only analog modules LOGO! AM 2 and AM 2 PT100 have the inputs at the bottom.

Each output is identified by the letter Q plus a number (AM 2 AQ: AQ plus number). In the figure, you can see the output terminals at the bottom.

Note

LOGO! can recognize, read and switch the I/O of all expansion modules regardless of their type. The I/Os are presented in the installation order of the modules.

The following I/Os and flag blocks are available for creating your circuit program: I1 to I24, AI1 to AI8, Q1 to Q16, AQ1 and AQ2, M1 to M27 and AM1 to AM6. Also available are the shift register bits S1 to S8, 4 cursor keys C▲, C▼, C◄, and C►, as well as 16 blank outputs X1 to X16. See Chapter 4.1 for more details.

The following applies to inputs I1, I2, I7 and I8 of LOGO! 12/24., and LOGO! 24/24o versions: If you use I1, I2, I7 or I8 in the circuit program, this input signal is digital. If you use AI3, AI4, AI1, or AI2, the input signal is analog. The numbering of the analog inputs is significant: AI1 and AI2 corresponded to I7 and I8 on the 0BA5 module. With the addition of two new analog inputs for the 0BA6 series, these modules optionally use I1 for AI3 and I2 for AI4. See the graphical representation at 2.1.1. Also note that you can also use I3, I4, I5, and I6 as fast digital inputs.
LOGO!'s connectors

The term connector refers to all connections and states in LOGO!. The digital I/O status can be '0' or '1'. Status '0' means that the input does not carry a specific voltage. Status '1' means that the input does carry a specific voltage.

The ‘hi’, ‘lo’ and ‘x’ connectors have been introduced to make it easier for you to create the circuit program:
- ‘hi’ (high) is assigned the status ‘1’,
- ‘lo’ (low) is assigned the status ‘0’.

You do not have to use all of the connectors of a block. The circuit program automatically assigns the unused connectors a status that ensures proper functioning of the relevant block. If you prefer to do so, you can identify unused connectors with an ‘x’.

For information on the meaning of the term “block”, refer to Chapter 3.3.

LOGO! has the following connectors:

<table>
<thead>
<tr>
<th>Connectors</th>
<th>LOGO! Basic / Pure</th>
<th>DM</th>
<th>AM</th>
<th>AM2AG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>LOGO! 230RC/RCo, LOGO! 24 RC/RCo</td>
<td>I9...I24</td>
<td>A1...A8</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>LOGO! 12/24RC/RCo, LOGO! 24/24o</td>
<td>I9...I24</td>
<td>A1...A8</td>
<td>none</td>
</tr>
<tr>
<td>Outputs</td>
<td>Q1...Q4</td>
<td>Q5...Q16</td>
<td>none</td>
<td>AQ1, AQ2</td>
</tr>
<tr>
<td>lo</td>
<td>Logical '0' signals (off)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hi</td>
<td>Logical '1' signals (on)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>An existing connection that is not used</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DM: Digital module
AM: Analog module
3.2 EIB inputs/outputs

The application program “20 CO LOGO! 900E02” controls the communication between the LOGO! and the EIB/KNX bus via the communication module CM EIB/KNX.

By configuring the application program in ETS (EIB Tool Software), the division of the input and output area of the LOGO! can be defined as a “hardware channel” and as a “virtual channel” on the EIB/KNX bus. This characteristic also applies for analog processing.

A communication object is assigned to each “hardware channel” and each “virtual channel” of LOGO! module. The real-time clock of LOGO! can be used as a master or slave via the EIB/KNX bus.

The behavior of the communication objects of the communication module CM EIB/KNX, when the status of the EIB/KNX bus changes, can also be parameterised.

A “virtual input channel” can be used as a bus state; that is, a bus voltage failure can be reported.

The settings for analog values in LOGO! (Offset, Gain) do not affect the analog values for the CM EIB/KNX communication module (the output values of the CM EIB/KNX are always the raw values between 0 and 1000). In this case, you must parameterize customizing in the ETS.

Functions of the application program

- Specification of the hardware configuration (number of local digital inputs and outputs, analog inputs)
- Selection of time master or slave
- Use of I24 as a bus status signal
- Behavior on bus voltage failure/recovery
- Input type as monoflop/normal for digital inputs via the EIB/KNX
- Output type as normal/dimmer/edge evaluation for digital outputs via the EIB/KNX
- Data type, adaptation, cyclical sending and sending on change in value for analog outputs via the EIB/KNX and analog inputs on LOGO!

Any further details about configuring the application program in ETS can be found in the current application program description.

For the application program see Siemens product database from version J onwards

or: http://www.siemens.de/gamma
http://www.siemens.de/logo
3.3 Blocks and block numbers

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

In Chapter 3.4 you will learn how to transform a conventional circuit into a LOGO! circuit program.

Blocks

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

When you create the circuit program, you interconnect the blocks. To do so, simply select the connection you require from the Co menu. The menu name Co is an abbreviation of the term “Connector”.

Logic operations

The most elementary blocks are the logic operations:

- AND
- OR
- ...

```
| I1 | = \geq 1 |
| I2 | x |
```

Inputs I1 and I2 are here connected to the OR block. The last two inputs of the block remain unused and are identified by the creator of the circuit program with an ‘x’.

These special functions offer you significantly greater performance:

- Pulse relay
- Up/down counter
- On-delay
- Softkey
- ....

Chapter 4 gives a full list of the LOGO! functions.
Block representation on the LOGO! display

The figure below shows a typical view of the LOGO! display. As you can see, it can show only one block at a time. We have therefore introduced block numbers to help you check the circuit structure.

Assigning a block number

LOGO! assigns each new block in a circuit program a block number.

LOGO! uses these block numbers to indicate the block interconnections. This means that these numbers are mainly an aid to your orientation in the circuit program.

The figure above shows you three views of the LOGO! display, which represent the circuit program. As you can see, LOGO! interconnects the blocks using their numbers.
Advantages of block numbers

You can connect almost any block to an input of the current block by means of its block number. In this way, you can reuse the interim results of logical or other operations, reduce programming effort, save memory space and clean up your circuit layout. To do so, however, you need to know how LOGO! has named the blocks.

Note

We advise you to create an organizational program chart. You will find this a valuable aid when you create the circuit program because you can enter in this chart all the block numbers that LOGO! assigns.

By using the LOGO!Soft Comfort software to program LOGO!, you can directly create a function chart of your circuit program. LOGO!Soft Comfort also allows you to assign eight-character names to up to 100 blocks, and to view these on the LOGO! display in parameter assignment mode (see Chapter 3.5).
3.4 From circuit diagram to LOGO! program

View of a circuit diagram

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

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

Relay K1 picks up when condition (S1 OR S2) AND S3 is met.

Creating this circuit with LOGO!

In LOGO! you create a circuit logic by interconnecting blocks and connectors:
Note

Although you have four inputs available for logic operations (Basic functions, see Chapter 4.2), most of the views will only show three inputs for reasons of clarity. You program this fourth input and assign parameters just like you do with the other three inputs.

To create a circuit logic in LOGO!, start at the circuit output.
The output is the load or relay that is to be switched.
Convert the circuit logic into blocks by working through the circuit, starting at the output and ending at the input:
Step 1: The make contact S3 is interconnected in series to output Q1 and to a further circuit element. A series connection corresponds with the AND block:

\[
\begin{array}{c}
\text{I3} \\
\times \\
\end{array} \quad \& \quad 
\begin{array}{c}
\text{Q1} \\
\end{array}
\]

Step 2: S1 and S2 are connected in parallel. A parallel circuit corresponds with the OR block:

\[
\begin{array}{c}
\text{I1} \\
\text{I2} \\
\times \\
\geq 1 \\
\end{array} \quad \& \quad 
\begin{array}{c}
\text{I3} \\
\times \\
\end{array} \quad 
\begin{array}{c}
\text{Q1} \\
\end{array}
\]

Unused inputs

The circuit program automatically assigns the unused connectors a status that ensures proper functioning of the relevant block. If you like, you can label unused connectors with an ‘x’ identifier.

In our example we shall use only two inputs of the OR block and two inputs of the AND block; the relevant unused third and fourth inputs are identified at the connector with an ‘x’.

Now connect the I/Os to LOGO!.

Wiring

Connect the switches S1 to S3 to the screw terminals of your LOGO!:
• S1 to connector I1 of LOGO!
• S2 to connector I2 of LOGO!
• S3 to connector I3 of LOGO!

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

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

![Wiring diagram]

3.5 The four golden rules for operating LOGO!

Rule 1
Changing the operating mode

- You create the circuit program in **programming mode**. After power is on, and when the display shows “No Program / Press ESC”, press the **ESC** key to select programming mode.

- Timer and parameter values of an existing circuit program can be edited both in **parameter assignment mode** and in **programming mode**. During **parameter assignment** LOGO! is in **RUN mode**; that is, it continues executing the circuit program (see Chapter 5). To work in **programming mode**, you need to terminate the circuit program by calling the “**Stop**” command.

- Select the ‘Start’ command on the main menu to set **RUN mode**.

- When the system is in **RUN**, you can return to **parameter assignment mode** by pressing the **ESC** key.

- When **parameter assignment mode** is open and you want to return to **programming mode**, select the “**Stop**” command from the parameter assignment menu, and confirm “**Stop Prg**” prompt with “**Yes**”. To do so, move the cursor to “**Yes**” and confirm with OK.

For more details on operating modes, refer to Appendix D.
Note
The following applies to 0BA2 device versions and earlier:

- You can open programming mode by pressing \( \text{←} \text{↑} + \text{OK} \).
- You set parameter assignment mode by pressing \( \text{ESC} + \text{OK} \).

Rule 2
Outputs and inputs
- Always create your circuit program by working from the output to the input.
- You can connect an output to several inputs, but not the same input to several outputs.
- Within the same program path you may not connect an output to an upstream input. For such internal recursions you should interconnect flags or outputs.

Rule 3
Cursor and cursor movement
The following applies when you edit a circuit program:

- You can **move the cursor** when it appears in the form of an underscore:
  - Press \( \text{←}, \text{↑}, \text{↓} \) or \( \text{△} \) to move the cursor in the circuit program.
  - Press \( \text{OK} \) to change to “Select connector/block”.
  - Press \( \text{ESC} \) to exit programming mode.
- You **select a connector/block** when the cursor appears as a solid square
  - Press \( \downarrow \) or \( \uparrow \) to select a connector or a block.
  - Confirm with \( \text{OK} \).
  - Press \( \text{ESC} \) to return to the previous step.

Rule 4
Planning
- Before you start to create a circuit program, you should either first create a design on paper or program LOGO! directly using LOGO!Soft Comfort.
- LOGO! can only save complete and faultless circuit programs.
3.6 Overview of LOGO! menus

Programming mode

Parameter assignment mode

For more details on these menus, refer to Appendix D.
3.7 Writing and starting the circuit program

After you have designed a circuit, you want to write it to your LOGO!. The small example below shows how to do this.

3.7.1 Selecting programming mode

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

```
No Program
Press ESC
```

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

```
>Program..
Card..
Setup..
Start
```

The first character in the first line is the ">" cursor. Press ▲ and ▼ to move the ">" cursor up and down. Move it to “Program..” and confirm with OK. LOGO! opens the programming menu.

```
>Edit..
Clear Prg
Password
Msg Config
```

Here you can also move the ">" cursor by pressing ▲ and ▼. Move the ">" cursor to "Edit.." and confirm with OK.

```
>Edit Prg
Edit Name
AQ
Memory?
```

The Edit menu of LOGO!
Move the ">" cursor to "Edit Prg" (for editing the circuit program) and confirm with OK. LOGO! now shows you the first output:

The first output of LOGO!

You are now in programming mode. Press ▲ and ▼ to select the other outputs. Now start to edit your circuit program.

Note

Because we have not yet saved a password for the circuit program in LOGO!, you can directly enter editing mode. When you select "Edit" after you have saved a password-protected circuit program, you are prompted to enter a password and to confirm it with OK. You can only edit the program after you have entered the correct password (see Chapter 3.7.5.).

3.7.2 The first circuit program

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

Circuit diagram

The corresponding circuit diagram:

The load is switched on with S1 OR S2. LOGO! interprets this parallel circuit as an 'OR' logic, because S1 OR S2 switches on the output.

Translated into a LOGO! circuit program this means: Relay K1 is (at output Q1) is controlled by means of an OR block.

Circuit program

S1 is connected to the I1 and S2 to the I2 input connector of the OR block.

The corresponding layout of the circuit program in LOGO!:
Wiring

The corresponding wiring:

S1 switches input I1, while S2 switches input I2. The load is connected to the relay Q1.
3.7.3 Circuit program input

Let us now write the circuit program, starting at the output and working towards the input. LOGO! initially shows the output:

The first LOGO! output

You will see an underscore below the Q in Q1, which is the cursor. The cursor indicates your current position in the circuit 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 current position in the circuit program.

At this point you enter only the first (OR) block. Press OK to select editing mode.

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

The cursor no longer appears in the form of an underscore; but instead as a flashing solid square. LOGO! offers you various options here.

Select GF (basic functions) by pressing the ▼ key until GF appears, and confirm with OK. LOGO! now shows the first block from the list of basic functions:

The AND is the first block of the basic functions list. The solid square cursor prompts you to select a block.
Now press ▼ or ▲ until the OR block appears on the display:

The solid square cursor is still positioned on the block.

Press **OK** to confirm your entries and exit the dialog.

You have now entered the first block. Each new block is automatically assigned a block number. The only thing left to do is interconnect the block inputs. This is how it is done:

Press **OK**.

Select the **Co** list: Press **OK**
The first element of the Co list is the "Input 1" character, namely 'I1'.

**Note**
Press ▼ to go the start of the Co list: I1, I2 .... to Io. Press ▲ to go to the end of the Co list: Io, hi, ..... to I1.

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

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

1. Switch to editing mode: Press OK
2. Select the Co list: Press ▼ or ▲
3. Confirm the Co list with: Press OK
4. Select I2: Press ▼ or ▲
5. Apply I2: Press OK

I2 is now connected to the input of the OR block:
We do not need the last two inputs of the OR block for this circuit program. You can mark the unused inputs with an ‘x’. Enter the ‘x’ character twice:

1. Switch to editing mode: Press OK
2. Select the Co list: Press ▼ or ▲
3. Accept the Co list: Press OK
4. Select ‘x’: Press ▼ or ▲
5. Apply x: Press OK

The display now shows:

This is the layout of your circuit program

Note

You can invert individual inputs of the basic and special functions; that is, if an input carries a logical “1” signal, the circuit program will output a logical “0”. On the other hand, a logical “0” is inverted into a logical “1” signal.

To invert an input, move the cursor to the relevant position, e.g.:

Confirm with OK.

Now press ▼ or ▲ to invert this input:
Next, press **ESC**.

You can review your first circuit program by pressing ◄ or ► to move the cursor through the circuit program.

We shall now exit circuit programming mode. This is how it is done:

Return to the programming menu: 

Press **ESC**

---

**Note**

LOGO! has now saved your circuit program to nonvolatile memory. The circuit program remains in the LOGO! memory until you explicitly delete it.

You can save the actual values of special functions in the case of a power outage assuming that these functions support the "Retentive" parameter and that the necessary program memory is available. The Retentive parameter is deactivated when you insert a function; to use it, you must enable this option.
3.7.4 Assigning a circuit program name

You can assign your circuit program a name that consists of up to 16 uppercase/lowercase letters, numbers and special characters.

In the programming menu:
1. Move the “>” cursor to 'Edit..': Press \ or ▲
2. Accept 'Edit': Press OK
3. Move the “>” cursor to 'Edit Name': Press \ or ▲
4. Accept 'Edit Name': Press OK

Press ▲ and ▼ to list the alphabet, numbers and special characters, either in ascending or descending order. You can select any letter, number or character.

To enter a space character, simply move the cursor with ▼ to the next position. This character is the first one in the list.

Examples:

Press ▼ once to select an “ A ”
▲ four times to select “ { ”, etc.

The following character set is available:

```
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 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 circuit program “ABC”:

5. Select " A": Press ▼
6. Move to the next letter: Press ▼
7. Select " B": Press ▼
8. Move to the next letter: Press ▼
9. Select " C": Press ▼
10.Confirm the complete name: Press OK

Your circuit program is now named “ABC”, and you are returned to the programming menu.

To change the name of your circuit program, proceed in the same way.

**Note**

You can change the name of the circuit program only in programming mode. You can read the name both in programming and in parameter assignment mode.
3.7.5 **Password**

You can protect a circuit program from unauthorized access by assigning it a password.

**To assign a password**

A password may have a maximum length of 10 characters, and consists only of uppercase letters. On LOGO!, the password can be assigned, edited or deactivated only in the “Password” menu.

In the programming menu:

1. Move the “>” cursor to ‘**Password**’: Press ▼ or ▲
2. Confirm the ‘**Password**’: Press **OK**

Press ▼ or ▲ to move up and down the alphabet to select your letters. Because LOGO! only provides uppercase letters for the password, you can quickly access letters “at the end” of the alphabet (in this example, English) by using the ▲ button:

Press ▲ once to select “Z”
Press ▲ twice to select “Y”, etc.

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

```
Old:
No Password
New:
```

This procedure is the same as for entering the name of the circuit program. Select “New” and enter:

3. Select “A”: Press ▼
4. Move to the next letter: Press ▲
5. Select “A”: Press ▼

The display now shows:

```
Old:
No Password
New:
```

6. Confirm the password: Press **OK**

Your circuit program is now protected with the password “AA”, and you are returned to the programming menu.
Note
You can cancel the input of a new password with ESC. In this case, LOGO! returns to the programming menu without saving the password.
You can also set your password using LOGO!Soft Comfort. You cannot edit a password-protected circuit program on LOGO! or upload it to LOGO!Soft Comfort unless you enter the correct password.
To allow you to create and edit a circuit program for a protected module (Card), you first need to assign a password to this new program (see Chapter 6.1).

Changing the password
You need to know the current password in order to change it.
In the programming menu:
1. Move the '>' cursor to 'Password': Press ▼ or ▲
2. Confirm the 'Password': Press OK
Select “Old” and enter your old password (in our case: ‘AA’) by repeating steps 3 through 6 as described earlier.
The display now shows:

Now you can select “New” to enter the new password, e.g. “ZZ”:
4. Move to the next letter: Press ►
5. Select “Z”: Press ▲
The display now shows:

Old:
AA
New:
ZZ

6. Confirm your new password: Press OK
Your new password “ZZ” is now set, and you are returned to the programming menu.
Deactivating the password

Let us assume you want to deactivate the password for whichever reason. For example, you want to allow another user to edit your circuit program. You must know your current password (in our example “ZZ”), the same as if you were changing it.

In the programming menu:

1. Move the ‘>’ cursor to **Password**: Press \( \downarrow \) or \( \uparrow \)
2. Confirm the 'Password': Press **OK**

Select “Old” and enter your current password as described in steps 3 to 5. Confirm your entries with **OK**.

The display shows:

Clear the password by leaving the input box **blank**:

3. Confirm the “blank” password: Press **OK**

The password is “cleared”, and you are returned to the programming menu.

---

**Note**

This action disables the password prompt, and thus permits access without a password.

Let the password prompt be **deactivated** for the time being, in order to accelerate progress in our further exercises and examples.

---

**Password: Wrong Password!**

When the user inputs the **wrong** password and confirms the input with **OK**, LOGO! does not open editing mode, but returns to the programming menu. This repeats itself over and again until you input the correct password.
### 3.7.6 Switching LOGO! to RUN mode

In the main menu, select RUN to start LOGO!.

1. Return to the main menu: Press **ESC**
2. Move the '>' cursor to 'Start': Press ▲ or ▼
3. Confirm 'Start': Press **OK**

LOGO! runs the circuit program and shows the following display:

#### Display field of LOGO! in RUN mode

- **Start screen:** Date and current time-of-day (only for versions with real-time clock). This element flashes if the date and time are not set.
- Or: Start screen digital inputs (see Chapter 5.2.5)

- **Inputs I1 to I9**: Press ▲
- **Inputs I10 to I19**: Press ▲
- **Inputs I20 to I24**: Press ▲

- **Outputs Q1 to Q9**: Press ▲
- **Outputs Q10 to Q16**: Press ▲

- **Analog inputs AI1 to AI3**: Press ▲
- **Analog inputs AI4 to AI6**: Press ▲
What is meant by: "LOGO! is in RUN"?

In RUN mode, LOGO! executes the circuit program. To do so, LOGO! first reads the status at the inputs, determines the status of the outputs by means of the user program, and switches these on or off according to your settings.

This is how LOGO! indicates the I/O status:

**Status indication on the display**

Let us examine this using our example:

- When switch S1 is closed, the status at input I1 is hi.
- LOGO! computes the output states by means of the circuit program.

Output Q1 = '1', in this case.

When Q1 = '1', LOGO! sets relay Q1, and the load connected to Q1 is supplied with voltage.
3.7.7 Second circuit program

Up to this point, you have successfully created your first circuit and assigned it a name and, if desired, a password. In this section we will show you how to modify existing circuit programs and how to use the special functions.

Using this second circuit program, we will show you how to:
- Add a block to an existing circuit program.
- Select a block for a special function.
- Assign parameters.

Modifying circuits

We shall use the first circuit program as a basis for the second, with some slight modifications.

First of all take a look at the circuit diagram for the second circuit program:

You already know the first part of the circuit. S1 and S2 switch a relay, which is to be used to switch on the load E1, and to switch off the load with a delay of 12 minutes.

This is the circuit program layout in LOGO!:

You can see the OR block and the output relay Q1 we have already used in the first circuit program. The only difference is the new off-delay block.

Editing the circuit program

Switch LOGO! to programming mode.

As a reminder:
1. Switch LOGO! to programming mode
   (in RUN: Press ESC to enter the parameter assignment mode. Select the ‘Stop’ command, confirm with OK, then move the ‘>’ cursor to ‘Yes’, and once again confirm with OK). See Page 64.
2. On the main menu, select “Program”
3. On the Programming menu, select “Edit”, confirm with OK. Next, select “Edit Prg” and confirm with OK.
   If required, enter your password at the prompt and confirm with OK.

You can now modify the current circuit program.
Adding a block to a circuit program

Move the cursor to the B in B1 (B1 is the number of the OR block):

![Diagram of B1 and Q1]

To move the cursor:
Press \( \downarrow \)

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

![Diagram of BN and Q1]

Press \( \downarrow \) to select the SF list:

![Diagram of SF and Q1]

The SF list contains the special function blocks.

Press **OK**.

The block of the first special function is shown:

![Diagram of Trg, Par, and Q1]

When you select a special or basic function block, LOGO! shows you the relevant function block. The solid square cursor is positioned on the block. Press \( \downarrow \) or \( \uparrow \) to select the required block.

Select your block (off-delay, see the next figure), and then press **OK**:

![Diagram of B1, R, Par, B2, and Q1]

The added block is assigned the block number B2. The cursor is positioned at the top input of the added block.
The B1 block previously connected to Q1 is automatically connected to the uppermost input of the new block. Note that you can only interconnect digital inputs with digital outputs or analog inputs with analog outputs. The 'old' block will otherwise be lost.

The off-delay block has three inputs. At the top is the trigger input (Trg) you use to start the off-delay time. In our example, the OR block B1 triggers the off-delay. You reset the time and the output with a signal at the reset input. Set the off-delay time at parameter T of the input Par.

In our example we do not use the reset input of the off-delay function, and we identify it with an 'x' connector.

Assigning block parameters

Now you set the off-delay time T:

1. Move the cursor to Par, if it not already at this position: Press ▲ or ▼
2. Switch to editing mode: Press OK

LOGO! shows the parameters in the parameter assignment window:

To change the time value:

- Press ▼ and ▲ to position the cursor.
- Press ▲ and ▼ to modify the value at the relevant position.
- Confirm your entries with OK.
Setting the time

Set the time \( T = 12:00 \) minutes:

1. Move the cursor to the first digit: Press \( \leftarrow \) or \( \rightarrow \)
2. Select the digit ‘1’: Press \( \uparrow \) or \( \downarrow \)
3. Shift the cursor to the second digit: Press \( \leftarrow \) or \( \rightarrow \)
4. Select digit ‘2’: Press \( \uparrow \) or \( \downarrow \)
5. Move the cursor to the unit: Press \( \leftarrow \) or \( \rightarrow \)
6. Select the timebase ‘\( m \)’ (for minutes): Press \( \uparrow \) or \( \downarrow \)

Showing/hiding parameters - the parameter protection mode

If you want to show/hide the parameter and allow/prevent its modification in parameter assignment mode:

1. Move the cursor to the protection mode: Press \( \leftarrow \) or \( \rightarrow \)
2. Select the protection mode: Press \( \uparrow \) or \( \downarrow \)

The display should now show:

- Protection mode +: The value of the time \( T \) can be modified in parameter assignment mode
- Protection mode -: The value of the time \( T \) is hidden in parameter assignment mode

3. Confirm your entries with: OK

Enabling/disabling retentivity

To decide whether you want to retain your current data after a power failure or not:

1. Move the cursor to the retentivity setting: Press \( \leftarrow \) or \( \rightarrow \)
2. Select the retentivity setting: Press \( \uparrow \) or \( \downarrow \)

The display now shows:

- Retentivity \( R \): Current data is retained
- Retentivity \( / \): Current data is not retained

3. Confirm your entries with: OK
Note

For further information on the protection mode, refer to Chapter 4.3.5.

For further information on retentivity, refer to Chapter 4.3.4

You can modify the protection mode and retentivity setting only in programming mode. This is not possible in parameter assignment mode.

In this manual, the protection mode ("+" or "−") and retentivity ("R" or "/") settings are only shown in the displays where these can actually be changed.

Verification of the circuit program

This program branch for Q1 is now completed. LOGO! shows you the output Q1.

You can once again view the circuit program on the display. Use the keys to browse the circuit program; that is, press ◀ or ▶ to move from block to block, ▲ and ▼ to move between the inputs at a block.

Closing the programming mode

Although you were shown how to exit the programming mode when you created your first circuit program, here is a reminder:

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

LOGO! is back in RUN mode:

You can press ◀ or ▶ to scroll the pages and to monitor the I/O states.
3.7.8 Deleting a block

Let us assume you want to delete the block B2 from your circuit program and connect B1 directly to Q1.

Proceed as follows:

1. Switch LOGO! to programming mode (as a reminder, refer to Page 64).
2. Select 'Edit': Press ▲ or ▼
3. Confirm 'Edit': Press OK
   (If required, enter your password and confirm with OK.)
4. Select 'Edit Prg': Press ▲ or ▼
5. Confirm 'Edit Prg': Press OK
6. Move the cursor to B2, the input of Q1 Press ◀:

   B2 Q1

7. Confirm with OK.

   The procedure:
   - Select the BN list: Press ▲ or ▼
   - Accept the BN list: Press OK
   - Select 'B1': Press ▲ or ▼
   - Apply 'B1': Press OK

   Result: Block B2 is deleted, because it is no longer used in the circuit. Block B1 has replaced B2 directly at the output.
3.7.9 Deleting block groups

Let us assume you want to delete the blocks B1 and B2 from the following circuit program (corresponds with the circuit program in Chapter 3.7.7).

Proceed as follows:

1. Switch LOGO! to programming mode (as a reminder, refer to page 64).
2. To select 'Edit': Press ▲ or ▼
3. To confirm 'Edit': Press OK
   (If required, enter your password and confirm with OK.)
4. To select 'Edit Prg': Press ▲ or ▼
5. To confirm 'Edit Prg': Press OK
6. To move the cursor to the input of Q1; that is, to B2, press ▶:

   ![Diagram](Diagram.png)

7. Confirm with OK.
8. Now set the connector 'x' at output Q1 instead of block B2. To do so:
   - Select the Co list: Press ▲ or ▼
   - Accept the Co list: Press OK
   - Select 'x': Press ▲ or ▼
   - Apply 'x': Press OK

   **Result**: Block B2 is deleted, because it is no longer used in the circuit. This includes all blocks connected to B2. In this example, block B1 also.
3.7.10 Correcting programming errors

Programming errors can be corrected easily in LOGO!:

- Provided editing mode is not yet closed, you can revert by one step by pressing ESC.
- If you have already configured all inputs, simply reconfigure the faulty input:
  1. Move the cursor to the faulty position
  2. Change to editing mode. Press OK
  3. Enter the correct input circuit

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

3.7.11 Selecting analog output values for RUN/STOP transition

You can select the analog values that are output at the two analog outputs when LOGO! changes from RUN mode to STOP mode.

In the programming menu:

1. Move the “>” cursor to 'Edit..': Press ▼ or ▲
2. Select 'Edit': Press OK
3. Move the “>” cursor to 'AQ': Press ▼ or ▲
4. Select 'AQ': Press OK
5. Move the “>” cursor to 'AQ in Stop': Press ▼ or ▲
6. Select 'AQ in Stop': Press OK

LOGO! shows the following display:

```
>Defined
Last
AQ in Stop
Last
```

The first two rows show your choices. The bottom row shows the current setting for the analog output channels. The default setting is 'Last'.

You can select either 'Defined' or 'Last'. 'Last' means that the analog output values are held at their last value and 'Defined' means that the analog output values are set to specific values. When LOGO! changes from RUN mode to STOP mode, the values of the analog outputs change as well, depending on the setting.

7. Select the desired output setting: Press ▲ or ▼.
8. Confirm your entry: Press OK
Defining a specific analog output value

To output a specific analog value at the two analog outputs:

9. Move the '>' cursor to 'Defined': Press ▲ or ▼
10. Confirm 'Defined': Press OK

The display shows:

```
AQ1: 00.00  
AQ2: 00.00
```

11. Enter a specific output value for each of the two analog outputs.
12. To confirm your entry: Press OK

3.7.12 Defining the type of analog outputs

Analog outputs can be either 0–10V, which is the default, or 4–20mA.

To define the type of analog outputs, follow these steps starting from the programming menu:

1. Move the “>” cursor to 'Edit..': Press ▼ or ▲
2. Select 'Edit': Press OK
3. Move the “>” cursor to 'AQ': Press ▼ or ▲
4. Select 'AQ': Press OK
5. Move the “>” cursor to 'AQ type': Press ▼ or ▲
6. Select 'AQ type': Press OK

LOGO! shows the following display, for example:

```
AQ1: default  
AQ2: 4–20mA
```

The defined type for each analog channel is shown. To change the type, continue as follows

7. Move to the AQ that you want to change. Press ◄ or ►
8. Select either default (0–10V) or 4–20mA. Press ▼ or ▲
9. Confirm your selection. Press OK
3.7.13 Deleting the circuit program and password

To delete a circuit program and the password if one is defined:

1. Switch the LOGO! to programming mode (main menu).

   >Program..
   Card..
   Setup..
   Start

   LOGO! opens the main menu

2. On the main menu, press ▲ or ▼ to move the '>' cursor to 'Program'. Press OK.

   >Edit..
   Clear Prg
   Password
   Msg Config

   LOGO! changes to the programming menu

3. On the programming menu, move the '>' cursor to 'Clear Prg':

   Press ▲ or ▼

4. Confirm 'Clear Prg':

   Press OK

   Clear Prg
   >No
   Yes
To cancel deletion of the circuit program, leave the '>' cursor at 'No' and press OK.
If you are sure that you want to delete the circuit program from memory:
5. Move the '>' cursor to 'Yes': Press ▲ or ▼
6. Press OK.

Password?
ZZ

To prevent unintentional deletion of your circuit program, you are prompted to enter your password (provided you have assigned one).

7. Enter your password.
8. Press OK. The circuit program and the password are deleted.

Note
Although you may have forgotten your password, you can still delete the circuit program and password by entering the wrong password three times.

3.7.14 Summertime/wintertime conversion

You can enable or disable automatic summertime/wintertime conversion
• in parameter assignment mode by calling the “Set..” menu command
• in programming mode by calling the “Setup” menu command.

To enable/disable automatic S/W Time conversion in programming mode:

1. Switch LOGO! to programming mode.
2. You are now in the main menu and want to select the 'Setup' menu command:
   Press ▲ or ▼
3. Confirm ‘Setup’: Press OK
4. Move the '>' cursor to 'Clock': Press ▲ or ▼
5. Confirm ‘Clock’: Press OK
6. Move the '>' cursor to 'S/W Time': Press ▲ or ▼
7. Confirm ‘S/W Time’: Press OK

LOGO! shows the following display:

>On
Off
S/W Time: Off
The current setting of automatic S/W Time conversion is shown on the bottom row. The default setting is 'Off': disabled.

To enable/disable automatic S/W Time conversion in parameter assignment mode:

If you want to enable/disable automatic S/W Time conversion in parameter assignment mode, select in the parameter assignment menu 'Set..', then menus 'Clock' and 'S/W Time'. You can now enable/disable automatic S/W Time conversion.

Enabling summertime/wintertime conversion

You now want to enable this conversion and define or set its parameters:

1. Move the '>' cursor to 'On': Press ▲ or ▼
2. Confirm 'On': Press OK

The display shows:

```
EU
```

3. Select the desired conversion: Press ▲ or ▼

What is shown on the display ?:

- 'EU' represents the start and end of European summertime.
- 'UK' represents the start and end of summertime in the United Kingdom.
- ‘US’ represents the start and end of daylight saving time (summertime) in the United States. The switchover times correspond to the daylight savings time rule prior to 2007. To use the 2007 switchover times, you must program a user-defined time.
- 'AUS' represents the start and end of Australian summertime.
- 'AUS-TAS' represents the start and end of Australian/ Tasmanian summertime.
- 'NZ' represents the start and end of New Zealand summertime.
- ..: Here you can enter any month, day and time zone difference.
The table below lists the preset conversions:

<table>
<thead>
<tr>
<th></th>
<th>Start of summertime</th>
<th>End of summertime</th>
<th>Time zone difference Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>Last Sunday in March: 02:00→03:00</td>
<td>Last Sunday in October: 03:00→02:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>UK</td>
<td>Last Sunday in March: 01:00→02:00</td>
<td>Last Sunday in October: 02:00→01:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>US</td>
<td>First Sunday in April: 02:00→03:00</td>
<td>Last Sunday in October: 02:00→01:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>AUS</td>
<td>Last Sunday in October: 02:00→03:00</td>
<td>Last Sunday in March: 03:00→02:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>AUS-TAS</td>
<td>First Sunday in October: 02:00→03:00</td>
<td>Last Sunday in March: 03:00→02:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>NZ</td>
<td>First Sunday in October: 02:00→03:00</td>
<td>Third Sunday in March: 03:00→02:00</td>
<td>60 Min.</td>
</tr>
<tr>
<td>..</td>
<td>Customized month and day; 02:00→02:00 +</td>
<td>Customized month and day; Time zone</td>
<td>User-defined (resolution in minutes)</td>
</tr>
<tr>
<td></td>
<td>Time zone difference</td>
<td>difference: 03:00→03:00 – Time zone</td>
<td></td>
</tr>
</tbody>
</table>

The United States of America redefined the daylight saving time (summer time) / standard time (winter time) switchover dates in 2007. LOGO!, however, uses the switchover dates as they were prior to 2007. To use the new U.S. switchover times, select ".." from LOGO! and program the start and end dates directly to correspond to a start date of 02:00 on the second Sunday in March, and an end date of 02:00 on the first Sunday in November.

**Note**

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

Let us assume you want to enable European summertime/wintertime conversion:

4. Move the '>' cursor to 'EU': Press ▲ or ▼

5. Confirm 'EU': Press OK

LOGO! shows the following display:

```
>On
Off
S/W Time:
On→EU
```

LOGO! indicates that European S/W Time conversion is enabled.
User-defined parameters

If none of the parameters/conversions apply to your country, you can customize these under menu item ‘.’. To do so:

1. Confirm ‘On’ once again: Press OK
2. Move the ‘>’ cursor to ‘.’: Press ▲ or ▼
3. Confirm the menu item ‘.’: Press OK

The display shows:

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

This is how you can enter your data:

- Press ▼ or ▲ to move the solid square/cursor.
- Press ▲ and ▼ to change the value at the cursor position.

The display shows:

- Confirm all your entries with OK.

You have now customized the summertime/wintertime conversion. The LOGO! display now shows:

LOGO! indicates that summertime/wintertime conversion is enabled, and that user-defined parameters (‘.’) have been set.
3.7.15 Synchronization

Time synchronization between LOGO! and a connected communication module EIB/KNX (version 0AA1 upwards!) can be enabled/disabled

- in parameter assignment mode by means of the set menu (“Clock” menu item)
- in programming mode by means of the setup menu (“Clock” menu item).

When synchronization is enabled, LOGO! can receive the time-of-day from a communication module EIB/KNX (version 0AA1 upwards).

Whether synchronization is enabled or disabled, the time-of-day is always sent to the expansion modules at power-up, every hour (STOP mode or RUN mode), and when the TOD is changed (after a ‘Set Clock’ is executed or after a summertime/wintertime conversion).

Note
When using a LOGO! basic module with digital or analog expansion modules, but without communication module EIB/KNX (version 0AA1 upwards), time synchronization must not be activated! You must check whether time synchronization is deactivated (‘Sync’ must be set to ‘Off’).

To enable/disable synchronization in programming mode:

1. Switch LOGO! to programming mode.
2. You are now in the main menu, and want to select ‘Setup’: Press ▲ or ▼
3. Confirm ‘Setup’: Press OK
4. Move the ‘>’ cursor to ‘Clock’: Press ▲ or ▼
5. Confirm ‘Clock’: Press OK
6. Move the ‘>’ cursor to ‘Sync’: Press ▲ or ▼
7. Apply ‘Sync’: Press OK
LOGO! shows the following display:

![Display showing >On Off Sync: Off]

The current setting of the automatic synchronization function is displayed on the bottom row. The default setting is ‘Off’; that is, disabled.

**To enable/disable synchronization in parameter assignment mode:**

If you want to enable/disable automatic synchronization in parameter assignment mode, select in the parameter assignment menu ‘Set.‘, then menus ‘Clock‘ and ‘Sync‘. You can now enable/disable automatic synchronization.

### Enabling synchronization

You want to enable synchronization:

1. Move the ‘>’ cursor to ‘On’: Press ▲ or ▼
2. Confirm ‘On’: Press OK

LOGO! shows the following display:

![Display showing >On Off Sync: On]

### 3.8 Memory space and circuit program size

The size of a circuit program in LOGO! is limited by the memory space (memory used by the blocks).

**Memory areas**

- **Program memory:**
  
  LOGO! allows only a limited number of blocks in your circuit program. The second limitation is based on the maximum number of bytes a circuit program may contain. The total number of bytes used can be determined by adding up the number of bytes used for the relevant function blocks.

- **Retentive memory (Rem):**
  
  In this area, LOGO! stores values which need to be retentive, for example, the hours counter value. Blocks with optional retentivity use this memory area only if this function is actually enabled.
Resources available in LOGO!

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

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Blocks</th>
<th>REM</th>
</tr>
</thead>
<tbody>
<tr>
<td>3800</td>
<td>200</td>
<td>250</td>
</tr>
</tbody>
</table>

LOGO! monitors memory utilization, and offers only those functions from the lists for which it can actually provide sufficient memory space.

Memory requirements

The table below shows an overview of the memory requirements for the basic and special function blocks:

<table>
<thead>
<tr>
<th>Function</th>
<th>Program memory</th>
<th>Rem memory*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AND</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>AND with edge evaluation</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>NAND (not AND)</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>NAND with edge evaluation</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>OR</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>NOR (not OR)</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>XOR (exclusive OR)</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>NOT (Negation)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td><strong>Special functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-delay</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Off-delay</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>On-/Off-delay</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Retentive on-delay</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Wiping relay (pulse output)</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Edge triggered wiping relay</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Asynchronous pulse generator</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Random generator</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Stairway lighting switch</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Multiple function switch</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Weekly timer</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Yearly timer</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Counters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up/down counter</td>
<td>28</td>
<td>5</td>
</tr>
<tr>
<td>Hours counter</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>Threshold trigger</td>
<td>16</td>
<td>-</td>
</tr>
</tbody>
</table>
## Utilization of memory areas

The system indicates that there is insufficient memory space by not allowing you to add a further block to your circuit program. LOGO! offers you only the blocks for which it can provide sufficient memory space. If LOGO! memory space is insufficient to hold any further blocks you select from a block list, the system will deny access to this list.

If memory space is fully occupied, optimize your circuit program or install a second LOGO!

<table>
<thead>
<tr>
<th>Function</th>
<th>Program memory</th>
<th>Rem memory*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog threshold trigger</td>
<td>16</td>
<td>–</td>
</tr>
<tr>
<td>Analog differential trigger</td>
<td>16</td>
<td>–</td>
</tr>
<tr>
<td>Analog comparator</td>
<td>24</td>
<td>–</td>
</tr>
<tr>
<td>Analog value monitoring</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>Analog amplifier</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td>Pulse Width Modulator (PWM)</td>
<td>24</td>
<td>–</td>
</tr>
<tr>
<td>Analog Math</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>Analog multiplexer</td>
<td>20</td>
<td>–</td>
</tr>
<tr>
<td>Analog ramp</td>
<td>36</td>
<td>–</td>
</tr>
<tr>
<td>PI controller</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latching relay</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Pulse relay</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Message texts</td>
<td>8</td>
<td>–</td>
</tr>
<tr>
<td>Softkey</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Shift register</td>
<td>12</td>
<td>1</td>
</tr>
</tbody>
</table>

*: Bytes in the Rem memory area if retentivity is enabled.
Calculating memory requirements

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

Example:

The sample circuit program contains:

<table>
<thead>
<tr>
<th>Block no.</th>
<th>Function</th>
<th>Memory area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bytes</td>
</tr>
<tr>
<td>B1</td>
<td>OR</td>
<td>12</td>
</tr>
<tr>
<td>B2</td>
<td>AND</td>
<td>12</td>
</tr>
<tr>
<td>B3</td>
<td>Weekly timer</td>
<td>20</td>
</tr>
<tr>
<td>B4</td>
<td>On-delay*</td>
<td>8</td>
</tr>
<tr>
<td>B5</td>
<td>Stairway lighting switch</td>
<td>12</td>
</tr>
<tr>
<td>B6</td>
<td>AND</td>
<td>12</td>
</tr>
</tbody>
</table>

Resources used by the circuit program: 76 bytes, 6 blocks, 3 REMs.
Memory space limits in LOGO!: 3800 bytes, 200 blocks, 250 REMs.
Still available in LOGO!: 3724 bytes, 194 blocks, 247 REMs.

*: Configured with retentivity.

This means that this circuit program fits in LOGO!
Indication of available memory space

LOGO! shows you the amount of free memory space.

Proceed as follows:

1. Switch LOGO! to programming mode
   (as a reminder, refer to page 64).
2. Select 'Edit': Press ▲ or ▼
3. Accept 'Edit': Press OK
4. Select 'Memory?': Press ▲ or ▼
5. Accept 'Memory?': Press OK

The display now shows:

```
Free Memory:
Byte = 3724
Block= 194
Rem = 247
```
LOGO! functions

Organization

LOGO! provides you with various elements in programming mode. In order to maintain the overview, we have organized the elements in 'Lists'. These lists are:

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

List contents

All lists show the elements available in LOGO! Usually, this includes all connectors, basic functions, and special functions. The \( \text{BN} \) list shows all the blocks that you have created in LOGO!.

If not all is shown

LOGO! does not show all elements if:

- No further blocks may be added.  
  This is either an indication of insufficient memory space or that the maximum number of blocks has been reached.
- A specific block’s memory space requirement would exceed the space available in LOGO!

See Chapter 3.8.
4.1 Constants and connectors - Co

Constants and connectors (= Co) represent inputs, outputs, flags and constant voltage levels (constants).

Inputs:

1) Digital inputs

Digital inputs are identified with an I. The number of the digital inputs (I1, I2, ...) corresponds to the number of the input connectors of the LOGO! Basic and of the connected digital modules, in the order of their installation. The fast digital inputs I3, I4, I5, and I6 of the LOGO! versions LOGO! 24, LOGO! 24o, LOGO! 12/24RC and LOGO! 12/24RCo can be used as fast counters.

2) Analog inputs

The LOGO! versions LOGO! 24, LOGO! 24o, LOGO! 12/24RC and LOGO! 12/24RCo are equipped with the inputs I1, I2, I7 and I8, which can also be programmed for use as AI3, AI4, AI1 and AI2 inputs. Signals at the I1, I2, I7 and I8 inputs are interpreted as digital values, and those at the AI3, AI4, AI1 and AI2 inputs are interpreted as analog values. Note that AI3 corresponds to I1 and AI4 corresponds to I2. This numbering preserves the previous correspondence of AI1 to I7 and AI2 to I8 that was available with the 0BA5 series. The inputs of a connected analog module are numbered according to the already existing analog inputs. In programming mode, when you select the input signal of a special function that takes an analog input, LOGO! offers the analog inputs AI1...AI8, analog flags AM1...AM6, and the block numbers of functions with analog output or the analog outputs AQ1 and AQ2.

Outputs:

1) Digital outputs

Digital outputs are identified by the character Q. The output numbers (Q1, Q2, ... Q16) correspond with the numbers of the output connectors at the LOGO! Basic and with those of the expansion modules, in their order of installation. See the following figure.

There are also 16 blank outputs available. These are identified with an x and cannot be reused in a circuit program (in contrast to flags, for example). The list shows all programmed blank outputs, and one blank output which is not yet configured. A blank output, for example, is useful for the special function "Message texts" (see Chapter 4.4.23), if only the message text is of significance to a circuit program.
2) Analog outputs

Analog outputs are identified by the letters AQ. Two analog outputs are available, namely AQ1 and AQ2. An analog output can only be connected with the analog input of a function, an analog flag AM or an analog output connector.

The following figure shows an example LOGO! configuration and the numbering of the inputs and outputs for the circuit program.

![LOGO! Configuration Diagram]

Flag blocks

Flag blocks are identified by the letters M or AM. These are virtual outputs, which output the value of their inputs. LOGO! provides 27 digital flags M1 ... M27 and 6 analog flags AM1 ... AM6.

Startup flag

Flag M8 is set in the first cycle of the user program and can thus be used in your circuit program as a startup flag. This signal is automatically reset after the circuit program has completed its first cycle.

The M8 flag can be used in all further cycles for setting, deletion and evaluation procedures in the same way as other flags.

Backlight flags M25 and M26

The M25 flag controls the backlight of the LOGO! Display. The M26 flag controls the backlight of the LOGO! TD.

Message text character set flag M27

The M27 flag selects between the two character sets that LOGO! uses to display message texts. State 0 corresponds to Character Set 1, and state 1 corresponds to Character Set 2. If M27=0 (low), only message texts configured for Character Set 1 will display; If M27=1 (high), only message texts configured for Character Set 2 will display. If you do not include M27 in the circuit program, message texts display in the character set that you selected from either the Msg Config menu or from LOGO!Soft Comfort.

Note

The output of the flag always carries the signal of the previous program cycle. This value does not change within the same program cycle.
Shift register bits

LOGO! provides the shift register bits S1 to S8, which are assigned the read-only attribute in the circuit program. The content of shift register bits can only be modified by means of the "Shift register" special function (see Chapter 4.4.25).

Cursor keys

Up to four cursor keys are available to you, namely C ▲, C ▼, C ◄, and C ▶ ("C" = "Cursor"). Cursor keys are programmed for the circuit program in the same way as other inputs. You can set the cursor keys in the corresponding display while the system is in RUN (see Chapter 3.7.6), and in an active message text (ESC + Key). Cursor keys can save switches and inputs, and allow operator control of the circuit program. Cursor key inputs from the LOGO! TD are identical to cursor key inputs from the LOGO! module.

LOGO! TD function keys

The LOGO! TD has four function keys that you can use in your circuit program. You program these keys in the same way as other inputs. Like the cursor keys, you can press these keys when LOGO! is in RUN mode to affect the behavior of the circuit program, and to save switches and inputs. They are identified as F1, F2, F3, and F4.

Levels

Voltage levels are designated hi and lo. A constant "1" = hi or "0" = lo status at the block can be set by means of a permanent voltage level or constant value hi or lo.

Open connectors

Unused block connectors can be identified with an x.
4.2  **Basic functions list - GF**

Basic functions represent simple logical elements of Boolean algebra.

You can invert the inputs of individual basic functions, that is, the circuit program inverts a logical "1" at a relevant input to a logical "0"; if "0" is set at the input, the program sets a logical "1". A programming example is found in Chapter 3.7.3.

The GF list contains the basic function blocks you can use for your circuit program. The following basic functions are available:

<table>
<thead>
<tr>
<th>View in the circuit diagram</th>
<th>View in LOGO!</th>
<th>Name of the basic function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series circuit make contact</td>
<td><img src="image" alt="" /></td>
<td>AND (see page 106)</td>
</tr>
<tr>
<td>Parallel circuit with break contacts</td>
<td><img src="image" alt="" /></td>
<td>NAND (not AND) (see page 107)</td>
</tr>
<tr>
<td>Parallel circuit with make contacts</td>
<td><img src="image" alt="" /></td>
<td>OR (see page 109)</td>
</tr>
<tr>
<td>Series circuit with break contacts</td>
<td><img src="image" alt="" /></td>
<td>NOR (not OR) (see page 109)</td>
</tr>
<tr>
<td>Double change-over contact</td>
<td><img src="image" alt="" /></td>
<td>XOR (exclusive OR) (see page 110)</td>
</tr>
<tr>
<td>Break contact</td>
<td><img src="image" alt="" /></td>
<td>NOT (negation, inverter) (see page 111)</td>
</tr>
</tbody>
</table>
4.2.1 AND

Circuit diagram of a series circuit with several make contacts:

Symbol in LOGO!:

The output of the AND is only 1 if all inputs are 1, i.e. all contacts are closed.

At an unused block input (x): x = 1.

AND function logic table

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2.2 AND with edge evaluation

Symbol in LOGO!:

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

At an unused block input (x): x = 1.
Timing diagram for the AND with edge evaluation

4.2.3 NAND (not AND)

Parallel circuit with multiple break contacts in the circuit diagram:

Symbol in LOGO!:

The output of the NAND is only 0 if the status at all inputs is 1, i.e. the contacts are closed.

At an unused block input (x): x = 1.
NAND function logic table

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
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</tbody>
</table>

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.

At an unused block input (x): x = 1.

Timing diagram for the NAND with edge evaluation
4.2.5 OR

Circuit diagram of a parallel circuit with several make contacts:

Symbol in LOGO!:

The output status of the OR element is only 1 if at least one input is 1, i.e. at least one of the contacts is closed.

At an unused block input (x): x = 0.

OR function logic table

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

4.2.6 NOR (not OR)

Circuit diagram of a series circuit with several break contacts:

Symbol in LOGO!:

The output status of the NOR is only 1 if all inputs are 0, i.e. if switched off. The NOR output is set to 0 when one of the inputs is switched on (logical 1 status).

At an unused block input (x): x = 0.
NOR function logic table

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Q</th>
</tr>
</thead>
<tbody>
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<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

4.2.7 XOR (exclusive OR)

The XOR in a circuit diagram, shown as series circuit with 2 changeover contacts:

Symbol in LOGO!:

The output status of the XOR is 1 if the inputs are not equivalent.

At an unused block input (x): x = 0.

XOR function logic table

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
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<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
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 inverts the input status.

Advantage of the NOT block, for example: LOGO! does not require break contacts. You simply use a make contact and the NOT block to convert these into a break contact.

NOT function logic table

<table>
<thead>
<tr>
<th></th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

4.3 Special functions

Because of their different input designation, you can see right away that there is a difference between the special functions and basic functions. SFs contain timer functions, retentive functions and various parameter assignment options, which allow you to adapt the circuit program to suit your own requirements.

This section provides you with a brief overview of input designations and with some particular background information on SFs. The SFs in particular are described in Chapter 4.4.
4.3.1 Designation of the inputs

Logical inputs

Here, you will find the description of the connectors you can use to create a logical link to other blocks or to the inputs of the LOGO! unit.

- **S (Set):**
  A signal at input S sets the output to logical “1”.

- **R (Reset):**
  The reset input R takes priority over all other inputs and resets the outputs.

- **Trg (Trigger):**
  This input is used to trigger the start of a function.

- **Cnt (Count):**
  This input is used for counting pulses.

- **Fre (Frequency):**
  Frequency signals to be evaluated are applied to this input.

- **Dir (Direction):**
  This input determines the direction of count, for example.

- **En (Enable):**
  This input enables a block function. When this input is "0", other signals to the block will be ignored.

- **Inv (Invert):**
  A signal at this input inverts the output signal of the block.

- **Ral (Reset all):**
  All internal values are reset.

Connector X at SF inputs

SF inputs connected to connector x are set low. That is, the inputs carry a 'lo' signal.

Parameter inputs

At some of the inputs you do not apply any signals. You configure the relevant block values instead. Examples:

- **Par (Parameter):**
  This input will not be connected. Here, you set the relevant block parameters (times, on/off thresholds etc.).

- **No (Cam):**
  This input will not be connected. Here, you configure the time patterns.

- **P (Priority):**
  This is an open input. Here, you define priorities and specify whether a message is to be acknowledged in RUN.
4.3.2 Time response

Parameter T

At some of the SFs it is possible to configure a time value T. When you preset this time, note that your input values are based on the timebase set:

<table>
<thead>
<tr>
<th>Timebase</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>s (seconds)</td>
<td>seconds : 1/100 seconds</td>
<td></td>
</tr>
<tr>
<td>m (minutes)</td>
<td>minutes : seconds</td>
<td></td>
</tr>
<tr>
<td>h (hours)</td>
<td>hours : minutes</td>
<td></td>
</tr>
</tbody>
</table>

Setting a time T of 250 minutes:

Unit in hours h:
- 04:00 hours 240 minutes
- 00:10 hours +10 minutes

\[\text{B1} + \text{T }= \text{04:10h}\]

Note

Always specify a time T in ≥ 0.02 s. The time T is not defined for T < 0.02 s.

Accuracy of T

Because of slight tolerances in the characteristics of electronic components, the set time T may deviate. LOGO! has a maximum tolerance of ± 0.02 %.
When 0.02 % of the time T is less than 0.02 seconds, the maximum deviation is 0.02 seconds.

Example:
The maximum tolerance per hour (3600 seconds) is ± 0.02 %, which is proportional to ± 0.72 seconds.
The maximum tolerance per minute (60 seconds) is ± 0.02 seconds.

Accuracy of the timer (weekly/yearly timer)
To prevent timing inaccuracy of the real-time clock in C versions caused by this deviation, the timer value is continuously compared with a high-precision timebase and corrected. The resultant maximum timing inaccuracy is ± 5 s/day.
4.3.3 Backup of the real-time clock

Because the internal real-time clock of a LOGO! is backed up, it continues operation after a power failure. The ambient temperature influences the backup time. At an ambient temperature of 25°C, the typical backup time is 80 hours.

If there is a power outage of a LOGO! for more than 80 hours, the internal clock responds, dependent on the equipment series, as shown below:

- **Equipment series 0BA0:**
  On restarting, the clock is set to "Sunday 00:00 1 January". The time starts to run. Due to this, the system processes the time switches, which trigger actions if necessary.

- **Equipment series 0BA1 and later:**
  On restarting, the clock is set to "Sunday 00:00 1 January". The time is stopped and flashes. LOGO! is back in the status that it was in before the power outage. In the RUN status, the system processes the counters that were parameterized with the time above. The clock is, however, still stopped.

- **Equipment series 0BA6:**
  If you are using the optional LOGO! Battery card, or combined LOGO! Memory/Battery card, LOGO! can retain the clock time for two years. These cards are available for equipment series 0BA6.

4.3.4 Retentivity

The switching states and counter values of SFs can be set retentive. This means that current data are retained after a power failure, and that the block resumes operation at the break point. The timer is not reset, but resumes operation until the time-to-go has expired, for example.

To enable this response, however, the relevant functions must be set retentive. Two options are available:

- **R:** The data is retained.
- **/:** Current data is not retained (default). See the example on Page 84.

SFs hours counter, weekly timer, yearly timer and PI controller are always retentive.

4.3.5 Parameter protection

In the parameter protection settings, you can determine whether or not the parameters can be displayed and edited in LOGO! parameter assignment mode. Two options are available:

- **+:** The parameter attribute permits read/write access in parameter assignment mode (default).
- **-:** The parameter settings are read-/write-protected in parameter assignment mode, and can be edited only in programming mode. See the example on Page 84.
4.3.6 Calculating the gain and offset of analog values

A sensor is connected to the analog input and converts a process variable into an electrical signal. This value of signal lies within the typical range of this sensor.

LOGO! always converts the electrical signals at the analog input into digital values from 0 to 1000.

A voltage of 0 to 10 V at input AI is transformed internally into a range of values from 0 to 1000. An input voltage exceeding 10 V is shown as internal value 1000.

Because you cannot always process the range of values from 0 to 1000 as predetermined by LOGO!, you can multiply the digital values by a gain factor and then shift the zero of the range of values (offset). This allows you to output an analog value to the LOGO! display, which is proportional to the actual process variable.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage (in V)</td>
<td>0</td>
<td>≥ 10</td>
</tr>
<tr>
<td>Internal value</td>
<td>0</td>
<td>1000</td>
</tr>
<tr>
<td>Gain</td>
<td>-10.00</td>
<td>+10.00</td>
</tr>
<tr>
<td>Offset</td>
<td>-10000</td>
<td>+10000</td>
</tr>
</tbody>
</table>

Mathematical rule

Actual value $A_x = (\text{internal value at input } A_x \cdot \text{gain}) + \text{offset}$

Gain and offset calculation

The gain and offset is calculated based on the relevant high and low values of the function.

Example 1:

The available thermocouples have the following technical data: -30 to +70°C, 0 to 10 V DC (i.e. 0 to 1000 in LOGO!).

Actual value $= (\text{internal value} \cdot \text{gain}) + \text{offset}$, thus

$-30 = (0 \cdot A) + B$, i.e. offset $B = -30$

$+70 = (1000 \cdot A) - 30$, i.e. gain $A = 0.1$

Example 2:

A pressure sensor converts a pressure of 1000 mbar into a voltage of 0 V, and a pressure of 5000 mbar into a voltage of 10 V.

Actual value $= (\text{internal value} \cdot \text{gain}) + \text{offset}$, thus

$1000 = (0 \cdot A) + B$, i.e. offset $B = 1000$

$5000 = (1000 \cdot A) + 1000$, i.e. gain $A = 4$
Example of analog values

<table>
<thead>
<tr>
<th>Process variable</th>
<th>Voltage (V)</th>
<th>Internal value</th>
<th>Gain</th>
<th>Offset</th>
<th>Value shown (Ax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 °C</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>-30</td>
<td>-30</td>
</tr>
<tr>
<td>0 °C</td>
<td>3</td>
<td>300</td>
<td>0.1</td>
<td>-30</td>
<td>0</td>
</tr>
<tr>
<td>+70 °C</td>
<td>10</td>
<td>1000</td>
<td>0.1</td>
<td>-30</td>
<td>70</td>
</tr>
<tr>
<td>1000 mbar</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>3700 mbar</td>
<td>6.75</td>
<td>675</td>
<td>4</td>
<td>1000</td>
<td>3700</td>
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<tr>
<td>5000 mbar</td>
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<td>10</td>
<td>0</td>
<td>0</td>
<td>20</td>
</tr>
</tbody>
</table>

A sample application is found in the description of the "Analog comparator" SF on Page 163.

For further information on analog inputs, refer to Chapter 4.1.
### 4.4 Special functions list - SF

When you create your circuit program in LOGO!, you find the special function blocks in the SF list.

You can invert the inputs of SFs individually, that is, the circuit program converts a logical "1" at the input into a logical "0"; a logical "0" it converts into a logical "1". An example of the program code is found in Chapter 3.7.3.

The table also specifies whether the relevant function can be set retentive (Rem). The following SFs are available:

<table>
<thead>
<tr>
<th>View in LOGO!</th>
<th>Name of the special function</th>
<th>Rem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On-delay</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Off-delay</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>On-/Off-delay</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Retentive on-delay</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Wiping relay (pulse output)</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Edge triggered wiping relay</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Asynchronous pulse generator</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Random generator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stairway lighting switch</td>
<td>REM</td>
</tr>
</tbody>
</table>
## LOGO! functions

<table>
<thead>
<tr>
<th>View in LOGO!</th>
<th>Name of the special function</th>
<th>Rem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger</td>
<td>Multiple function switch</td>
<td>REM</td>
</tr>
<tr>
<td>Weekly timer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly timer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counter</td>
<td>Up/down counter</td>
<td>REM</td>
</tr>
<tr>
<td>Hours counter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold trigger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog</td>
<td>Analog threshold trigger</td>
<td></td>
</tr>
<tr>
<td>Differential trigger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparator</td>
<td>Analog comparator</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>Anlog value monitoring</td>
<td></td>
</tr>
<tr>
<td>Amplifier</td>
<td>Analog amplifier</td>
<td></td>
</tr>
</tbody>
</table>

### Counter

- **Weekly timer** (see Page 139)
- **Yearly timer** (see Page 143)

### Analog

- **Analog threshold trigger** (see Page 157)
- **Analog differential trigger** (see Page 160)
- **Analog comparator** (see Page 163)
- **Analog value monitoring** (see Page 168)
- **Analog amplifier** (see Page 171)
<table>
<thead>
<tr>
<th>View in LOGO!</th>
<th>Name of the special function</th>
<th>Rem</th>
</tr>
</thead>
<tbody>
<tr>
<td>En S1 S2 Par</td>
<td>Analog multiplexer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see Page 191)</td>
<td></td>
</tr>
<tr>
<td>En Ax Par</td>
<td>Pulse Width Modulator (PWM)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see Page 168)</td>
<td></td>
</tr>
<tr>
<td>En Par</td>
<td>Analog Math</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see Page 168)</td>
<td></td>
</tr>
<tr>
<td>En Sel St Par</td>
<td>Analog ramp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see Page 193)</td>
<td></td>
</tr>
<tr>
<td>A/M R PV Par</td>
<td>PI controller</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>(see Page 197)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Miscellaneous</strong></td>
<td></td>
</tr>
<tr>
<td>En P Par</td>
<td>Message texts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(see Page 175)</td>
<td></td>
</tr>
<tr>
<td>En Par</td>
<td>Softkey</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>(see Page 186)</td>
<td></td>
</tr>
<tr>
<td>In Trg Dir Par</td>
<td>Shift register</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>(see Page 189)</td>
<td></td>
</tr>
</tbody>
</table>

**LOGO! Manual**

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4.4.1 On-delay

Short description

The output is only set after a configurable on-delay time has expired.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>Input</td>
<td>A signal at input Trg (Trigger) triggers the on-delay timer.</td>
</tr>
<tr>
<td></td>
<td>Parameter</td>
<td>T represents the time after which the output is switched on (0 to 1 transition of the output signal). Retentivity: ( / ) = no retentivity ( R ) = the status is retentive.</td>
</tr>
<tr>
<td></td>
<td>Output</td>
<td>Q is switched on when the set time T has expired, provided Trg is still set.</td>
</tr>
</tbody>
</table>

Parameter T

Note the defaults for parameter T in Chapter 4.3.2.

The time for parameter T can also be preset based on the actual value of another, already-configured function. You can use the actual values of the following functions:

- Analog comparator (actual value \( Ax - Ay \), see Chapter 4.4.18)
- Analog threshold trigger (actual value \( Ax \), see Chapter 4.4.16)
- Analog amplifier (actual value \( Ax \), see Chapter 4.4.20)
- Analog multiplexer (actual value \( AQ \), see Chapter 4.4.26)
- Analog ramp (actual value \( AQ \), see Chapter 4.4.27)
- PI controller (actual value \( AQ \), see Chapter 4.4.28)
- Counter (actual value \( Cnt \), see Chapter 4.4.13)
- Analog Math (actual value \( AQ \), see Chapter 4.4.30)

Select the required function by the block number. The timebase is adjustable.

Please note the following listing:
Valid ranges of the timebase, if T = parameter

<table>
<thead>
<tr>
<th>Timebase</th>
<th>max. value</th>
<th>min. resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>s (seconds)</td>
<td>99:99</td>
<td>10 ms</td>
<td>+ 10 ms</td>
</tr>
<tr>
<td>m (minutes)</td>
<td>99:59</td>
<td>1 s</td>
<td>+ 1 s</td>
</tr>
<tr>
<td>h (hours)</td>
<td>99:59</td>
<td>1 min</td>
<td>+ 1 min</td>
</tr>
</tbody>
</table>

The display in programming mode (example):

```
B12 +R
T   =04:10h
```

Valid ranges of the timebase, if T = Actual value of an already-programmed function

<table>
<thead>
<tr>
<th>Timebase</th>
<th>max. value</th>
<th>Meaning</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ms</td>
<td>99990</td>
<td>Number of ms</td>
<td>+ 10 ms</td>
</tr>
<tr>
<td>s</td>
<td>5999</td>
<td>Number of s</td>
<td>+ 1 s</td>
</tr>
<tr>
<td>m</td>
<td>5999</td>
<td>Number of min</td>
<td>+ 1 min</td>
</tr>
</tbody>
</table>

The display in programming mode (example):

```
B12 +R
T   →B006s
```

If the referenced block (B6, in the example) returns a value that lies out of the valid range, the value is rounded up or down to the next valid value.

**Parameter preset = Actual value of an already-programmed function**

How to include the actual value of an already-programmed function:

1. Press ▶ to move the cursor to the equal sign of parameter T.

```
B12 +R
T   =04:10h
```

Press ▶ twice.
2. Press ▼ to change the equal sign into an arrow. If it exists, the last referenced block and its timebase is shown.

```
B12 +R
T →B006s
```

3. Press ▶ to move the cursor to the “B” of the shown block, and then press ▼ to select the required block number.

4. Press ▶ to move the cursor to the block’s timebase and press ▼ to select the required timebase.

```
B12 +R
T →B006m
```

The view in parameter assignment mode (example):

```
B12
T =04:10h T =04:10
Ta =02:00h Ta =02:00h
```

**Timing diagram**

The bold section of the timing diagram is also shown in the on-delay icon.

**Functional description**

The time \( T_a \) is triggered with a 0 to 1 transition at input \( \text{Trg} \) (\( T_a \) is the current LOGO! time).

If the status of input \( \text{Trg} \) 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 when the status at input \( \text{Trg} \) returns to 0 before the time \( T \) has expired.

The output is reset to 0 when the signal at input \( \text{Trg} \) is 0.

If retentivity is not set, output \( Q \) and the expired time are reset after a power failure.
4.4.2 Off-delay

Short description

When an on-delay is set, the output is reset when the configured time has expired.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Input Trg</td>
<td>The off-delay timer starts with a negative edge (1 to 0 transition) at input Trg (Trigger)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Input R</td>
<td>A signal at input R resets the on-delay time and the output.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Parameter</td>
<td>The output switches off (transitions from 1 to 0) when the delay time T expires. Retentivity: / = No retentivity R = The status is retentive.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Output Q</td>
<td>Q is set with a signal at input Trg. It holds this state until T has expired.</td>
</tr>
</tbody>
</table>

Parameter T

Note the parameter T defaults specified in Chapter 4.3.2.

The time for parameter T can be based on the actual value of another, already-configured function. You can use the actual value of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid timebase ranges and parameter preset, refer to Chapter 4.4.1.

Timing diagram

![Timing Diagram](image)
Functional description

Output Q is set to hi immediately when the input Trg changes to hi.

The actual time $T_a$ in LOGO! is retrigged at the 1 to 0 transition of Trg. The output remains set. Output Q is reset to 0 with off-delay when $T_a$ reaches the value configured at $T$ ($T_a=T$).

The time $T_a$ is retrigged with a one-shot at input Trg.

You can set input R (Reset) to reset the time $T_a$ and the output before $T_a$ has expired.

If retentivity is not set, output Q and the expired time are reset after a power failure.

4.4.3 On-/Off-delay

Short description

The on-/off-delay function sets the output after the set on-delay time has expired, and resets it upon expiration of the off-delay time.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg Par Q</td>
<td>Input Trg</td>
<td>A positive edge (0 to 1 transition) at input Trg (Trigger) triggers the on-delay time $T_H$. A negative edge (1 to 0 transition) at input Trg (Trigger) triggers the off-delay time $T_L$.</td>
</tr>
<tr>
<td>Parameter</td>
<td>$T_H$ is the time after which the output is set hi (output signal transition 0 to 1). $T_L$ is the time after which the output is reset (output signal transition 1 to 0). Retentivity: / = No retentivity R = The status is retentive.</td>
<td></td>
</tr>
<tr>
<td>Output Q</td>
<td>Q is set when the configured time $T_H$ has expired and Trg is still set. It is reset on expiration of the time $T_L$ if the trigger Trg has not been set again.</td>
<td></td>
</tr>
</tbody>
</table>
Parameters $T_H$ and $T_L$

Note the preset values for the parameters $T_H$ and $T_L$ in Chapter 4.3.2.

The on-delay and off-delay times for parameters $T_H$ and $T_L$ can be based on the actual value of another, already-configured function. You can use the actual values of the following functions:

- Analog comparator (actual value $Ax - Ay$, see Chapter 4.4.18)
- Analog threshold trigger (actual value $Ax$, see Chapter 4.4.16)
- Analog amplifier (actual value $Ax$, see Chapter 4.4.20)
- Analog multiplexer (actual value $AQ$, see Chapter 4.4.26)
- Analog ramp (actual value $AQ$, see Chapter 4.4.27)
- PI controller (actual value $AQ$, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value $AQ$, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid timebase ranges and parameter preset, refer to Chapter 4.4.1.

Timing diagram

The bold section of the timing diagram is also shown in the on/off-delay symbol.

Functional description

The time $T_H$ is triggered with 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 with on-delay).

The time is reset when the signal at input Trg is reset to 0 before the time $T_H$ has expired.

A 1 to 0 transition at input Trg triggers the time $T_L$.

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

The time is reset when the signal at input Trg changes to 1 again before the time $T_L$ has expired.

If retentivity is not set, output Q and the expired time are reset after a power failure.
4.4.4 Retentive on-delay

Short description
A one-shot at the input triggers a configurable on-delay time. The output is set when this time has expired.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>A signal at input Trg (Trigger) triggers the on-delay timer.</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>A signal at input R resets the on-delay time and the output.</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>T represents the on-delay time for the output (output status transition 0 to 1). Retentivity: /= no retentivity R = The status is retentive.</td>
<td></td>
</tr>
<tr>
<td>Output Q</td>
<td>Q is set after the time T has expired.</td>
<td></td>
</tr>
</tbody>
</table>

Parameter T
Note the defaults specified in Chapter 4.3.2.
The time for parameter T can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

Timing diagram

The bold section of the timing diagram is also shown in the symbol of the retentive on-delay.
Functional description

The 0 to 1 signal transition at input Trg triggers the current time $T_a$. Output Q is set when $T_a = T$. A further signal at input Trg does not influence the time $T_a$.

The output and the time $T_a$ are reset with the next 1 signal at input R.

If retentivity is not set, output Q and the expired time are reset after a power failure.

4.4.5 Wiping relay (pulse output)

Short description

An input pulse generates a signal with a configurable period at the output.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>Input Trg</td>
<td>A signal at input Trg (Trigger) triggers the time for the wiping relay function.</td>
</tr>
<tr>
<td>Par</td>
<td>Parameter</td>
<td>The output is switched off after the time T has expired (output signal transition 1 to 0). Retentivity: / = No retentivity, R = The status is retentive.</td>
</tr>
<tr>
<td>Q</td>
<td>Output Q</td>
<td>A signal at input Trg sets Q. If the input signal = 1, output Q remains set for the time $T_a$.</td>
</tr>
</tbody>
</table>

Parameter T

Note the information on parameter T in Chapter 4.3.2.

The time for parameter T can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value $Ax - Ay$, see Chapter 4.4.18)
- Analog threshold trigger (actual value $Ax$, see Chapter 4.4.16)
- Analog amplifier (actual value $Ax$, see Chapter 4.4.20)
- Analog multiplexer (actual value $AQ$, see Chapter 4.4.26)
- Analog ramp (actual value $AQ$, see Chapter 4.4.27)
- PI controller (actual value $AQ$, see Chapter 4.4.28)
- Up/down counter (actual value $Cnt$, see Chapter 4.4.13)
- Analog Math (actual value $AQ$, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.
Timing diagram

![Timing diagram](image)

The bold section of the timing diagram also appears in the symbol of the wiping relay.

Functional description

A 0 to 1 transition at input Trg sets the output, and triggers a time $T_a$ during which the output remains set.

Output Q is reset to lo (pulse output) when $T_a$ reaches the value preset at $T$ ($T_a = T$).

The output is immediately reset if there is a 1 to 0 transition at input Trg before the specified time has expired.

If retentivity is not set, output Q and the expired time are reset after a power failure.

4.4.6 Edge triggered wiping relay

Short description

An input pulse generates a preset number of output pulses with a defined pulse/pause ratio (retriggerable), after a configured delay time has expired.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>Input Trg</td>
<td>A signal at input Trg (Trigger) triggers the times for the edge triggered wiping relay.</td>
</tr>
<tr>
<td>R</td>
<td>Input R</td>
<td>A signal at input R resets the current time ($T_a$) and the output.</td>
</tr>
<tr>
<td>P/Q</td>
<td>Parameter</td>
<td>The interpulse width $T_L$ and the pulse width $T_H$ are configurable. N determines the number of pulse/pause cycles $T_L/T_H$: Range of values: 1...9 Retentivity: / = No retentivity R = The status is retentive.</td>
</tr>
<tr>
<td>Q</td>
<td>Output Q</td>
<td>Q is set after $T_L$ has expired, and reset after $T_H$ has expired.</td>
</tr>
</tbody>
</table>
Parameters TH and TL

Note the information on parameter T in Chapter 4.3.2.

The pulse width TH and the interpulse width TL can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

**Timing diagram A**

![Timing diagram A]

- The bold section of the timing diagram also appears in the symbol of the edge triggered wiping relay.

**Timing diagram B**

![Timing diagram B]

- Timing diagram for the sample configuration

**Functional description**

A 0 to 1 transition at input Trg triggers the time TL (Time Low). After the time TL has expired, output Q is set for the duration of TH (Time High).

If there is a further 0 to 1 transition (retriggering pulse) at input Trg before the preset time (TL + TH) has expired, Ta is reset and the pulse/pause cycle is restarted.

If retentivity is not set, output Q and the time are reset after a power failure.
Setting the Par parameter

View in programming mode (example):

```
B25 1+R
TL =02:00s
TH =03:00s
```

Press ▶

```
B25 2
N =1
```

View in parameter assignment mode (example):

```
B25
TL =02:00s
TH =03:00s
Ta =01:15s
```

4.4.7 Asynchronous pulse generator

Short description

The output pulse shape can be modified by reconfiguring the pulse/pause ratio.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>Input En</td>
<td>You can use input EN to set and reset the asynchronous pulse generator.</td>
</tr>
<tr>
<td>INV</td>
<td>Input INV</td>
<td>Input INV can be used to invert the output signal of the active asynchronous pulse generator.</td>
</tr>
</tbody>
</table>
| Par             | Parameter | You can configure the pulse width TH and the interpulse width TL. Retentivity: 
|                 |         | / = No retentivity |
|                 |         | R = The status is retentive. |
| Q               | Output Q | Q is set and reset cyclically according to the pulse/pause ratio TH and TL. |
Parameters TH and TL

Note the information on parameter T in Chapter 4.3.2.

The pulse width TH and the interpulse width TL can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

Timing diagram

En
Inv
Q

T_H, T_L, T_H, T_L, T_H, T_L

Functional description

You can configure the pulse/interpulse width at the T_H (Time High) and T_L (Time Low) parameters.

Input Inv can be used to invert the output signal, provided the block is enabled with a signal at input EN.

If retentivity is not set, output Q and the expired time are reset after a power failure.
4.4.8 Random generator

Short description

The output of the random generator is set or reset within a configured time.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Input En</td>
<td>A positive edge (0 to 1 transition) at input En (Enable) triggers the on-delay time of the random generator. A negative edge (1 to 0 transition) at input En (Enable) triggers the off-delay time of the random generator.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Parameter</td>
<td>The on-delay is set at random to a value between 0 s and TH. The off-delay is set at random to a value between 0 s and TL.</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Output Q</td>
<td>Output Q is set when the on-delay has expired and if En is still set. It is reset when the off-delay has expired, provided En was not set again meanwhile.</td>
</tr>
</tbody>
</table>

Parameter $T_H$ and $T_L$

Note the defaults of the $T_H$ and $T_L$ parameters listed in Chapter 4.3.2.

The on-delay time $T_H$ and the off-delay time $T_L$ can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value $Ax - Ay$, see Chapter 4.4.18)
- Analog threshold trigger (actual value $Ax$, see Chapter 4.4.16)
- Analog amplifier (actual value $Ax$, see Chapter 4.4.20)
- Analog multiplexer (actual value $AQ$, see Chapter 4.4.26)
- Analog ramp (actual value $AQ$, see Chapter 4.4.27)
- PI controller (actual value $AQ$, see Chapter 4.4.28)
- Up/down counter (actual value $Cnt$, see Chapter 4.4.13)
- Analog Math (actual value $AQ$, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

Timing diagram

![Timing Diagram](image)
Functional description

The 0 to 1 transition at input En triggers a random on-delay time between 0 s and \( T_H \). The output is set when the on-delay time has expired and if the signal at input En remains hi at least for the duration of this time.

The time is reset if input En is reset before the on-delay time has expired.

A 1 to 0 transition at input EN triggers a random off-delay time between 0 s and \( T_L \).

The output is reset after the off-delay time has expired, provided input En remains lo at least for the duration of this time.

The time is reset if the signal at input En changes to 1 again before the off-delay time has expired.

The time expired is reset after a power failure.
4.4.9 Stairway lighting switch

Short description
An input edge triggers a configurable and retriggerable time. The output is reset after this time has expired. A warning signal can be output before this time has expired to warn of the impending shutdown.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg Par</td>
<td>Input Trg</td>
<td>A signal at input Trg (Trigger) triggers the off-delay time for the stairway lighting switch.</td>
</tr>
<tr>
<td>Parameter</td>
<td>T represents the off-delay time of the output (output signal transition 1 to 0). T1 determines the triggering time for the pre-warning. TIL determines the length of the pre-warning signal. Retentivity: / = No retentivity R = The status is retentive.</td>
<td></td>
</tr>
<tr>
<td>Output Q</td>
<td>Output Q is reset after the time T has expired. A warning signal can be output before this time has expired.</td>
<td></td>
</tr>
</tbody>
</table>

Parameter T, T1 and TIL

Note the defaults of the T parameters listed in Chapter 4.3.2.

The off-delay time T, the pre-warning time T1 and the pre-warning period TIL can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

Timing diagram

```
Trg

Q

T

T1

TIL

T_a is busy

Ta is busy
```
Functional description

A 0 to 1 signal transition at input Trg sets output Q. The next 1 to 0 transition at Trg retriggers the current time Ta, and output Q remains set.

Output Q is reset when Ta = T. You can output a warning signal before the off-delay time (T - T!) has expired to reset Q for the time of the pre-warning period T!L.

A further one-shot at input Trg during Ta retriggers the time Ta.

If retentivity is not set, output Q and the expired time are reset after a power failure.

Setting the Par parameter

Note the defaults specified in Chapter 4.3.2.

Note

All times must have the same timebase.

View in programming mode (example):

```plaintext
B9 1+R
T =60:00s
```

Press ►

```plaintext
B9 2
T! =05:00s
T!L=00:10s
```

View in parameter assignment mode (example):

```plaintext
B9 1
T =60:00s
Ta =06:00s
```
4.4.10 Multiple function switch

Short description
Switch with two different functions:

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

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>Input Trg</td>
<td>A signal at input Trg (Trigger) sets output Q (permanent light) or resets Q with an off-delay. When active, output Q can be reset with a signal at input Trg.</td>
</tr>
<tr>
<td>R</td>
<td>Input R</td>
<td>A signal at input R resets the current time $T_a$ and resets the output.</td>
</tr>
<tr>
<td>Par</td>
<td>Parameter</td>
<td>$T$ represents the off-delay time. The output is reset (1 to 0 transition) when time $T$ expires. $T_L$ represents the time during which the output must be set to enable the permanent light function. $T_I$ represents the on-delay for the prewarning time. $T_{IL}$ represents the length of the prewarning time period. Retentivity: / = No retentivity R = The status is retentive.</td>
</tr>
<tr>
<td>Par</td>
<td>Output Q</td>
<td>A signal at Trg switches on output Q. Depending on the length of the input at Trg, the output is switched off again or switched on permanently, or it is reset with a further signal at Trg.</td>
</tr>
</tbody>
</table>

Parameters $T$, $T_L$, $T_I$ and $T_{IL}$

Note the defaults of the T parameters listed in Chapter 4.3.2.

The off-delay time $T$, the permanent light time $T_L$, the on-delay prewarning time $T_I$ and the prewarning time period $T_{IL}$ can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value $Ax - Ay$, see Chapter 4.4.18)
- Analog threshold trigger (actual value $Ax$, see Chapter 4.4.16)
- Analog amplifier (actual value $Ax$, see Chapter 4.4.20)
- Analog multiplexer (actual value $AQ$, see Chapter 4.4.26)
- Analog ramp (actual value $AQ$, see Chapter 4.4.27)
- PI controller (actual value $AQ$, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value $AQ$, see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.
Timing diagram

Functional description

A 0 to 1 transition at input Trg sets output Q.

If output Q = 0, and input Trg is set hi at least for the duration of TL, the permanent lighting function is enabled and output Q is set accordingly.

The off-delay T is triggered when input Trg returns to 0 before TL has expired.

Output Q is reset when Ta = T.

You can output an off-warning signal prior to the expiration of the off-delay time (T - T!) that resets Q for the duration of the prewarning time period TIL. A subsequent signal at Trg always resets T and the output Q.

If retentivity is not set, output Q and the expired time are reset after a power failure.

Setting the Par parameter

Note the defaults specified in Chapter 4.3.2.
**Note**

T, T!, and T\_L must all have the same timebase.

View in programming mode (example):

```
B5 1+R
T  =60:00s
TL =10:00s
```

Protection mode and retentivity

Off-delay

Permanent light on-time

Press ▷

```
B5 2
T! =30:00s
T!L=20:00s
```

Start of the off-warning period

(T - T!)

Off-warning time

View in parameter assignment mode (example):

```
B5 1
T  =60:00s
TL =10:00s
Ta =06:00s
```

Current value of the time T\_L or T
4.4.11 Weekly timer

Short description

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

Note

Because the LOGO! 24/24o does not have a real-time clock, the weekly timer function is not available for this version.

Symbol in LOGO!

<table>
<thead>
<tr>
<th>Cam parameters 1, 2, and 3</th>
<th>At the Cam parameters, you set the on- and off-times of the weekly timer for each Cam switch. Here you also configure the days and the time-of-day.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par</td>
<td>You specify whether the timer pulses on for one cycle when activated and then reset. The pulse setting applies to all three cams.</td>
</tr>
<tr>
<td>Output Q</td>
<td>Q is set when the configured cam is actuated.</td>
</tr>
</tbody>
</table>

Timing diagram (three examples)

Cam 1: Daily: 06:30 h to 8:00 h
Cam 2: Tuesday: 03:10 h to 04:15 h
Cam 3: Saturday and Sunday: 16:30 h to 23:10 h

Functional description

Each weekly timer has three cams you can use to configure a time hysteresis. You specify the on- and off-times at the Cam parameters. The weekly timer sets the output at a certain on-time, if this is not already set.

The weekly timer resets the output at a certain off-time if you configured an off-time, or at the end of the cycle if you specified a pulse output. You will cause a conflict if the on- and off-times you set for the weekly timer are identical, though set on different cams. In this case, cam3 takes priority over cam2, whereas cam2 takes priority over cam1.

The switching state of the weekly timer is determined by the status of all three cams.
Parameter assignment screen form

View of the parameter assignment screen form, for example for Cam1 and the Pulse setting:

```
B1 1+
D=MTWTFSS
On =06:30
Off=08:00
```

Weekdays (daily)

```
B1 4+
Pulse=Off
```

**Weekday**

The suffix of “D=” (Day) has the following meaning:

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

The uppercase letter indicates: A weekday is selected. A “- -” means: A weekday has not been selected.
On-/Off-times

Any time between 00:00 h and 23:59 h is possible. You can also configure the on-time to be a pulse signal. The timer block will be activated at the specified time for one cycle and then the output is reset.

--:-- means: No on-/off-times set.

Setting the weekly timer

To set the on-/off-times:

1. Move the cursor to one of the Cam parameters of the timer (e.g. No1).
2. Press OK. LOGO! opens the Cam parameter assignment screen form. The cursor is positioned on the weekday.
3. Press ▲ and ▼ to select one or several weekdays.
4. Press ► 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 to the cursor to the various positions, using the keys ◄ and ►. At the first position, you can only select the value --:-- (--:-- means: No on-/off-times set).
6. Press ► to 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 with OK.

The cursor is now positioned on the No2 parameter (Cam2) and you can configure a further cam.

Note

For information on timer accuracy, refer to the technical data and to Chapter 4.3.2.

Weekly timer: Example

The output of the weekly timer switch is to be set daily from 06:30 h to 08:00 h. The output should also be set every Tuesday from 03:10 h to 04:15 h, and on the weekends from 16:30 h to 23:10 h.

This requires three cams.

Here are the parameter assignment screen forms of the cams No 1, 2 and 3, based on the timing diagram shown earlier.
**LOGO! functions**

**Cam1**
Cam No1 must set the output of the weekly timer daily from 06:30 h to 08:00 h.

```
B1  1+
D=MTWTFSS
On =06:30
Off=08:00
```

**Cam2**
Cam No2 must set the output of the weekly timer every Tuesday from 03:10 h to 04:15 h.

```
B1  2
D=--T-----
On =03:10
Off=04:15
```

**Cam3**
Cam No3 must set the output of the weekly timer switch every Saturday and Sunday from 16:30 h to 23:10 h.

```
B1  3
D=-----SS
On =16:30
Off=23:10
```

**Result**

```
Cam:  1 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 3 |
      M | W | T | W | T | F | S | S | S
      M | T | W | T | F | S | S | S | S
```

`Q`
4.4.12 Yearly timer

Short description
The yearly timer function controls a timer that can be set on and off on a yearly or monthly basis. The output is controlled by means of a configurable on/off date.

Note
Because LOGO! 24/24o does not have a real-time clock, the yearly timer is not available for this version.

Timing diagrams

**Example 1:** Monthly mode off, Yearly mode off, On Time = 2008-02-20, Off Time = 2009-04-15: In 2008 and 2009 only, on February 20 the timer output switches on and on April 15 the timer output switches off.

```
YYYY.MM.DD+
On = 2008 02 20
Off = 2009 04 15
```

**Example 2:** Monthly mode on, Yearly mode off, On Time = 2008**-**01, Off Time = 2010**-**05: Starting in 2008, on the first day of each month the timer output switches on and switches off on the fifth day of the month. The timer continues in this pattern through the last month of 2010.

```
YYYY.MM.DD+
On = 2008 ** 01
Off = 2010 ** 05
```
Example 3: Monthly mode off, Yearly mode on, On Time = 06-01, Off Time = 08-31: Every year beginning in 2000, on June 1 the timer output switches on and remains on until August 31.

Example 4: Yearly mode on, Pulse selected, On Time = 03-15, Off Time = 03-15: Every year on March 15, the timer switches on for one cycle.

Example 5: Yearly mode on, On Time = 12-15, Off Time = 01-07: On December 15 the timer output switches on and remains on until January 7 of the following year. When the timer turns off on January 7, 2099 it does NOT turn on again the following December 15, because the Off Time of the Off Year has been reached.

Functional description

The yearly timer sets and resets the output at specific on and off dates. The time-of-day for sets and resets is always 00:00.

The on time specifies when the timer is activated. The off time specifies when the output is reset. For the on and off times, note the order of the fields. The first field defines the year, the second the month and the third the day.

When you set the Monthly mode on, the timer output switches on each month at the specified day of the on time and remains on until the specified day of the off time and continues in that pattern through the year of the off time.

When you set the Yearly mode on, the timer output switches on each year at the specified month and day of the on time and remains on until the specified month and day of the off time. The on year is 2000 year and the off year is 2099.

If you select Pulse output, the timer output switches on at the specified on time for one cycle and then the timer output is reset.
Sample configuration

The output of a LOGO! is to be set annually on March 1, reset on April 4, set again on July 7, and reset again on November 19. You need to configure two yearly timers with corresponding on-times. The outputs are then logically linked by means of an OR block.

**Yearly Timer 1**
- **On-time Mar 1**
- **Off-time Apr 4**

**Yearly Timer 2**
- **On-time Jul 7**
- **Off-time Nov 19**

---

**Result**

<table>
<thead>
<tr>
<th>Yearly Timer 1</th>
<th>Yearly Timer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ymode = On</strong></td>
<td><strong>Ymode = On</strong></td>
</tr>
<tr>
<td><strong>Mmode = Off</strong></td>
<td><strong>Mmode = Off</strong></td>
</tr>
<tr>
<td><strong>Pulse = Off</strong></td>
<td><strong>Pulse = Off</strong></td>
</tr>
</tbody>
</table>

**B1 1+**
- **ON :**
  - **YYYY-MM-DD**
  - **2000-03-01**
- **OFF :**
  - **YYYY-MM-DD**
  - **2099-04-04**

**B2 1+**
- **ON :**
  - **YYYY-MM-DD**
  - **2000-07-07**
- **OFF :**
  - **YYYY-MM-DD**
  - **2099-11-19**

---

**Result**

B1  B2

<table>
<thead>
<tr>
<th>On</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1 at 00:00 h</td>
<td>July 7 at 00:00 h</td>
</tr>
<tr>
<td>April 4 at 00:00 h</td>
<td>November 19 at 00:00 h</td>
</tr>
</tbody>
</table>
Further examples

The following examples correspond to Examples 1 to Example 5 as described previously.

<table>
<thead>
<tr>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3 1+</td>
<td>B4 1+</td>
<td>B5 1+</td>
</tr>
<tr>
<td>Ymode = Off</td>
<td>Ymode = Off</td>
<td>Ymode = On</td>
</tr>
<tr>
<td>Mmode = Off</td>
<td>Mmode = On</td>
<td>Mmode = Off</td>
</tr>
<tr>
<td>Pulse = Off</td>
<td>Pulse = Off</td>
<td>Pulse = Off</td>
</tr>
<tr>
<td>B3 2+</td>
<td>B4 2+</td>
<td>B5 2+</td>
</tr>
<tr>
<td>ON : YYYY-MM-DD</td>
<td>ON : YYYY-**-DD</td>
<td>ON : YYYY-MM-DD</td>
</tr>
<tr>
<td>2008-02-20</td>
<td>2008-**-01</td>
<td>2000-06-01</td>
</tr>
<tr>
<td>B3 3+</td>
<td>B4 3+</td>
<td>B5 3+</td>
</tr>
<tr>
<td>OFF : YYYY-MM-DD</td>
<td>OFF : YYYY-**-DD</td>
<td>OFF : YYYY-MM-DD</td>
</tr>
<tr>
<td>2008-04-15</td>
<td>2010-**-05</td>
<td>2099-08-31</td>
</tr>
<tr>
<td>Example 4</td>
<td>Example 5</td>
<td></td>
</tr>
<tr>
<td>B6 1+</td>
<td>B7 1+</td>
<td></td>
</tr>
<tr>
<td>Ymode = On</td>
<td>Ymode = On</td>
<td></td>
</tr>
<tr>
<td>Mmode = Off</td>
<td>Mmode = Off</td>
<td></td>
</tr>
<tr>
<td>Pulse = On</td>
<td>Pulse = Off</td>
<td></td>
</tr>
<tr>
<td>B6 2+</td>
<td>B7 2+</td>
<td></td>
</tr>
<tr>
<td>ON : YYYY-MM-DD</td>
<td>ON : YYYY-MM-DD</td>
<td></td>
</tr>
<tr>
<td>2000-03-15</td>
<td>2000-12-15</td>
<td></td>
</tr>
<tr>
<td>B6 3+</td>
<td>B7 3+</td>
<td></td>
</tr>
<tr>
<td>OFF : YYYY-MM-DD</td>
<td>OFF : YYYY-MM-DD</td>
<td></td>
</tr>
<tr>
<td>2099-03-15</td>
<td>2011-01-07</td>
<td></td>
</tr>
</tbody>
</table>
4.4.13 Up/down counter

Short description
An input pulse increments or decrements an internal value, depending on the parameter setting. The output is set or reset when a configured threshold is reached. The direction of count can be changed with a signal at input Dir.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="symbol" alt="Input R" /></td>
<td>Input R</td>
<td>A signal at input R resets the internal count value to zero.</td>
</tr>
<tr>
<td><img src="symbol" alt="Input Cnt" /></td>
<td>Input Cnt</td>
<td>The function counts the 0 to 1 transitions at input Cnt. 1 to 0 transitions are not counted. Use • inputs I3, I4, I5, and I6 for fast counting (only LOGO! 12/24 RC/RCo and LOGO! 24/24o): max. 5 kHz. • any other input or circuit component for counting low frequency signals (typ. 4 Hz).</td>
</tr>
<tr>
<td><img src="symbol" alt="Input Dir" /></td>
<td>Input Dir</td>
<td>You set the direction of count at input Dir: Dir = 0: Up count Dir = 1: Down count</td>
</tr>
<tr>
<td><img src="symbol" alt="Parameter" /></td>
<td>Parameter</td>
<td>On: On threshold Range of values: 0...999999 Off: Off threshold Range of values: 0...999999 StartVal: Initial value from which to begin counting either down or up. Retentivity for internal counter value Cnt: / = No retentivity R = The status is retentive.</td>
</tr>
<tr>
<td><img src="symbol" alt="Output Q" /></td>
<td>Output Q</td>
<td>Q is set or reset, depending on the current value at Cnt and the set thresholds.</td>
</tr>
</tbody>
</table>

Parameters On and Off
The on threshold On and the off threshold Off can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:
- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)
Select the required function by the block number.
LOGO! functions

Timing diagram

![Timing Diagram](image)

Functional description

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

You can use input R to reset the internal count value to the start value. As long as R = 1, the output is also 0 and the pulses at input Cnt are not counted.

If retentivity is not set, output Q and the expired time are reset after a power failure.

Q is set or reset depending on the current value at Cnt and the set thresholds. See the calculation rule below.

Calculation rule

- If the On threshold ≥ Off threshold, then:
  - Q = 1, if Cnt ≥ On
  - Q = 0, if Cnt < Off.
- If the On threshold < Off threshold, then Q = 1,
  if On ≤ Cnt < Off.

Default on/off parameters

The default limits for the on and/or off parameters can be derived from another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. For information on parameter defaults, refer to Chapter 4.4.1.
Note

The system scans the counter limit value cyclically.

Thus, if the pulse frequency at the fast digital inputs I3, I4, I5 or I6 is faster than the cycle time, the special function might not switch until after the specified limit value is exceeded.

Example: Up to 100 pulses per cycle can be counted; 900 pulses have been counted so far. On = 950; Off = 10000. The output is set in the next cycle, after the value has reached 1000. (The output would not be set at all if the value Off = 980.)

View in programming mode (example):

```
B3 1+R
On =001234
Off=000000
```

or

```
B3 1+R
On =123456
Off→B021
```

To set the start value, press ▲ or ▼ to access the following screen form:

```
B3 2+R
STV =0100
```

If the referenced block (B021, in the example) returns a value that lies out of the valid range, the value is rounded to the next valid value.

The view in parameter assignment mode (example):

```
B3
On =001234
Off=000000
Cnt=000120
```

or

```
B3
On =123456
Off→B021
Cnt=000120
```

Current count value
## 4.4.14 Hours counter

**Short description**

A configured time is triggered with a signal at the monitoring input. The output is set when this time has expired.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Input R</td>
<td>A positive edge (0 to 1 transition) at input R resets output Q and sets a configured value MI at the counter for the duration of the time-to-go (MN).</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Input En</td>
<td>En is the monitoring input. LOGO! scans the on-time of this input.</td>
</tr>
</tbody>
</table>
| ![Symbol](image) | Input Ral | A positive edge at input Ral (Reset all) resets the hours counter (OT) and the output, and sets the time-to-go value (MN) to the maintenance interval MI:  
  - output Q = 0,  
  - measured operating time OT = 0 and  
  - the time-to-go of the maintenance interval MN = MI. |
| ![Symbol](image) | Parameter | MI: Maintenance interval to be preset in units of hours and minutes  
  Range of values: 0000...9999 h  
  OT: The accumulated total operating time; you can specify an offset in hours and minutes  
  Range of values: 00000...99999 h  
  Q→0:  
  - When "R" is selected:  
    Q = 1, if MN = 0;  
    Q = 0, if R = 1 or Ral = 1  
  - When "R+En" is selected:  
    Q = 1, if MN = 0;  
    Q = 0, if R = 1 or Ral = 1 or En = 0. |
| ![Symbol](image) | Output Q | The output is set when the time-to-go MN = 0 (see timing diagramm).  
  The output is reset:  
  - When "Q→0:R+En", if  
    R = 1 or Ral = 1 or En = 0  
  - When "Q→0:R", if R = 1 or Ral = 1. |

MI = Configured time interval  
MN= Time-to-go  
OT= Total time expired since the last hi signal at input Ral  
These values are always retentive!
Parameter MI

The maintenance interval MI can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number.

Timing diagram

MI = Configured time interval
MN = Time-to-go
OT = Total time expired since the last hi signal at input Ral
Functional description

The hours counter monitors input En. When En = 1, LOGO! computes the time expired and the time-to-go MN. LOGO! shows these times in parameter assignment mode. Output Q is set when the time-to-go MN = 0.

A signal at reset input R resets output Q and sets the preset value of MI at the counter for the duration of MN. The hours counter OT is not affected.

With a signal at the reset input Ral, you reset output Q and set the preset value of MI at the counter for the duration of MN. The hours counter OT is reset to zero.

Depending on your configuration of parameter Q, the output is either reset with a signal at input R or Ral ("Q→0:R"), or when a reset signal is set hi, or the En signal is set lo ("Q→0:R+En").

Viewing the MI, MN and OT values

- LOGO! Basic with display unit: You can open the parameter assignment mode when the system is in RUN to view the actual values of MI, MN and OT.
- LOGO! Basic without display unit: In LOGO!Soft Comfort, you can use the Online Test to read these values (for further information, see Chapter 7).

Limit value of OT

The value of the operating hours in OT are retained when you reset the hours counter with a signal at input R. The hours counter OT continues the count as long as En = 1, irrespective of the status at the reset input R.

The counter limit of OT is 99999 h.

The hours counter stops when it reaches this value.

In programming mode, you can set the initial value of OT. The counter starts operation at any value other than zero. MN is automatically calculated at the START, based on the MI and OT values.

(Example: MI is a reference parameter to the actual value of Block 1, which is 100. OT = 30, the result is MN = 70).
Setting the Par parameter

View in programming mode:

<table>
<thead>
<tr>
<th>B16 1+R MI = 0100h 00 m</th>
<th>B16 1+R MI→ B001h</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>B16 2+R OT =00030h 00 m</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>B16 3+R Q→0:R+En</th>
</tr>
</thead>
</table>

MI is the configurable time interval. The permissible range of values is 0 to 9999 hours.

For information on how to assign the actual value of another already-programmed function to a parameter, see section 4.4.1

View in parameter assignment mode:

<table>
<thead>
<tr>
<th>B16 1 MI = 0100h 00 m</th>
</tr>
</thead>
</table>

Time interval

<table>
<thead>
<tr>
<th>B16 2 OT =00083h 15 m</th>
</tr>
</thead>
</table>

Total operating hours

<table>
<thead>
<tr>
<th>B16 3 MN = 0016h 45 m</th>
</tr>
</thead>
</table>

Time-to-go
## 4.4.15 Threshold trigger

### Short description

The output is set and reset with two configurable threshold triggers.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fre</td>
<td>Input Fr</td>
<td>The function counts the 0 to 1 transitions at input Fre. 1 to 0 transitions are not counted. Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• inputs I3, I4, I5, I6 for fast counting (only LOGO! 12/24 RC/RCo and LOGO! 24/24o): max. 5 kHz.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• any other input or circuit component for counting low frequency signals (typ. 4 Hz).</td>
</tr>
</tbody>
</table>

### Parameter G_T

The gate time G_T can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number.

### Timing diagram

![Timing diagram](image)
**Functional description**

The threshold trigger measures the signals at input Fre. The pulses are recorded across a configurable time $G_T$.

Output $Q$ is set and reset in accordance with the set thresholds. See the calculation rule below.

**Calculation rule**

- If the On threshold $\geq$ Off threshold, then:
  
  - $Q = 1$, if $f_a >$ On
  - $Q = 0$, if $f_a \leq$ Off.

- If the On threshold $< $ Off threshold, then $Q = 1$ if $On \leq f_a <$ Off.

**Setting the Par parameter**

---

**Note**

The system scans the counter limit value once per interval $G_T$.

View in programming mode (example):

```
B15 1+
On  =0009
Off =0005
```

Press ►

```
B15 2
G_T=01:00s
```

Press ►
Note
The "seconds" timebase is here set as permanent default.
When you preset a time G_T of 1 s, LOGO! returns the current frequency in parameter \( f_a \) in Hz.

View in parameter assignment mode (example):

\[
\begin{array}{l}
| B15 | On =0009 | Off =0005 | fa =0010 |
\end{array}
\]

Note
\( f_a \) always represents the total pulses measured per time unit G_T.
4.4.16 Analog threshold trigger

Short description

The output is set and reset at two configurable thresholds.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Ax )</td>
<td>Input Ax</td>
<td>You apply the analog signal to be analyzed at input ( Ax ). Use the analog inputs ( AI1...AI8 ), the analog flags ( AM1...AM6 ), the block number of a function with analog output, or the analog outputs ( AQ1 ) and ( AQ2 ).</td>
</tr>
<tr>
<td>Par</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameter

- **A**: Gain
  - Range of values: \( \pm 10.00 \)
- **B**: Zero offset
  - Range of values: \( \pm 10,000 \)
- **On**: On threshold
  - Range of values: \( \pm 20,000 \)
- **Off**: Off threshold
  - Range of values: \( \pm 20,000 \)
- **p**: Number of decimals
  - Range of values: 0, 1, 2, 3

Output \( Q \)

\( Q \) is set or reset by the threshold triggers.

Gain and offset parameters

Please note the information on gain and offset parameters in Chapter 4.3.6.

Parameters On and Off

The On and Off parameters can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value \( Ax - Ay \), see Chapter 4.4.18)
- Analog threshold trigger (actual value \( Ax \), see Chapter 4.4.16)
- Analog amplifier (actual value \( Ax \), see Chapter 4.4.20)
- Analog multiplexer (actual value \( AQ \), see Chapter 4.4.26)
- Analog ramp (actual value \( AQ \), see Chapter 4.4.27)
- PI controller (actual value \( AQ \), see Chapter 4.4.28)
- Up/down counter (actual value \( Cnt \), see Chapter 4.4.13)
- Analog Math (actual value \( AQ \), see Chapter 4.4.30)

Select the required function by the block number.
Parameter p (number of decimals)

Does not apply to the display of On, Off and Ax values in a message text.
Does not apply to the comparison of On and Off values! (The compare function ignores the decimal point.)

Timing diagram

![Timing diagram](image)

Functional description

The function fetches the analog signal at input Ax.

Ax is multiplied by the value of the A (gain) parameter, and the value at parameter B (offset) is added to product, i.e. \((Ax \cdot \text{gain}) + \text{offset} = \text{actual value of Ax}\).

Output Q is set or reset, depending on the set thresholds. See the calculation rule below.

Calculation rule

- If the On threshold \(\geq\) Off threshold, then:
  \(Q = 1\), if the actual value \(Ax > \text{On}\)
  \(Q = 0\), if the actual value \(Ax \leq \text{Off}\).

- If the On threshold < Off threshold, then \(Q = 1\) if \(\text{On} \leq \text{actual value Ax} < \text{Off}\).
Setting the Par parameter

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

View in programming mode (example):

```
B3 1+
On =+04000
Off =+02000
```

Parameter protection mode
On threshold
Off threshold

Press ▶

```
B3 2
A =01.00
B =+00000
p =2
```

Gain
Offset
Decimals in the message text

View in parameter assignment mode (example):

```
B3
On =+04000
Off =+02000
Ax =+05000
```

On threshold
Off threshold
Q = 1 (Ax > On)

View in the message text (example):

```
+050.00
```

Ax, when p = 2
Q = 1 (Ax > On)
4.4.17 Analog differential trigger

Short description

The output is set and reset depending on a configurable threshold and a differential value.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( Ax )</td>
<td>Input Ax</td>
<td>You apply the analog signal to be analyzed at input Ax. Use the analog inputs AI1...AI8 (*), the analog flags AM1...AM6, the block number of a function with analog output, or the analog outputs AQ1 and AQ2.</td>
</tr>
<tr>
<td>( A )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( L )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( Q )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameter

A: Gain
Range of values: ±10.00

B: Zero offset
Range of values: ±10,000

On: On/Off threshold
Range of values: ±20,000

Δ: Differential value for calculating the off parameter
Range of values: ±20,000

p: Number of decimals
Range of values: 0, 1, 2, 3

Output Q
Q is set or reset, depending on the threshold and difference values.

* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).

Gain and offset parameters

Please note the information on gain and offset parameters in Chapter 4.3.6.
Parameter p (number of decimals)

Does not apply to the display of On, Off and Ax values in a message text.

Timing diagram A: Function with negative difference $\Delta$

Timing diagram B: Function with positive difference $\Delta$

Functional description

The function fetches the analog signal at input Ax.

Ax is multiplied by the value of the A (gain) parameter, and the value at parameter B (offset) is added to product, i.e. $(Ax \cdot \text{gain}) + \text{offset} = \text{actual value of } Ax$.

Output Q is set or reset, depending on the set (On) threshold and difference value ($\Delta$). The function automatically calculates the Off parameter: $\text{Off} = \text{On} + \Delta$, whereby $\Delta$ may be positive or negative. See the calculation rule below.

Calculation rule

- When you set a negative differential value $\Delta$, the On threshold $\geq$ Off threshold, and:
  
  $Q = 1$, if the actual value $Ax > \text{On}$
  $Q = 0$, if the actual value $Ax \leq \text{Off}$.

  See the timing diagram A.

- When you set a positive differential value $\Delta$, the On threshold $<$ the Off threshold, and $Q = 1$, if:
  
  $On \leq$ actual value $Ax < \text{Off}$.

  See the timing diagram B.
Setting the Par parameter

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

View in programming mode (example):

```
B3 1+
On =+04000
Δ =-02000
```

Parameter protection mode
On/off threshold
Differential value for the on/off threshold

Press ►

```
B3 2
A =01.00
B =+00000
p =2
```

Gain
Offset
Decimals in the message text

View in parameter assignment mode (example):

```
B3
On =+04000
Δ =-02000
Ax =+05000
```

On threshold
Differential value for the off threshold
Q = 1 (Ax > On)

Press ▼

```
B3
Off =+02000
```

Off threshold
4.4.18 Analog comparator

Short description

The output is set and reset depending on the difference $Ax - Ay$ and on two configurable thresholds.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Ax$</td>
<td>Inputs $Ax$ and $Ay$</td>
<td></td>
</tr>
<tr>
<td>$Ay$</td>
<td>You apply the analog signals the difference of which you want to analyze at the inputs $Ax$ and $Ay$. Use the analog inputs AI1...AI8 (*), the analog flags AM1...AM6, the block number of a function with analog output, or the analog outputs AQ1 and AQ2.</td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>A: Gain Range of values: $\pm 10.00$</td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>B: Zero offset Range of values: $\pm 10,000$</td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>On: On threshold Range of values: $\pm 20,000$</td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>Off: Off threshold Range of values: $\pm 20,000$</td>
<td></td>
</tr>
<tr>
<td>$p$</td>
<td>$p$: Number of decimals Range of values: 0, 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td>$Q$</td>
<td>$Q$ is set or reset, depending on the difference $Ax - Ay$ and the set thresholds.</td>
<td></td>
</tr>
</tbody>
</table>

* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).

Gain and offset parameters

For more information on the gain and offset parameters, refer to Chapter 4.3.6.

Parameters On and Off

The on threshold On and the off threshold Off can be provided by the actual value of another already–programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value $Ax - Ay$, see Chapter 4.4.18)
- Analog threshold trigger (actual value $Ax$, see Chapter 4.4.16)
- Analog amplifier (actual value $Ax$, see Chapter 4.4.20)
- Analog multiplexer (actual value $AQ$, see Chapter 4.4.26)
- Analog ramp (actual value $AQ$, see Chapter 4.4.27)
- PI controller (actual value $AQ$, see Chapter 4.4.28)
- Up/down counter (actual value $Cnt$, see Chapter 4.4.13)
- Analog Math (actual value $AQ$, see Chapter 4.4.30)

Select the required function by the block number.
LOGO! functions

Parameter p (number of decimals)

Does not apply to Ax, Ay, On, Off and $\Delta$ values displayed in a message text. 
Does not apply to the comparison of on and off values! (The compare function ignores the decimal point.)

Timing diagram

![Timing diagram](image)

Functional description

The function fetches the analog values from the inputs Ax and Ay. 
Ax and Ay are each multiplied by the value of the A (gain) parameter, and the value at parameter B (offset) is then added to the relevant product, i.e.

$$(Ax \cdot \text{gain}) + \text{offset} = \text{actual value Ax} \text{ or}$$
$$(Ay \cdot \text{gain}) + \text{offset} = \text{actual value Ay}.$$ 

The function forms the difference ("$\Delta$") between the actual values Ax - Ay.

Output Q is set or reset, depending on difference of the actual values Ax - Ay and the set thresholds. See the calculation rule below.

Calculation rule

- If the On threshold $\geq$ Off threshold, then:
  $Q = 1$, if:
  $$(\text{actual value Ax} - \text{actual value Ay}) > \text{On}$$
  $Q = 0$, if:
  $$(\text{actual value Ax} - \text{actual value Ay}) \leq \text{Off}.$$ 

- If the On threshold $<$ Off threshold, then $Q = 1$, if:
  $\text{On} \leq (\text{actual value Ax} - \text{actual value Ay}) < \text{Off}.$
Setting the Par parameter

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

View in programming mode:

```
  B3  1+
  On =+00000
  Off =+00000
```

Press ►

```
  B3  2
  A =00.00
  B =+00000
  p =0
```

Example

In a heating control system, the supply \( T_v \) and return line temperatures \( T_r \) are to be compared, for example with a sensor at AI2.

A control signal is to be triggered (for example “heater On”) when the difference between the supply and return line temperatures is greater than 15 °C. The control signal is reset when the difference is less than 5 °C.

The process variable of the temperature is to be shown in parameter assignment mode.

The thermocouples available have the following technical data: -30 to +70 °C, 0 to 10 VDC.

<table>
<thead>
<tr>
<th>Application</th>
<th>Internal mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30 to +70 °C = 0 to 10 VDC</td>
<td>0 to 1000</td>
</tr>
<tr>
<td>0 °C</td>
<td>300 → Offset = -30</td>
</tr>
<tr>
<td>Range of values:</td>
<td>1000 → Gain = 100/1000 = 0.1</td>
</tr>
<tr>
<td>-30 to +70 °C = 100</td>
<td></td>
</tr>
<tr>
<td>On threshold = 15 °C</td>
<td>Threshold = 15</td>
</tr>
<tr>
<td>Off threshold = 5 °C</td>
<td>Threshold = 5</td>
</tr>
</tbody>
</table>

See also Chapter 4.3.6.
Configuration (example):

```
B3  1+
On =+00015
Off =+00005
```

Press ▲

```
B3  2
A  =00.10
B  =-00030
p  =0
```

View in parameter assignment mode (example):

```
B3  1
On =+00015
Off =+00005
```

Press ▼

```
B3  2
Ax =+00010
Ay =-00020
Δ  =+00030
```

View in the message text (example):

```
Ax =+00010
Ay =-00020
```
Reducing the input response of the analog comparator

You can selectively delay the output of an analog comparator by means of the "On-delay" and "Off-delay" special functions. With on-delay, output Q is only set if the pulse width of the triggering signal at input Trg (analog comparator output) is longer than the on-delay time.

Using this method, you will obtain a virtual hysteresis and reduce the input response to short signals.

Function block diagram
4.4.19 Analog watchdog

Short description

This special function saves the process variable of an analog input to memory, and sets the output when the output variable exceeds or drops below this stored value plus a configurable offset.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>A positive edge (0 to 1 transition) at input En saves the analog value at input Ax (&quot;Aen&quot;) to memory and starts monitoring of the analog range Aen - Δ2 to Aen + Δ1</td>
<td></td>
</tr>
<tr>
<td>Ax</td>
<td>You apply the analog signal to be monitored at input Ax. Use the analog inputs AI1...AI8 (*), the analog flags AM1...AM6, the block number of a function with analog output, or the analog outputs AQ1 and AQ2.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Gain</td>
<td>Range of values: ±10.00</td>
</tr>
<tr>
<td>B: Zero offset</td>
<td>Range of values: ±10,000</td>
</tr>
<tr>
<td>Δ1: Difference value above Aen: on/off threshold</td>
<td>Range of values: 0-20,000</td>
</tr>
<tr>
<td>Δ2: Difference value below Aen: on/off threshold</td>
<td>Range of values: 0-20,000</td>
</tr>
<tr>
<td>p: Number of decimals</td>
<td>Range of values: 0, 1, 2, 3</td>
</tr>
</tbody>
</table>

Output Q: Q is set/reset, depending on the stored analog value and the offset.

* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).

Gain and offset parameters

For more information on gain and offset parameters, refer to Chapter 4.3.6.

Parameters Delta1 and Delta2

The Delta1 and Delta2 parameters can be provided by the actual value of another already-programmed function. You can use the actual value of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number.
**Parameter p (number of decimals)**

Applies only to the Aen, Ax, Δ1 and Δ2 values displayed in a message text.

**Timing diagram**

![Timing diagram](image)

**Functional description**

A 0 to 1 transition at input En saves the value of the signal at the analog input Ax. This saved process variable is referred to as "Aen".

Both the analog actual values Ax and Aen are multiplied by the value at parameter A (gain), and parameter B (offset) is then added to the product:

(Ax · gain) + offset = Actual value Aen, when input En changes from 0 to 1, or
(Ax · gain) + offset = Actual value Ax.

Output Q is set when the signal at input En = 1 and if the actual value at input Ax is out of range of Aen - Δ2 to Aen + Δ1.

Output Q is reset, when the actual value at input Ax lies within the range of Aen - Δ2 to Aen+ Δ1, or when the signal at input En changes to lo.
Setting the Par parameter

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

View in programming mode:

```
B3 1+
\[\Delta 1 = 00000\]
\[\Delta 2 = 00000\]
```

Press ▶

```
B3 2
\[A = 00.00\]
\[B = +00000\]
\[\text{p} = 0\]
```

View in parameter assignment mode (example):

```
B3
\[\Delta 1 = 00010\]
\[A_{en} = -00020\]
\[A_x = +00005\]
Q = 1 (Ax is out of the range of \(A_{en} - \Delta 2\) to \(A_{en} + \Delta 1\))
```

```
B3
\[\Delta 2 = 00010\]
```
4.4.20 Analog amplifier

Short description

This special function amplifies the value of an analog input and outputs the result at an analog output.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \text{Ax} \rightarrow \text{Par} \rightarrow \text{AQ} ]</td>
<td>Input Ax</td>
<td>You apply the analog signal to be amplified at input Ax. Use the analog inputs AI1...AI8 (*), the analog flags AM1...AM6, the block number of a function with analog output, or the analog outputs AQ1 and AQ2.</td>
</tr>
</tbody>
</table>

Parameter

A: Gain

Range of values: ±10.00

B: Zero offset

Range of values: ±10,000

p: Number of decimals

Range of values:

0, 1, 2, 3

Output AQ

This special function has an analog output! This output can only be connected with the analog input of a function, an analog flag or an analog output connector (AQ1, AQ2). Range of values for AQ:

-32768...+32767

* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).

Gain and offset parameters

Please note the information on gain and offset parameters in Chapter 4.3.6.

Parameter p (number of decimals)

Applies only to the AQ value in a message text.

Functional description

The function fetches the analog signal of input Ax.

This value is multiplied by the value of the A (gain) parameter, and parameter B (offset) is then added to the product: \((Ax \cdot \text{gain}) + \text{offset} = \text{actual value Ax}\).

The actual value Ax is output at AQ.

Analog output

If you interconnect this special function with a real analog output, note that the analog output can only process values between 0 and 1000. To do this, you may need to connect an additional amplifier between the analog output of the special function and the real analog output. Using this amplifier, you standardize the output range of the special function to a value range of 0 to 1000.
Scaling an analog input value

You can influence the analog input value of a potentiometer by interconnecting an analog input with an analog amplifier and an analog flag.

- Scale the analog value at the analog amplifier for further use.
- Connect, for example, the time base for parameter T of a time function (e.g. On-/Off-delay, Chapter 4.4.3) or the on and/or off limit specification of an up/down counter (Chapter 4.4.13) to the scaled analog value.

For more information with programming examples refer to the online help for LOGO!Soft Comfort.

Setting the Par parameter

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

View in programming mode (example):

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3</td>
<td>+</td>
</tr>
<tr>
<td>A</td>
<td>02.50</td>
</tr>
<tr>
<td>B</td>
<td>-0.0300</td>
</tr>
<tr>
<td>p</td>
<td>0</td>
</tr>
</tbody>
</table>

View in parameter assignment mode (example):

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B3</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>02.50</td>
</tr>
<tr>
<td>B</td>
<td>-0.0300</td>
</tr>
<tr>
<td>AQ</td>
<td>-0.00250</td>
</tr>
</tbody>
</table>

4.4.21 Latching relay

Short description

Input S sets output Q, input R resets output Q again.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input S</td>
<td>You set output Q with a signal at input S.</td>
<td></td>
</tr>
<tr>
<td>Input R</td>
<td>You reset output Q with a signal at input R. If S and R = 1, the output is reset.</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Retentivity: /= No retentivity R = The status is retentive.</td>
<td></td>
</tr>
<tr>
<td>Output Q</td>
<td>Q is set with a signal at input S, and reset with a signal at input R.</td>
<td></td>
</tr>
</tbody>
</table>
Switching response

A latching relay represents a simple binary element. The output value depends on the status at the inputs and on the previous output status. The following table shows the logic once again:

<table>
<thead>
<tr>
<th>$S_n$</th>
<th>$R_n$</th>
<th>$Q$</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>x</td>
<td>The status is retentive</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Reset</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Set</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Reset (takes priority over Set)</td>
</tr>
</tbody>
</table>

When retentivity is enabled, the current status of the output signal is retained after a power failure.

4.4.22 Pulse relay

Short description

A short pulse at the input sets and resets the output.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trg</td>
<td>Input Trg</td>
<td>You set and reset output $Q$ with a signal at input Trg (Trigger).</td>
</tr>
<tr>
<td>Par</td>
<td>Input S</td>
<td>You set output $Q$ with a signal at input $S$.</td>
</tr>
<tr>
<td>Par</td>
<td>Input R</td>
<td>You reset output $Q$ with a signal at input $R$.</td>
</tr>
</tbody>
</table>

Parameter

Selection:

- RS (R input priority)
- SR (S input priority)

Retentivity:

- $/$ = No retentivity
- $R$ = The status is retentive.

Output $Q$

$Q$ is set with a signal at Trg, and reset with the next signal at Trg, if $S$ and $R = 0$.

Timing diagram

The bold printed section of the timing diagram is also shown in the symbol for the pulse relay.
**Functional description**

Output Q changes its status; that is, the output is set or reset with each 0 to 1 transition at input Trg and if the inputs S and R = 0.

The signal at input Trg does not influence the special function when S or R = 1.

You set the pulse relay with a signal at input S. The output is set hi.

You reset the pulse relay with a signal at input R. The output is set lo.

**Status diagram**

<table>
<thead>
<tr>
<th>Par</th>
<th>$Q_{n-1}$</th>
<th>S</th>
<th>R</th>
<th>Trg</th>
<th>$Q_n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0 -&gt;1</td>
<td>1**</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>0</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0 -&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>RS</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RS</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>0</td>
</tr>
<tr>
<td>SR</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SR</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0 -&gt;1</td>
<td>0**</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>0</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>*</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0 -&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>RS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>0</td>
</tr>
<tr>
<td>SR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0 -&gt;1</td>
<td>1</td>
</tr>
</tbody>
</table>

*: RS or SR

**: Triggering signal is effective, because S and R = 0.
Depending on your configuration, either input R takes priority over input S (input S is not effective when R = 1), or vice versa (input R is not effective when S = 1).

After a power failure, the pulse relay and output Q are reset if you have not enabled retentivity.

View in programming mode:

```
B29 R
Par=RS

Press ▼ or ▲
```

B29 R
Par=SR

This special function is not available in parameter assignment mode.

---

**Note**

If Trg = 0 and Par = RS, the special function "Pulse relay" corresponds with the special function "Latching relay" (see Chapter 4.4.21).

---

### 4.4.23 Message texts

**Short description**

With the message text function block, you can configure a message that includes text and other parameters for LOGO! to display in RUN mode.

You can configure simple message texts from the LOGO! Display. LOGO!Soft Comfort provides an extended set of features for message texts: bar graph representation of data, names for digital I/O states and more. Refer to the LOGO!Soft Comfort documentation for information on these features.

**Global Message Text Settings**

You configure global parameters that apply to all message texts from the Msg Config selections on the Programming menu:

- **Analog Time**: refresh rate in milliseconds that specifies how frequently analog inputs in message texts are updated
- **Tick time**: frequency at which message texts scroll on and off the display
  
  There are two ways that a message text can tick on and off the screen: line by line, or character by character, which are described in more detail below. A line of a text message, or each character of a text message in turn will tick on and off the LOGO! Display based on the tick time. For a message that ticks line by line, the actual tick time is ten times the configured tick time. For messages that tick character by character, the actual tick time is the configured tick time.
- **CharSets**: The primary and secondary characters set from which you can configure message texts. CharSet1 and CharSet2 can be any of the supported...
character sets for LOGO!:

ISO8859-1     ISO8859-16
ISO8859-5     GB-3212
ISO8859-9     Shift-JIS

• Current Character Set: which character set is selected for the display of message texts

Of the fifty possible message texts that you can configure, you can select any of them to be from the first language and the rest from the second language. Of course, you can configure all of the message texts to be in one language, and none in the second language.

Within a single message text, the text must be from one character set. You can edit message texts in any of the supported character sets from LOGO!Soft Comfort. From the LOGO!Basic Module, you can only edit text using characters from the English alphabet and selected special characters.

The language and therefore character set of a message text is independent of the language setting for the LOGO! display menus. They can be different.
Programming Global Message Text Parameters

Set the Analog Refresh Time

Step through values of 100, 200, 400, 800 or 1000 ms to increase or decrease the analog input refresh time. LOGO! updates the value and cursor position between .1s and 1s to show your current selection.

Set the Tick Time

Select digit position to modify. (You cannot modify the last two digits.)

Select value from 0 to 9 for the current position. Minimum tick time is 100 ms. Maximum tick time is 10000 ms.

Select Character Sets

Set the CharSet1 or CharSet2 selection

Select Current Character Set

Select CharSet1 or CharSet2 for the current character set
Message Text Function Block

The description which follows applies to features of message texts that you can configure directly from the LOGO! Display.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>A 0 to 1 transition at input En (Enable) starts the output of the message text.</td>
<td></td>
</tr>
</tbody>
</table>
| P               | P: Priority of the message text  
Range of values: 0...127  
Message destination  
Message tick settings  
Ack: Acknowledgment of the message text |
| Text            | Text: Input of the message text  
Par: Parameter or actual value of another already-programmed function (see “Visible parameters or process variables”)  
Time: Display of the continuously updated time-of-day  
Date: Display of the continuously updated date  
EnTime: Display of the time of the 0 to 1 transition of the signal at input En  
EnDate: Display of the date of the 0 to 1 transition of the signal at input En  
I/O status names: Display of a digital input or output status name, for example “On” or “Off”  
Analog Input: Display of an analog input value to be shown in message text and updated according to the analog time. |
| Output Q        | Q remains set as long as the message text is set. |

Restriction

A maximum of 50 message texts are available.
Functional description

When LOGO! is in RUN mode, LOGO! displays the message text that you have configured along with its parameter values upon a 0 to 1 transition of the signal at input En.

Based on your setting for the message destination, the message text displays on the LOGO! Display, the LOGO! TD, or both.

If you use flag M27 in your circuit program, then if M27=0 (low) then LOGO! displays the message text only if it is from the primary character set (Character Set 1). If M27=1 (high), then LOGO! displays the message text only if is from the secondary character set (Character Set 2). (See the M27 flag description in section 4.1).

If you have configured message ticking, the message will tick on and off the display according to your specifications, either a character at a time, or a line at a time.

If acknowledgment is disabled (Quit = Off), the message text is hidden when the status of the signal at input En changes from 1 to 0.

If acknowledgment is enabled (Quit = On) and the status of the signal at input En changes from 1 to 0, the message text is output until it is acknowledged with OK. When En = 1, you cannot acknowledge the message text.

When multiple message text functions are triggered with En=1, LOGO! displays the message text with the highest priority (0 = lowest, 127 = highest). This also means that LOGO! displays a newly activated message text only if its priority is higher than that of previously activated message texts.

After a message text is disabled or acknowledged, the function automatically shows the previously active message text that takes the highest priority.

You can change the view and the message texts by pressing the keys ▲ and ▼.

Example

This is how two message texts could be shown:

Display field of LOGO! in RUN mode

Motor 5
STOP AT
10:12
!!Action!!

Example: Message text with priority 30

▼ Key ▲

Motor 2
3000
hours
MAINTENANCE

Example: Message text with priority 10

▼ Press ▲

No 09:00
2003-01-27

Date and current time-of-day (only for versions with real-time clock).
Message Ticking

You can configure message text lines to tick or not tick. Two types of message ticking exist:

- Character by character
- Line by line

Messages that tick character by character scroll off the characters of the message line one character at a time to the left with the additional characters scrolling in one at a time from the right. The time interval for the tick is specified by the TickTime message text setting.

Messages that tick line by line scroll one half of the message off the display to the left with the second half of the message scrolling in from the right. The time interval for the tick is ten times the TickTime parameter. The two halves of the message simply alternate on the LOGO! Display or LOGO! TD.

Example: Tick Message Character by Character

The following illustration shows a one-line, 24-character message text:

If you set this message to tick “character by character” with a tick interval of 0.1 seconds, then the initial appearance of this message line on the LOGO! Display or LOGO! TD is as shown in this illustration:

After 0.1 second, one character of the message line ticks. The message appears as follows on the LOGO! Display or LOGO! TD:
Example: Tick Message Line by Line

The following example uses the same message configuration as the previous example:

If you set this message to tick "line by line" with a tick interval of 0.1 seconds, then the initial appearance of this message on the LOGO! Display or LOGO! TD is the left half of the message as shown in this illustration:

After 1 second (10 x 0.1 second), the message ticks to show the right half of the message as shown in this illustration:

The screen display alternates between the two message halves every second.

You can configure each individual line of a message text to tick or not tick. The "character by character" or "line by line" setting applies to all lines that you configure to tick.
**Input P configuration**

From the input P, you configure the following characteristics of the message text:

- Priority
- Acknowledgement
- Message destination
- Tick type, and tick setting for each line

To configure the priority and the acknowledgment (programming mode):

1. Increase the priority to 1:
   - Cursor on ‘0’ → ▲
2. Change to ‘Ack’:
   - Press ▶
3. Enable ‘Ack’:
   - Press ▲ or ▼

LOGO! shows:

```
B33  +
Priority 01
Ack=On  
```

4. Confirm the entries with
   - OK

To configure the message destination and tick type (programming mode):

1. From the Priority and Acknowledgement screen form, press ▶ to access the Message Destination and Tick Type screen form.

2. Press ▶ to position the cursor on the “LOGO! Disp” line.
3. Press ▲ or ▼ to toggle through the three choices for message destination: LOGO! Disp, LOGO! TD, or Both.
4. If your message text has lines that tick, press ▶ to position the cursor on the "Ch by Ch" line.

5. If your message text has lines that tick, press ▲ or ▼ to select either "Ch by Ch" or "Ln by Ln" for the TickType.

6. Press ▶ to enable or disable ticking for each line of the message text. LOGO! displays the following screen form:

   Setting for each individual line of the message text:
   No: Line does not tick
   Yes: Line does tick

   1 = No
   2 = No
   3 = No
   4 = No

7. Press ▲ or ▼ to choose between "No" and "Yes" to define whether the line ticks or not.

8. To enable or disable message ticking for other lines, press ▶ to move the cursor to another line, and press ▲ or ▼ to choose between "No" and "Yes" for the selected line.

9. Press OK to confirm the complete message text configuration.

Visible parameters or process variables

The following parameters or process variables can be displayed in a message text, as either numerical values or bar-graph representations of values:

<table>
<thead>
<tr>
<th>Special function</th>
<th>Parameter or process variable visible in a message text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timers</td>
<td>T, T_a</td>
</tr>
<tr>
<td>On-delay</td>
<td>T, T_a</td>
</tr>
<tr>
<td>Off-delay</td>
<td>T, T_a</td>
</tr>
<tr>
<td>On-/Off-delay</td>
<td>T_a, T_H, T_L</td>
</tr>
<tr>
<td>Retentive on-delay</td>
<td>T, T_a</td>
</tr>
<tr>
<td>Wiping relay (pulse output)</td>
<td>T, T_a</td>
</tr>
<tr>
<td>Edge triggered wiping relay</td>
<td>T_a, T_H, T_L</td>
</tr>
<tr>
<td>Asynchronous pulse generator</td>
<td>T_a, T_H, T_L</td>
</tr>
<tr>
<td>Random generator</td>
<td>T_H, T_L</td>
</tr>
<tr>
<td>Stairway lighting switch</td>
<td>T_a, T, T_l</td>
</tr>
<tr>
<td>Multiple function switch</td>
<td>T_a, T, T_l</td>
</tr>
<tr>
<td>Weekly timer</td>
<td>3*on/off/day</td>
</tr>
<tr>
<td>Yearly timer</td>
<td>On, Off</td>
</tr>
<tr>
<td>Counter</td>
<td></td>
</tr>
<tr>
<td>Up/down counter</td>
<td>Cnt, On, Off</td>
</tr>
<tr>
<td>Hours counter</td>
<td>MI, Q, OT</td>
</tr>
<tr>
<td>Threshold trigger</td>
<td>f_a, On, Off, G_T</td>
</tr>
</tbody>
</table>
LOGO! functions

<table>
<thead>
<tr>
<th>Special function</th>
<th>Parameter or process variable visible in a message text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog</td>
<td></td>
</tr>
<tr>
<td>Analog threshold trigger</td>
<td>On, Off, A, B, Ax</td>
</tr>
<tr>
<td>Analog differential trigger</td>
<td>On, ∆, A, B, Ax, Off</td>
</tr>
<tr>
<td>Analog comparator</td>
<td>On, Off, A, B, Ax, Ay, ∆A</td>
</tr>
<tr>
<td>Analog value monitoring</td>
<td>∆, A, B, Ax, Aen</td>
</tr>
<tr>
<td>Analog amplifier</td>
<td>A, B, Ax</td>
</tr>
<tr>
<td>Analog multiplexer</td>
<td>V1, V2, V3, V4, AQ</td>
</tr>
<tr>
<td>Analog ramp</td>
<td>L1, L2, MaxL, StSp, Rate, A, B, AQ</td>
</tr>
<tr>
<td>PI controller</td>
<td>SP, Mq, KC, TI, Min, Max, A, B, PV, AQ</td>
</tr>
<tr>
<td>Analog Math</td>
<td>V1, V2, V3, V4, AQ</td>
</tr>
<tr>
<td>PWM (Pulse Width Modulator)</td>
<td>A, B, T, Ax amplified</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Latching relay</td>
<td>-</td>
</tr>
<tr>
<td>Pulse relay</td>
<td>-</td>
</tr>
<tr>
<td>Message texts</td>
<td>-</td>
</tr>
<tr>
<td>Softkey</td>
<td>On/Off</td>
</tr>
<tr>
<td>Shift register</td>
<td>-</td>
</tr>
</tbody>
</table>

For timers, a message text can also display the remaining time. “Remaining time” refers to how much time of the parameter setting remains.

Bar graphs can be either horizontal or vertical representations of the current or actual value scaled between the minimum and maximum value. For more information on configuring and displaying bar graphs in message texts, refer to the LOGO!Soft Comfort online help.

Changing parameters in the active message text

Only simple message texts can be edited from the LOGO! Basic module. Text messages created in LOGO!Soft Comfort that make use of new features such as bar graphs, I/O status names, and others cannot be edited from the LOGO! Basic module.

You can allow editing of parameter and process variables in an active message text by entering a "+" in the first line. To prevent changes, enter a "- -" sign.

When the message text is active, press **ESC** to select the editing mode.

**Note**

You must keep the **ESC** key pressed for at least one second.

Press ◄ and ► to select the relevant parameter. Press **OK** to change the parameter. Use the ▲ and ▼ keys to edit a parameter.

Confirm your changes with **OK**. You can now edit further parameters in the message text (if any exist). Press **ESC** to exit editing mode.
Key input simulation in the active message text

You can enable the four cursor keys C ▲, C ▼, C ◄ and C ◄ in an active message text by pressing ESC plus the relevant cursor key.

Setting the Par parameter

View in programming mode:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Parameter assignment screen form for Par

Press ▼ to select a line for the message text.

Press ▲ and ▼ to select the letter to be displayed in the text. To move the cursor from one position to the other, press ◄ and ▶.

The list of available characters is the same as for the circuit program name. The character set is found in Chapter 3.7.4. When you enter message text from the LOGO! Basic module, you can only enter characters from the ISO8859-1 character set. To enter text from another language, you must enter the text in LOGO!Soft Comfort.

Note that the number of characters per line of message text can be greater than the number of characters that LOGO! can show on the display. For each line you can optionally configure the line to tick: the message will scroll off the display in marquee fashion. You can choose the type of ticking:

- Character by Character: The characters in the message line tick off the display one character at a time to the left with the remaining characters ticking in from the right.
- Line by Line: One half of the message line ticks off the display and is replaced by the other half of the message line.

Press OK to confirm your changes, and press ESC to exit the editing mode.
4.4.24 Softkey

Short description

This special function has the effect of a mechanical pushbutton or switch.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>Input En</td>
<td>Output Q is set with a 0 to 1 transition of the signal at input En (Enable), and if 'Switch=On' was confirmed in parameter assignment mode.</td>
</tr>
<tr>
<td>Par</td>
<td>Parameter</td>
<td>Programming mode: Selecting the function for pushbutton action for the duration of one cycle, or for switching action. Start: On or off state, initialized at the first start of the program if retentivity is disabled. Retentivity: / = No retentivity R = The status is retentive. Parameter assignment mode (RUN mode): Switch: Switches the momentary pushbutton (switch) on or off.</td>
</tr>
<tr>
<td>Q</td>
<td>Output Q</td>
<td>Switches on if En=1 and Switch=On was confirmed with OK.</td>
</tr>
</tbody>
</table>

Factory setting

The default parameter setting is switching action.

Timing diagram

![Timing diagram]

Functional description

In parameter assignment mode, the output is set with a signal at input En, if the 'Switch' parameter is set to 'On' and confirmed with OK. Whether the function was configured for pushbutton or switching action is of no concern here.

The output is reset to '0' in the following three cases:

- After a 1 to 0 transition at input En
- When the function was configured for momentary pushbutton action, and one cycle has expired since it was switched on
- When the position 'Off' was selected at the 'Switch' parameter and confirmed with OK in parameter assignment mode

If retentivity is not set, output Q is initialized after a power failure according to your configuration at the "Start" parameter.
Setting the Par parameter

View in programming mode (example):

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’)

   ![Diagram with B33 +/ and On=△ Start=On]

   The status is not retentive
   The function is set for ‘momentary push-button’ action
   Q is set in the first cycle after the program start

To change ‘Par’ to ‘Switch’ action and the initialization status after the program start:

4. To select ‘Momentary pushbutton’ or ‘Switch’ action:

   ![Diagram with B33 +/ and On/Off Start=On]

   Press ▲ or ▼

5. To change to the start state:
   Press ◀ or ▶

6. To change the start state:

   ![Diagram with B33 +/ and On/Off Start=Off]

   Press ▲ or ▼

7. Confirm your entries with

   OK
View in parameter assignment mode (example):

Here, you can set or reset the 'Switch' parameter (On/Off). When in RUN, LOGO! shows the following display:

```
B33
Switch=Off
```

The pushbutton/switch here is switched off

Let us assume you want to set 'Switch' (On).

1. Change to the editing mode:
   Confirm with OK
   (the cursor is now positioned on 'Off')

2. To change from 'Off' to 'On':
   Press ▲ or ▼

3. Confirm your entries with
   Press OK

```
B33
Switch=On
```

The momentary pushbutton/switch is here switched on
4.4.25 Shift register

Short description

You can use the shift register function to read the value of an input and to shift its bits left or right. The output value corresponds with the configured shift register bit. The shifting direction can be changed at a special input.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input In</td>
<td></td>
<td>Input read at the start of the function.</td>
</tr>
<tr>
<td>Input Trg</td>
<td></td>
<td>A positive edge (0 to 1 transition) at input Trg (Trigger) starts the special function. 1 to 0 transitions are irrelevant.</td>
</tr>
<tr>
<td>Input Dir</td>
<td></td>
<td>The signal at input Dir determines the shifting direction for the shift register bits S1...S8: Dir = 0: Shift up (S1 &gt;&gt; S8) Dir = 1: Shift down (S8 &gt;&gt; S1)</td>
</tr>
<tr>
<td>Parameter</td>
<td></td>
<td>Shift register bit that determines the value at output Q. Possible settings: S1 ... S8 Retentivity: /= No retentivity R = The status is retentive.</td>
</tr>
<tr>
<td>Output Q</td>
<td></td>
<td>The output value corresponds with the configured shift register bit.</td>
</tr>
</tbody>
</table>

Functional description

The function reads the value at input In with a positive edge (0 to 1 transition) at input Trg (Trigger).

This value is applied to shift register bit S1 or S8, depending on the shifting direction:

- Shift up: The value at input In is set at S1; the previous value at S1 is shifted to S2; the previous value at S2 is shifted to S3 etc.
- Shift down: The value at input In is set at S8; the previous value at S8 is shifted to S7; the previous value at S7 is shifted to S6 etc.

Output Q returns the value of the configured shift register bit.

If retentivity is disabled, the shift function restarts at S1 or S8 after a power failure. When enabled, retentivity always applies to all shift register bits.

Note

The special function shift register can be used only once in the circuit program.
Timing diagram

<table>
<thead>
<tr>
<th></th>
<th>In</th>
<th>Trg</th>
<th>Q</th>
<th>Dir</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>S1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>S2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>S3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>S4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>S5</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>S6</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>S8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

S4 = Q (example)

Setting the Par parameter

View in programming mode:

```
B3  R
Q=S8
```

Press ▼

```
B3  R
Q=S7
```

etc. You can select S8...S1.

This special function is not available in parameter assignment mode.
4.4.26 Analog Multiplexer

Short description

This special function outputs one of four predefined analog values or 0 at the analog output.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>Input En</td>
<td>A change in status from 0 to 1 at input En (Enable) switches a parameterized analog value to the output AQ, depending on the value of S1 and S2.</td>
</tr>
<tr>
<td>S1</td>
<td>Inputs S1 and S2</td>
<td>S1 and S2 (selectors) for selecting the analog value to be issued.</td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td>• S1 = 0 and S2 = 0: Value 1 is issued</td>
</tr>
<tr>
<td>Par</td>
<td></td>
<td>• S1 = 0 and S2 = 1: Value 2 is issued</td>
</tr>
<tr>
<td>AQ</td>
<td></td>
<td>• S1 = 1 and S2 = 0: Value 3 is issued</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• S1 = 1 and S2 = 1: Value 4 is issued</td>
</tr>
<tr>
<td>Parameter</td>
<td>V1...V4: Analog values that will be issued.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values: -32768...+32767</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p: Number of decimals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values: 0, 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td>Output AQ</td>
<td>This special function has an analog output. This output can only be connected with the analog input of a function, an analog flag or an analog output connector (AQ1, AQ2).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values for AQ: -32768...+32767</td>
<td></td>
</tr>
</tbody>
</table>

Parameters V1...V4

The analog values for the parameters V1...V4 can be derived from another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. For information on parameter defaults, refer to Chapter 4.4.1.
**LOGO! functions**

**Parameter p (number of decimals)**

Applies only to the values displayed in a message text.

**Timing diagram**

![Timing diagram](image)

**Functional description**

If input En is set, then the function issues one of 4 possible analog values V1 to V4 at the output AQ, depending on the value of S1 and S2.

If the input En is not set, then the function issues the analog value 0 at output AQ.

**Analog output**

If you interconnect this special function with a real analog output, note that the analog output can only process values between 0 and 1000. To do this, you may need to connect an additional amplifier between the analog output of the special function and the real analog output. Using this amplifier, you standardize the output range of the special function to a value range of 0 to 1000.

**Setting the Par parameter**

View in programming mode (example):

| B3 1+/ | V1 =+04000 |
| V2 =-02000 |

Press   

View in parameter assignment mode:

| B3 2+/ | V3 →B020   |
| V4 →B021   |
| p =0       |

| B3 1   | V1 =+04000 |
| V2 =-02000 |

Press   

| B3 2   | V3 →B020   |
| V4 →B021   |
| AQ +=4000 |

4.4.27 Analog Ramp

Short description

The Analog Ramp instruction allows the output to be changed from the current level to the selected level at a specified rate.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En Sel St Par AQ</td>
<td>Input En</td>
<td>A change in the status from 0 to 1 at input En (Enable) applies the start/stop level (Offset &quot;B&quot; + StSp) to the output for 100 ms and starts the ramp operation to the selected level. A change in the status from 1 to 0 immediately sets the current level to Offset &quot;B&quot;, which makes output AQ equal to 0.</td>
</tr>
<tr>
<td></td>
<td>Input Sel</td>
<td>Sel = 0: Level 1 is selected Sel = 1: Level 2 is selected A change in status of Sel causes the current level to start changing to the selected level at the specified rate.</td>
</tr>
<tr>
<td></td>
<td>Input St</td>
<td>A change in the status from 0 to 1 at input St (Decelerated Stop) causes the current level to decrease at a constant rate until the start/stop level (Offset &quot;B&quot; + StSp) is reached. The start/stop level is maintained for 100 ms and then the current level is set to Offset &quot;B&quot;, which makes output AQ equal to 0.</td>
</tr>
</tbody>
</table>
### Symbol in LOGO!

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Level 1 and Level 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Levels to be reached</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values for each level:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10,000 to 20,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MaxL:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum value that must not be exceeded under any circumstances.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10,000 to 20,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>StSp:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Start/Stop offset:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>value that is added to Offset &quot;B&quot; to create the start/stop level. If the Start/Stop offset is 0, then the start/stop level is Offset &quot;B&quot;.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 20,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rate:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acceleration with which level 1, level 2 or Offset is reached. Steps/seconds are issued.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 to 10,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A: Gain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 to 10.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B: Offset</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±10,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>p: Number of decimals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range of values:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0, 1, 2, 3</td>
<td></td>
</tr>
</tbody>
</table>

| Output AQ       | The output AQ is scaled using the formula: |
|                 | Range of values for AQ: |
|                 | 0 to 32767 |
|                 | (Current Level - Offset "B")/ Gain "A" |
|                 | Range of values: |
|                 | 0 to 32767 |
|                 | Note: |
|                 | When AQ is displayed in parameter mode or message mode, it is displayed as an unscaled value (engineering units: current level). |
Parameters L1, L2

The analog values for the parameters L1 and L2 can be derived from another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. For information on parameter defaults, refer to Chapter 4.4.1.

Parameter p (number of decimals)

Applies only to the AQ, L1, L2, MaxL, StSp and Rate values displayed in a message text.

Timing diagram for AQ
Functional description

If the input En is set, then the function sets the current level to StSp + Offset "B" for 100 ms.

Then, depending on the connection of Sel, the function runs from the level StSp + Offset "B" to either level 1 or level 2 at the acceleration set in Rate.

If the input St is set, the function runs to a level of StSp + Offset "B" at the acceleration set in Rate. Then the function holds the level at StSp + Offset "B" for 100 ms. After 100 ms, the level is set to Offset "B". The scaled value (output AQ) is 0.

If the input St is set, the function can only be restarted after the inputs St and En have been reset.

If input Sel has been changed, depending on the connection of Sel, the function runs from the current target level to the new target level at the rate that is specified.

If the input En is reset, the function immediately sets the current level to Offset "B".

The current level is updated every 100 ms. Note the relationship between output AQ and the current level:

Output AQ = (current level - Offset "B" / Gain "A")

Note

For further information on analog value processing please refer to the online help for LOGO!Soft Comfort.

Setting the Par parameter

View in programming mode (example):

<table>
<thead>
<tr>
<th>B3 1+/</th>
<th>B3 2+/</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 +=04000</td>
<td>MaxL=+7000</td>
</tr>
<tr>
<td>L2 →B020</td>
<td>StSp=00222</td>
</tr>
<tr>
<td></td>
<td>Rate=00500</td>
</tr>
</tbody>
</table>

Press

<table>
<thead>
<tr>
<th>B3 3+/</th>
</tr>
</thead>
<tbody>
<tr>
<td>A =02.50</td>
</tr>
<tr>
<td>B =-00300</td>
</tr>
<tr>
<td>p =0</td>
</tr>
</tbody>
</table>

Gain
Offset
Decimals in the message text
4.4.28  PI controller

Short description

Proportional-action and integral-action controllers. You can use both types of controller individually or combined.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/M</td>
<td>Input A/M</td>
<td>Set the mode of the controller: 1: automatic mode 0: manual mode</td>
</tr>
<tr>
<td>R</td>
<td>Use the input R to reset the output AQ. As long as this input is set, the input A/M is disabled. Output AQ is set to 0.</td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>Analog value: process variable, influences the output</td>
<td></td>
</tr>
</tbody>
</table>
Symbol in LOGO! | Wiring | Description
--- | --- | ---
Parameter | SP: Set-value assignment  
Range of values:  
-10,000 to +20,000 |  
KC: Gain  
Range of values:  
00.00 to 99.99  
TI: Integral time  
Range of values:  
00:01 to 99:59 m  
Dir: Action direction of the controller  
Range of values:  
+ or -  
Mq: Value from AQ with manual mode  
Range of values:  
0 to 1000  
Min: Minimum value for PV  
Range of values:  
-10,000 to +20,000  
Max: Maximum value for PV  
Range of values:  
-10,000 to +20,000  
A: Gain  
Range of values:  
±10.00  
B: Offset  
Range of values:  
±10,000  
p: Number of decimals  
Range of values:  
0, 1, 2, 3
Output AQ | This special function has an analog output (= manipulated variable). This output can only be connected with the analog input of a function, an analog flag or an analog output connector (AQ1, AQ2).  
Range of values for AQ:  
0...1000
Parameters SP and Mq

The set-value SP and the value for Mq can be provided by another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value AQ, see Chapter 4.4.26)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ)
- Up/down counter (actual value Cnt, see Chapter 4.4.13)
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. For information on parameter defaults, refer to Chapter 4.4.1.

Parameters KC, TI

Please note:

- If parameter KC has value 0, the "P" function (proportional control) will not be executed.
- If parameter TI has value 99:59 m, the "I" function (integral-action control) will not be executed.

Parameter p (number of decimals)

Applies only to the PV, SP, Min and Max values displayed in a message text.
Timing diagram

The nature, manner and speed with which the AQ changes depend on the parameters KC and TI. Thus, the course of AQ in the diagram is merely an example. A control action is continuous; therefore the diagram portrays just an extract.

1. A disturbance causes the PV to drop, as Dir is positioned upwards, AQ increases until PV corresponds again to SP.
2. A disturbance causes the PV to drop, as Dir is positioned downwards, AQ decreases until PV corresponds again to SP.
   It is not possible to change the direction (Dir) at runtime of the function. The change is shown here for illustrative purposes only.
3. As AQ is set to 0 by means of the input R, PV changes. This is based on the fact that PV increases, which on account of Dir = upwards causes AQ to drop.
Functional description

If the input A/M is set to 0, then the special function issues output AQ with the value that you set with parameter Mq.

If the input A/M is set to 1, then automatic mode commences. As an integral sum the value Mq is adopted, the controller function begins the calculations.

Note

For further information on the controller basics please refer to the online help for LOGO!Soft Comfort.

The updated value PV is used to calculate in the formulas:

\[
Updated\; value\; PV = (PV - gain) + offset
\]

- If the updated value PV = SP, then the special function does not change the value of AQ.
- Dir = upwards (+) (timing diagram numbers 1. and 3.)
  - If the updated value PV > SP, then the special function reduces the value of AQ.
  - If the updated value PV < SP, then the special function increases the value of AQ.
- Dir = downwards (-) (timing diagram number 2.)
  - If the updated value PV > SP, then the special function increases the value of AQ.
  - If the updated value PV < SP, then the special function reduces the value of AQ.

With a disturbance, AQ continues to increase / decrease until the updated value PV again corresponds to SP. The speed with which AQ changes depends on the parameters KC and TI.

If the input PV exceeds the parameter Max, then the updated value PV is set to the value of Max. If the PV falls short of the parameter Min, then the updated value PV is set to the value of Min.

If the input R is set to 1, then the AQ output is reset. As long as R is set, the input A/M is disabled.

Sampling time

The sampling time is fixed at 500 ms.
Parameter sets

For more information and application examples with application-related parameter sets for KC, TI and Dir refer to the online help for LOGO!Soft Comfort.

Setting the Par parameter

View in programming mode (example):

```
B3 1+/ SP →B020

Press ◄ ►

B3 2+/ KC =10.00
   TI =01:00
   Dir=+

Press ◄ ►

B3 3+/ Mq →B021
   Min=-05000
   Max=+05000

Press ◄ ►

B3 4+/ A =02.50
   B =-00300
   P =0
```

View in parameter assignment mode:

```
B3 1 SP →B020
   PV = 0
   AQ =+0250

Press ◄ ►

B3 2
   KC =10.00
   TI =01:00
   Dir=+

Press ◄ ►

B3 3 Mq →B021
   Min=-05000
   Max=+05000

Press ◄ ►

B3 4
   A =02.50
   B =-00300
```
4.4.29 Pulse Width Modulator (PWM)

Short description

The Pulse Width Modulator (PWM) instruction modulates the analog input value \( Ax \) to a pulsed digital output signal. The pulse width is proportional to the analog value \( Ax \).

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>Input ( Ax )</td>
<td>Analog signal to be modulated to a pulsed digital output signal.</td>
</tr>
</tbody>
</table>
| Par | Parameter | A: Gain  
| | | Range of values: \( \pm - 10.00 \)  
| | | B: Zero offset  
| | | Range of values: \( \pm - 10,000 \)  
| | | T: Periodic time over which the digital output is modulated  
| | | p: Number of decimals  
| | | Range of values: 0, 1, 2, 3 |
| | Output \( Q \) | \( Q \) is set or reset for the proportion of each time period according to the proportion of the standardized value \( Ax \) to the analog value range. |

Parameter T

Note the defaults of the T parameters listed in Chapter 4.3.2.

The periodic time \( T \) can be provided by the actual value of another already-programmed function. You can use the actual value of the following functions:

- Analog comparator (actual value \( Ax - Ay \), see Chapter 4.4.18)
- Analog threshold trigger (actual value \( Ax \), see Chapter 4.4.16)
- Analog amplifier (actual value \( Ax \), see Chapter 4.4.20)
- Analog multiplexer (actual value \( AQ \), see Chapter 4.4.26)
- Analog ramp (actual value \( AQ \), see Chapter 4.4.27)
- PI controller (actual value \( AQ \), see Chapter 4.4.28)
- Up/down counter (actual value \( Cnt \), see Chapter 4.4.13).
- Analog Math (actual value \( AQ \), see Chapter 4.4.30)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Chapter 4.4.1.

Parameters \( p \) (number of decimals)

Parameter \( p \) applies only to the display of the \( Ax \) value in a message text.
Functional description

The function reads the value of the signal at the analog input Ax.
This value is multiplied by the value of parameter A (gain). Parameter B (offset) is added to the product, as follows:

\[(Ax \times \text{Gain}) + \text{Offset} = \text{Actual value Ax}\]

The function block calculates the proportion of the value Ax to the range. The block sets the digital output Q high for the same proportion of the T (periodic time) parameter, and sets Q low for the remainder of the time period.

Examples with Timing Diagrams

The following examples show how the PWM instruction modulates a digital output signal from the analog input value:

1. An analog value of 500 (range 0...1000) as the value for Ax must be modulated to a digital signal string. The user-defined T (periodic time) parameter is 4 seconds. At the digital output of the PWM function the digital signal string is 2 seconds high, 2 seconds low, 2 seconds high, 2 seconds low and continues in that pattern as long as parameter En = high.

2. An analog value of 300 (range 0...1000) as the value for Ax must be modulated to a digital signal string. The user-defined T (periodic time) parameter is 10 seconds. At the digital output of the PWM function the digital signal string is 3 seconds high, 7 seconds low, 3 seconds high, 7 seconds low and continues in that pattern as long as parameter “En” = high.
Calculation rule

\[ Q = 1, \text{ for } \frac{(Ax - Min)}{(Max - Min)} \text{ of time period } T, \text{ when } Min < Ax < Max \]
\[ Q = 0, \text{ for } PT - \left[ \frac{(Ax - Min)}{(Max - Min)} \right] \text{ of time period } T. \]

Setting the Par Parameter

The following illustration shows the view in programming mode that corresponds to the first example:

Use the \( \uparrow \) and \( \downarrow \) keys to navigate to the parameter values on a screen form. To change a value, press the OK key and then use the \( \leftarrow \) and \( \rightarrow \) keys to scroll through value choices for each value. Use the ESC key to leave one screen form and then use the \( \leftarrow \) and \( \rightarrow \) keys to navigate from one screen form to the next.
4.4.30 Analog Math

Short description
The analog math block calculates the value AQ of an equation formed from the user-defined operands and operators.

<table>
<thead>
<tr>
<th>Symbol in LOGO!</th>
<th>Wiring</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>En</td>
<td>Input En</td>
<td>A change in the status from 0 to 1 at input En (Enable) enables the analog math function block.</td>
</tr>
<tr>
<td>Par</td>
<td>Parameter</td>
<td>V1: First operand value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V2: Second operand value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V3: Third operand value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V4: Fourth operand value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Op1: First operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Op2: Second operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Op3: Third operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pr1: Priority of first operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pr2: Priority of second operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pr3: Priority of third operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qen: 0: Reset value of AQ to 0 when En=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Retain last value of AQ when En=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p: Number of decimals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range of values: 0, 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>AQ</td>
<td>Output AQ</td>
<td>The output AQ is the result of the equation formed from the operand values and operators.</td>
</tr>
</tbody>
</table>

Parameters V1...V4
The analog values for the parameters V1...V4 can be derived from another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (actual value Ax - Ay, see Chapter 4.4.18)
- Analog threshold trigger (actual value Ax, see Chapter 4.4.16)
- Analog amplifier (actual value Ax, see Chapter 4.4.20)
- Analog multiplexer (actual value Ax)
- Analog ramp (actual value AQ, see Chapter 4.4.27)
- PI controller (actual value AQ, see Chapter 4.4.28)
- Up/down counter (actual value Cnt, see Chapter 4.4.13).
- Analog Math (actual value AQ, see Chapter 4.4.30)

Select the required function by the block number. For information on parameter defaults, refer to Chapter 4.4.1.

Parameters p (number of decimals)
Parameter p applies only to the display of Value1, Value2, Value3, Value4 and AQ in a message text.
Functional Description

The analog math function combines the four operands and three operators to form an equation. The operator can be any one of the four standard operators: +, -, *, or /. For each operator, you must set a unique priority of High (H), Medium (M), or Low (L). The high operation will be performed first, followed by the medium operation, and then by the low operation. You must have exactly one operation of each priority. The operand values can reference another previously-defined function to provide the value.

The number of operand values is fixed at four and the number of operators is fixed at 3. If you need to use fewer operands, use constructions such as + 0 or * 1 to fill the remaining parameters.

You can also configure the behavior of the function when the Enable parameter En=0. The function block can either retain its last value, or be set to 0. If the parameter Qen→0 = 0, then the function sets AQ to 0 when En=0. If the parameter Qen→0 = 1, then the function leaves AQ at its last value when En=0.

Examples

The following tables show some simple example analog math block parameters, and the resulting equations and output values:

<table>
<thead>
<tr>
<th>V1</th>
<th>Op1 (Pr1)</th>
<th>V2</th>
<th>Op2 (Pr2)</th>
<th>V3</th>
<th>Op3 (Pr3)</th>
<th>V4</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>+ (M)</td>
<td>6</td>
<td>/ (H)</td>
<td>3</td>
<td>- (L)</td>
<td>1</td>
</tr>
</tbody>
</table>

Equation: \((12 + (6/3)) - 1\)
Result: 13

<table>
<thead>
<tr>
<th>V1</th>
<th>Op1 (Pr1)</th>
<th>V2</th>
<th>Op2 (Pr2)</th>
<th>V3</th>
<th>Op3 (Pr3)</th>
<th>V4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>+ (L)</td>
<td>3</td>
<td>* (M)</td>
<td>1</td>
<td>+ (H)</td>
<td>4</td>
</tr>
</tbody>
</table>

Equation: \(2 + (3 \times (1 + 4))\)
Result: 17

<table>
<thead>
<tr>
<th>V1</th>
<th>Op1 (Pr1)</th>
<th>V2</th>
<th>Op2 (Pr2)</th>
<th>V3</th>
<th>Op3 (Pr3)</th>
<th>V4</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>- (H)</td>
<td>25</td>
<td>/ (L)</td>
<td>2</td>
<td>+ (M)</td>
<td>1</td>
</tr>
</tbody>
</table>

Equation: \((100 - 25) / (2 + 1)\)
Result: 25
Setting the Par parameter

The following illustration shows the view in programming mode that corresponds to the first example \((12 + (6 / 3)) - 1\):

```
B1  +/-
V1=+00012
OP1= +
PR1=M

Press
<  |  >

B1  +/-
V2=+0006
OP2=/
PR2=H

Press
<  |  >

B1  +/-
V3=+00003
OP3=-
PR3=L

B1  +/-
V4=+00001
Qen→0: 0
p  =0
```

Use the < and > keys to navigate between the operand value, operator, and operation priority. To change a value, use the ▲ and ▼ keys to scroll through value choices for each value. Use the < key to navigate from one screen to the previous screen when the cursor is on the V1..V4 line, and the > key to navigate to the next screen from the PR1..PR3 line.
Configuring LOGO!

Parameter assignment refers to the configuration of the block parameters. You can set delay times for time functions, the switching times of timers, counter threshold values, the monitoring interval of an hours counter, the on and off thresholds of the trigger, and more.

You can configure the parameters

- In programming mode
- In parameter assignment mode

In programming mode, the author of the circuit program also sets the parameters. Parameter assignment mode allows the editing of parameters without having to modify the circuit program. This feature is available so that you can edit parameters without having to change to programming mode. The advantage: The circuit program remains protected, but can be adapted by the user to meet specific requirements.

---

**Note**

In parameter assignment mode, LOGO! continues execution of the circuit program.
5.1 Selecting parameter assignment mode

Press ESC to change from RUN to parameter assignment mode:

![ESC prompt]

Note

The following applies to earlier device versions up to 0BA2:
- You open parameter assignment mode by pressing ESC+OK.

LOGO! changes to parameter assignment mode and opens the parameter assignment menu:

>Stop
Set Param
Set..
Prg Name

Description of the four menu items of the parameter assignment menu

- **Stop**
  You select this command to stop your circuit program and thus change to the main menu of programming mode. To do so:
  1. To move the '>' cursor to 'Stop': Press ▲ or ▼
  2. To confirm 'Stop': Press OK

  ![Stop Prg]

  >No
  Yes

  3. To move the '>' cursor to 'Yes': Press ▲ or ▼
  4. To confirm 'Yes': Press OK
LOGO! shows the main menu of the programming mode:

![Main Menu](image)

- **Set Param**
  For information on the various parameters, refer to the Chapters 5.1.1 to 5.1.3.
- **Set.**
  For information on the various settings, refer to Chapter 5.2.
- **Prg Name**
  This menu command only allows you to **read** the name of your circuit program. It is not possible to modify this name in parameter assignment mode (see Chapter 3.7.4).

### 5.1.1 Parameters

**Note**

In the following discourse on parameters, we presume that the respective default parameter protection mode ("+") has been maintained. This is a prerequisite for viewing and editing parameters in the parameter assignment mode! See Chapter 4.3.5 and the example on Page 84.

Parameters are, for example:
- The delay times of a timer relay.
- The switching times (cams) of a timer switch.
- Counter thresholds
- The monitoring time for hour counters
- The trigger thresholds.

Each one of the parameters is identified by its block number (Bx) and the shortname of the parameter. Examples:
- T: ...is a configurable time.
- MI:...is a configurable time interval.

**Note**

LOGO!Soft Comfort also allows you to assign names to blocks (for more information, refer to Chapter 7).
5.1.2 Selecting the parameters

To select a parameter:

1. On the parameter assignment menu, select ‘Set Param’: Press ▼ or ▲

   \[
   \text{Stop} \\
   >\text{Set Param} \\
   \text{Set..} \\
   \text{Prg Name}
   \]

2. Confirm with OK. LOGO! shows the first parameter. If no parameter can be set, you can press ESC to return to the parameter assignment menu.

   \[
   \text{Block number} \\
   \text{Display number for functions with several displays} \\
   \text{The value set at parameter } T \text{ (Time)} \\
   \text{The current time in LOGO!}
   \]

3. Now, select the desired parameter: Press ▲ or ▼.

4. Select the parameter you want to edit, and press OK.
5.1.3 Modifying parameters

You first select the parameter you want to edit (see Chapter 5.1.2).

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

1. Move the cursor to the point at which you want to make the change: 
   Press ◄ or ►

2. To change this value: 
   Press ▲ or ▼

3. To apply the value: 
   OK

Note

When changing the time parameters when the system is in RUN, you can also change the timebase (s = seconds, m = minutes, h = hours). This does not apply if the time parameter represents the result of another function (for an example, see Chapter 4.4.1). In this case you can neither change the value nor the timebase. The current time is reset to zero when you change the timebase.

Current value of a time T

View of a time T in parameter assignment mode:

<table>
<thead>
<tr>
<th>B9</th>
<th>T = 80:00s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta</td>
<td>06:00s</td>
</tr>
</tbody>
</table>

You can change the configured time T.

Current timer value

View of a timer cam in parameter assignment mode:

<table>
<thead>
<tr>
<th>B1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>D=M-W-F--</td>
<td></td>
</tr>
<tr>
<td>On = 09:00</td>
<td></td>
</tr>
<tr>
<td>Off = 10:00</td>
<td></td>
</tr>
</tbody>
</table>

You can change the on/off times and the day.
Current value of a counter

View of a counter parameter in parameter assignment mode:

<table>
<thead>
<tr>
<th>B3</th>
<th>On =001234</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Off=000000</td>
</tr>
<tr>
<td></td>
<td>Cnt=000120</td>
</tr>
</tbody>
</table>

You can change the on/off threshold. This does not apply if the on or off threshold represents the result of another function (in the example in section 4.4.13, this is B021).

Current value of an hour counter

View of an hour counter parameter in parameter assignment mode:

<table>
<thead>
<tr>
<th>B16 1</th>
<th>MI = 0100h 00 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>B16 2</td>
<td>OT =00083h 15 m</td>
</tr>
<tr>
<td>B16 3</td>
<td>MN = 0016h 45 m</td>
</tr>
</tbody>
</table>

You can edit the configured time interval MI.

Current value of a threshold trigger

View of the parameter of a threshold trigger in parameter assignment mode:

<table>
<thead>
<tr>
<th>B15</th>
<th>On =0009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Off=0005</td>
</tr>
<tr>
<td></td>
<td>fa =0010</td>
</tr>
</tbody>
</table>

You can change the on/off threshold.
5.2 Setting the default values for LOGO!

You can set the following default values for a LOGO! Basic module:

Clock settings

You can set the default values for time-of-day and date, summertime/wintertime conversion and synchronization:

• in parameter assignment mode by means of the set menu (“Clock” menu item)
• in programming mode by means of the setup menu (“Clock” menu item).

Time-of-day and date see Chapter 5.2.1.
Summertime/wintertime conversion see Chapter 3.7.14.
Synchronization see Chapter 3.7.15.

Contrast and backlight settings

You can set the default values for the display contrast and backlight:

• in parameter assignment mode by means of the set menu (“LCD” menu item)
• in programming mode by means of the setup menu (“LCD” menu item).

See Chapter 5.2.2.

Menu Language

You can set the language in which the LOGO! menus will be displayed:

• in parameter assignment mode by means of the set menu (“Menu Lang” menu item)
• in programming mode by means of the setup menu (“Menu Lang” menu item)

Number of Basic Module Analog Inputs

The LOGO! Basic Modules LOGO! 24/o, and LOGO! 12/24RC/o support four analog inputs. Formerly they supported two. You can choose whether to use two or four analog inputs on these modules:

• in parameter assignment mode by means of the set menu (“BM AI NUM” menu item)
• in programming mode by means of the setup menu (“BM AI NUM” menu item)

Start screen settings

You can select the default setting for the start screen that displays on LOGO! and the LOGO! TD when LOGO! transitions to RUN mode:

• in parameter assignment mode by means of the set menu (“StartScreen” menu item)

See Chapter 5.2.5.

Message Text settings

You can select settings that apply to all message text function blocks from the Programming menu. See Chapter 4.4.23.
5.2.1 Setting the time of day and date (LOGO! ... C)

You can set the time of day and the date

- in parameter assignment mode by means of the set menu (“Clock” menu item)
- in programming mode by means of the setup menu (“Clock” menu item)

To set the TOD and the date in parameter assignment mode:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select ‘Set..’: Press ▼ or ▲

   Stop
   Set Param
   >Set..
   Prg Name

3. Confirm ‘Set..’: Press OK
4. Move the ‘>’ cursor to ‘Clock’: Press ▲ or ▼
5. Confirm ‘Clock’: Press OK
6. Move the ‘>’ cursor to ‘Set Clock’: Press ▲ or ▼
7. Apply ‘Set Clock’: Press OK

Note
The ‘Set Clock’ command is only executed if your LOGO! is equipped with a
real-time clock (LOGO!..C). You set the real-time clock of LOGO! by means of the
‘Set Clock’ command.

LOGO! shows the following display.

   Set Clock
   Mo 15:30
   YYYY-MM-DD
   2008-05-26

The cursor is positioned on the weekday.

8. Select the day of the week: Press ▲ or ▼
9. Move the cursor to the next position: Press ◀ or ▶
10. To change the value: Press ▲ or ▼
11. To set the correct TOD, repeat steps 9. and 10.
12. To set the correct date, repeat steps 9. and 10.
13. To confirm your entries: Press OK
To set the TOD and the date in programming mode:

If you want to set the TOD and the date in programming mode, select ‘Setup’ in the main menu, then menus ‘Clock’ and ‘Set Clock’. You can now set the weekday and the time as described earlier (as of step 8.).

5.2.2 Setting the display contrast and backlight choice

You can set the default value for the display contrast:

- in parameter assignment mode by means of the set menu (“LCD” menu item)
- in programming mode by means of the setup menu (“LCD” menu item).

To set the display contrast in parameter assignment mode:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select ’Set’: Press ▼ or ▲
3. Confirm ’Set.’: Press OK
4. On the Set menu, select ’LCD’: Press ▼ or ▲
5. Confirm ’LCD.’: Press OK
6. By default, the cursor points to Contrast. If not, move the ‘>’ cursor to ‘Contrast’: Press ▲ or ▼
7. Confirm ’Contrast’: Press OK

LOGO! shows the following display:

Contrast

-....[[[....+

8. To change the display contrast: Press ◀ or ▶
9. To confirm your entry: Press OK

To set the display contrast in programming mode:

If you want to set the display contrast in programming mode, select ’Setup’ in the main menu, then menu ‘Contrast’. You can now set the display contrast as described earlier (as of step 8.).
To set the back light choice in parameter assignment mode:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select 'Set': Press \( \downarrow \) or \( \uparrow \)
3. Confirm 'Set..': Press OK
4. On the Set menu, select 'LCD': Press \( \downarrow \) or \( \uparrow \)
5. Confirm 'LCD..': Press OK
6. Move the '>' cursor to 'Back light': Press \( \uparrow \) or \( \downarrow \)
7. Confirm 'Back light': Press OK
8. Move the '>' cursor to 'Default' or 'alwaysOn': Press \( \uparrow \) or \( \downarrow \)

The default is that the back light is not on. To set the back light to always be on, select the 'alwaysOn' choice.

To set the back light choice in programming mode:

If you want to set the backlight choice in programming mode, select 'Setup' in the main menu, then menu 'LCD'. You can now set the back light choice as described earlier (as of step 6.).

5.2.3 Setting the menu language

The language of the LOGO! menus can be one of ten predefined languages.

To set the menu language in parameter assignment mode:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select 'Set': Press \( \downarrow \) or \( \uparrow \)
3. Confirm 'Set..': Press OK
4. On the Set menu, select 'Menu Lang': Press \( \downarrow \) or \( \uparrow \)
5. Confirm 'Menu Lang': Press OK
6. Move the '>' cursor to the language of your choice: Press \( \uparrow \) or \( \downarrow \)
7. Confirm language selection. Press OK

To set the menu language in programming mode:

If you want to set the menu language in programming mode, select 'Setup' in the main menu, then menu 'Menu Lang'. You can now set the menu language as described earlier (as of step 6.).
5.2.4 Setting the number of AIs in the Basic Module

The first two input terminals of some LOGO! Basic modules can be used as either digital inputs or as two additional analog inputs. If you choose to use them as analog inputs, they are AI3 and AI4 respectively. Otherwise the module has only AI1 and AI2 on the rightmost input terminals. The LOGO! Basic Modules that support the two additional optional AIs provide a menu setting for you to define whether the module is to be used with two or four analog inputs. LOGO! Basic Modules that do not support up to four analog inputs do not have this menu selection.

To set the number of AIs in parameter assignment mode:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select ‘Set’: Press ▼ or ▲
3. Confirm ‘Set..’: Press OK
4. On the Set menu, select ‘BM AI NUM’: Press ▼ or ▲
5. Confirm ‘BM AI NUM’: Press OK
6. Move to ‘2AI’ or ‘4AI’: Press ▲ or ▼
7. Confirm selection. Press OK

To set the number of AIs in programming mode:

If you want to set the number of AIs in programming mode, select ‘Setup’ in the main menu, then menu ‘BM AI NUM’. You can now set the number of AIs as described earlier (as of step 6.).

If you change the number of analog inputs, LOGO! restarts automatically.
5.2.5 Setting the start screen

You can select the default setting for the start screen that LOGO! and the LOGO! TD will display in RUN mode. You make this selection from the parameter assignment mode by means of the set menu ("StartScreen" menu item).

To select the start screen:

1. Select parameter assignment mode (see Chapter 5.1.)
2. On the parameter assignment menu, select 'Set..': Press ▼ or ▲
3. Confirm 'Set..': Press OK
4. Move to 'StartScreen': Press ▲ or ▼
5. Confirm 'StartScreen': Press OK

LOGO! shows the following display:

```
>Clock
Input DI
StartScreen
Clock
```

The current setting of the start screen is shown in the bottom row. The default setting is 'Clock'.

You can choose between the display of the current time-of-day and date, or the values of the digital inputs:

6. Select the desired default setting: Press ▲ or ▼.
7. To confirm your entry: Press OK

LOGO! displays your selection.

Power the LOGO! Basic module off then on to make your changes take effect. When LOGO! is in RUN mode, both LOGO! and the LOGO! TD will display the start screen that you selected.
LOGO! memory and battery cards

LOGO! provides the following cards for program storage and real-time clock backup:

- LOGO! Memory Card
- LOGO! Battery Card
- LOGO! Combined Memory/Battery Card

The LOGO! Memory Card provides storage for the circuit program. The LOGO! Battery Card provides battery backup of the real-time clock for up to two years. The LOGO! Combined Memory/Battery card provides both circuit program storage and battery backup of the real-time clock.

LOGO! allows you to store only one circuit program in its memory. If you want to modify the circuit program or create an additional one without deleting the first, you must archive it somewhere.

You can copy the LOGO! circuit program to a LOGO! Memory Card or LOGO! Combined Memory/Battery card. You can then insert this card in another LOGO! in order to copy the circuit program. This enables you to manage your programs in the following ways:

- Archive circuit programs
- Reproduce circuit programs
- Send circuit programs by mail
- Write and test your circuit program at the office, and then transfer it to a LOGO! in the switching cabinet

LOGO! is supplied with a hood. The LOGO! Memory Card, LOGO! Battery Card and LOGO! Memory/Battery Card are supplied separately.

Note

You do not need a memory card or combined memory/battery card to backup the circuit program in your LOGO!.
The LOGO! circuit program is automatically stored in nonvolatile memory when you exit the programming mode.

The memory card or combined memory/battery card can backup all data in the LOGO! circuit program memory. The order numbers are found in the appendix.
LOGO! memory and battery cards

Compatibility (Old memory cards in newer LOGO! modules)

... to earlier versions (0BA4 and 0BA5 devices):
Data written to the memory card in an 0BA4 or 0BA5 version can be read in all 0BA6 versions.

... to earlier versions (0BA0 to 0BA3 devices):
A memory card that contains data written in earlier versions (0BA0...0BA3 devices) cannot be used in LOGO! devices of the 0BA4 and later generations. When the LOGO! system detects such an 'old' memory card, the message “Unknown Card / Press ESC” is output to the display.
Vice versa, an 0BA4 or later memory card cannot be used in LOGO! devices of the 0BA0...0BA3 family.

Compatibility (New memory cards in LOGO! older modules)
The LOGO! 0BA6 memory card and the 0BA6 combined memory/battery card can be used in 0BA4 or 0BA5 devices to store a circuit program but cannot be used in 0BA0..0BA3 devices. These cards can provide program storage only; they cannot be used to extend the real-time clock backup.
A LOGO! 0BA6 memory card or combined memory/battery card that already has a LOGO! 0BA6 circuit program stored on it cannot be used in any device other than a LOGO! 0BA6 device.

Upward compatibility of circuit programs
Circuit programs written for the previous versions 0BA0...0BA5 can be transferred to 0BA6 units from LOGO!Soft Comfort.
6.1 Security function (CopyProtect)

The security function provides copy protection for circuit programs on memory cards or combined memory/battery cards.

Unprotected memory cards

You can edit circuit programs without restrictions and exchange data between the memory card or combined memory/battery card and the device.

Protected memory cards

A circuit program is protected when it is transferred from a protected program memory card or combined memory/battery card to LOGO!.

To execute this circuit program in LOGO!, the protected card must remain inserted during RUN; that is, the circuit program stored on the card cannot be copied to other LOGO! devices.

Over and above that, a protected circuit program is write-protected.

A circuit program with password protection is no longer protected after the correct password has been entered; that is, you can then edit the program and remove the memory card or combined memory/battery card.

Note

When you create the circuit program for a memory card or combined memory/battery card, you need to assign a password to be able to edit it at a later time (see Chapter 3.7.5).

Correlation between the password and the protective function

<table>
<thead>
<tr>
<th>Password</th>
<th>Protection</th>
<th>Editing</th>
<th>Copying</th>
<th>Deleting</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>Yes, with password</td>
<td>Yes</td>
<td>Yes, with password</td>
</tr>
<tr>
<td>-</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes, with password</td>
<td>Yes, with password</td>
<td>Yes, with password</td>
</tr>
</tbody>
</table>
LOGO! memory and battery cards

Assigning a security function

To assign a circuit program and copy protection function to the memory card or combined memory/battery card, open the programming mode and select "Card".

1. Switch LOGO! to programming mode (ESC / >Stop).
2. Select the 'Card' command: Press ▲ or ▼
3. To apply 'Card': Press OK
4. Move the '>' cursor to 'CopyProtect': Press ▲ or ▼
5. To apply 'CopyProtect': Press OK

LOGO! shows the following display:

```
> No
Yes
CopyProtect: No
```

The current protection setting is shown in the bottom line. This function is disabled by default ("No": disabled).

Enabling the security function

To set the security function:

1. Move the '>' cursor to 'Yes': Press ▲ or ▼
2. Confirm 'Yes': Press OK

LOGO! shows the following display:

```
> No
Yes
CopyProtect: Yes
```

Note

This only generates a circuit program and copy protection for the memory card or combined memory/battery card; the circuit program itself must be copied separately from LOGO! to the memory card or combined memory/battery card. (This copy can be done at power-on. See chapter 6.4).

You can always change the "No" status (security function disabled) to "Yes" (security function enabled).

A status change from "Yes" (security function enabled) to "No" (security function disabled) is only possible if the memory card or combined memory/battery card does not contain a circuit program.
6.2 Inserting and removing the memory card

When you remove a memory card or combined memory/battery card that contains a circuit program with copy protection attributes, note the following: The circuit program stored on the card can only be executed if the card remains inserted during system runtime.

After you have removed the memory card or combined memory/battery card, LOGO! outputs the message ‘No Program’. A removal of the card during RUN will lead to impermissible operating states.

Always heed the following warning:

Warning
Do not touch the open slot of the memory card with your fingers or with a metallic or conductive object.

The memory card socket might be under voltage if the polarity is accidentally reversed at L1 and N.

The memory card or combined memory/battery card must only be removed by qualified personnel.
Removing the memory card or combined memory/battery card

Carefully insert a screwdriver into the groove on the upper end of the memory card or combined memory/battery card and lever the module partially out of the slot.

You can now remove the memory card or combined memory/battery card.

Inserting a memory card or combined memory/battery card

The entry of the memory card and the combined memory/battery card slot is chamfered on its bottom right. The edge of the cards are chamfered accordingly. This encoding prevents you from inserting the memory card or combined memory/battery card the wrong way. Insert the memory card or combined memory/battery card into the slot and push it in until it engages.
6.3 Copying data from LOGO! to the memory card

To copy the circuit program to the memory card or combined memory/battery card:

1. Insert the memory card or combined memory/battery card into the slot.
2. Switch LOGO! to programming mode (ESC / >Stop).

```
>Program..  LOGO! main menu
  Card..
  Setup..
  Start
```

3. The main menu opens. To select the ‘Card’ command: Press ▲ or ▼
4. Press OK. The transfer menu opens.

```
>Card  Card→Card
  CopyProtect
```

5. Move the ‘>’ cursor to ‘LOGO → Card’ (if required): Press ▲ or ▼
6. Press OK.

LOGO! now copies the circuit program to the memory card or combined memory/battery card. (If the memorycard is from an incompatible 0BA0..0BA3 version, LOGO! displays this message: “Unknown Card / Press ESC”.)

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

```
>Program..
  Card..
  Setup..
  Start
```

The circuit program backup is now stored on your memory card or combined memory/battery card and you can remove the card. **Do not forget** to replace the cap.

If power fails while LOGO! is copying the circuit program, repeat the process after Power On.

**Note**

The password of a protected circuit program in LOGO! also applies to the copied program version on your memory card or combined memory/battery card.
6.4 Copying data from the memory card to LOGO!

You can copy a circuit program from a compatible memory card or combined memory/battery card to LOGO! in one of two ways:

- Automatically during the startup of LOGO! (POWER ON)
- By means of the “Card” menu of LOGO!

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

Automatic copying during the startup of LOGO!

Proceed as follows:

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

LOGO! copies the program from the program module/card to LOGO!. (If the memorycard is from an incompatible 0BA0..0BA3 version, LOGO! displays this message: “Unknown Card / Press ESC”.)

When LOGO! has finished copying, it opens the main menu:

```
>Program..
Card..
Setup..
Start
```

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

1. Move the ‘>’ cursor to ‘Start’: Press ▲ or ▼
2. Press OK.
Copying by means of the “Card” menu

For information on the replacement of a memory card or combined memory/battery card, also note Chapter 6.2.
To copy a program from the memory card or combined memory/battery card to LOGO!:

1. Insert the memory card or combined memory/battery card
2. Switch LOGO! to programming mode (ESC / >Stop).

3. Move the '>' cursor to 'Card': Press ▲ or ▼
4. Press OK. The transfer menu opens.
5. Move the '>' cursor to 'Card → LOGO': Press ▲ or ▼

6. Press OK.

LOGO! copies the circuit program from the memory card or combined memory/battery card to LOGO!. (If the memory card is from an incompatible 0BA0..0BA3 version, LOGO! displays this message: “Unknown Card / Press ESC”.)

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

LOGO!Soft Comfort is available as a programming package for the PC. This software provides many features, for example:

- A graphic interface for offline creation of your circuit program by means of Ladder Diagram (contact chart / circuit diagram) or Function Block Diagram (function chart)
- Simulation of your circuit program on the PC
- Generating and printing of an overview chart for the circuit program
- Saving a backup of the circuit program on the hard drive or other media
- Comparing circuit programs
- Easy configuration of blocks
- Transferring the circuit program in both directions:
  - from LOGO! to the PC
  - from the PC to LOGO!
- Reading the values of the hour counter
- Setting the time of day
- Summertime/wintertime conversion
- Online test: Display of status changes and process variables of LOGO! in RUN mode:
  - Status of a digital I/O, flags, shift register bits and cursor keys
  - The values of all analog I/Os and flags
  - The results of all blocks
  - The current values (including the times) of selected blocks
- Starting and stopping circuit program execution via the PC (RUN, STOP)

The LOGO! alternatives

As you can see, LOGO!Soft Comfort represents an alternative to conventional engineering methods, with several advantages:

- You can develop the circuit program on your PC.
- You simulate the circuit program on your computer and verify its functions before you actually implement it in your system.
- You can add comments to the circuit program and create hardcopies.
- You can save a copy of your circuit program to the file system on your PC, to make it directly available for modifications.
- It takes only a few key actions to download the circuit program to LOGO!. 
LOGO! software

LOGO!Soft Comfort


LOGO!Soft Comfort V6.0

This is the current version of LOGO!Soft Comfort. You will find all the functions and the functionality of the devices described in this manual in the version 6.0.

Upgrading LOGO!Soft Comfort versions V1.0 up to V5.0

The upgrade can only be installed for the full version of LOGO!Soft Comfort V1.0, V2.0, V3.0, V4.0 or V5.0.

Order numbers are in Appendix E.

Note

If a full version is not installed, you can carry out an upgrade as follows:

- Install the software from the CD.
- When the system prompts you for the previous version, place the old LOGO!Soft Comfort CD in the CD drive.
- Point your browser to the “...\Tools\Application” directory on the CD.

Updates and info

You can download demo versions of the software free of charge from the Internet address specified in the preface.

For detailed information on updates, upgrades and the LOGO!Soft Comfort Update Center, refer to the LOGO!Soft Comfort online help.
7.1 Connecting LOGO! to a PC

Connecting the PC cable

To connect LOGO! to a PC, you need the LOGO! PC cable (Appendix E lists the order number).

Turn the power off to the LOGO! Basic module. Remove the cap, memory card, or combined memory/battery card from your LOGO! and connect the cable to this socket. Connect the other end of the cable to the serial port of your PC.

Connecting the USB PC cable

You can also connect LOGO! to the PC with the LOGO! USB PC cable (Appendix E lists the order number).

Remove the cap or memory card, battery card, or combined memory/battery card from your LOGO! and connect the cable to this socket. Connect the other end of the cable to a USB port of your PC.

Switching LOGO! to PC->LOGO mode

Switch the LOGO! with/without display to STOP from your PC (refer to the LOGO!Soft Comfort online help), or select the ESC / >Stop command on a device with display and confirm the entry with ‘Yes’.

When LOGO! is in STOP and online with the PC, the following PC commands are accepted:

- Switch LOGO! to RUN
- Read/write the circuit program
- Read/write the summertime/wintertime

When you start the upload/download in STOP, the following display appears automatically:
**LOGO! software**

---

**Note**
You can switch earlier versions up to 0BA3 with/without display to PC↔LOGO mode as follows:

1. Switch off the power supply to LOGO!.
2. Remove the cover or the memory, battery, or combined memory/battery card and connect the cable to this socket.
3. Switch on power.

LOGO! switches automatically to PC ↔ LOGO mode.

The PC can now access LOGO! For information on this function, refer to the LOGO!Soft Comfort Online Help.

For more information on LOGO! versions without display, refer to Appendix C.

---

**Closing the PC↔LOGO mode**

When the data transfer is completed, the connection to the PC is shut down automatically.

---

**Note**
If the circuit program created with LOGO!Soft Comfort is password protected, both the circuit program and the password are downloaded to LOGO!. The password prompt is enabled at the end of the data transfer.

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

LOGO! sample applications are available to all our customers free of charge on the Internet at
http://www.siemens.com/logo

go to Products & Solutions --> Applications --> Application Examples).

The examples provided are not guaranteed to be error-free; they serve as general
information about the fields of application for LOGO!, and may be different from
user-specific solutions. Siemens reserves the right to make changes.

The user operates the system at his own responsibility. For safety concerns, refer
to the relevant national standards and system-related installation regulations.

On the Internet you can find the following sample applications, tips for further
applications, and more:

- Irrigation system for greenhouse plants
- Conveyor control system
- Bending machine control system
- Shop window lighting
- Bell system (e.g. in a school)
- Parking lot surveillance
- Outdoor lighting
- Shutter control system
- Domestic outdoor and indoor lighting system
- Control system of 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 boilers
- Control system for several pump sets with centralized operator control
- Cutting device (e.g. for detonating fuses)
- Monitoring periods of utilization, for example of a solar energy system
Applications

- Intelligent foot switches, for example for speed preselection)
- Elevating platform controls
- Impregnation of textiles, heating and conveyor belt controls
- Silo-filling system
- Fill station with message text on the LOGO! TD that displays the sum of counted objects

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. If you have installed LOGO!Soft Comfort on your computer, you can simply click the disk icon to download the relevant circuit programs, which you can then adapt to suit your application and download to LOGO! directly via the PC cable.

Benefits of LOGO!

LOGO! is a particularly useful feature

- For replacing auxiliary switchgear with the integrated LOGO! functions
- For saving wiring and installation work - because LOGO! keeps the wiring "in its head".
- For reducing space requirements for components in the control cabinet/distribution box. A smaller control cabinet/distribution box may provide sufficient space.
- For adding or changing functions, without having to install additional switchgear or change the wiring.
- For offering your customers new, additional functions for domestic and commercial housing installations. Examples:
  - Domestic security systems: LOGO! switches on a lamp at regular intervals or opens and closes the shutters while you are on holiday.
  - Central heating: LOGO! runs the circulation pump only when water or heating is actually required.
  - Refrigerating systems: LOGO! can defrost refrigerating systems at regular intervals to save energy costs.
  - You can illuminate aquaria and terraria on a time-dependent basis.

Last but not least you can:

- Use commonly available switches and pushbuttons, which makes it easy to install a domestic system.
- Connect LOGO! directly to your domestic installation; the integrated power supply makes it possible.
Do you want more Info?

For more information about LOGO!, see our web page (see the preface for the URL).

Do you have any suggestions?

There are definitely many more useful applications for 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. No matter whether your LOGO! circuit is particularly complex or simple, simply write to us. We shall be delighted to receive all your suggestions.

Write to:

Siemens AG
A&D AS SM MA
PO box 48 48
D-90327 Nuremberg
### A.1 General technical data

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Tested in accordance with</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGO!Basic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td></td>
<td>72 x 90 x 55 mm</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>Approx. 190 g</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td>on a 35 mm profile rail</td>
</tr>
<tr>
<td>LOGO! expansion modules DM8..., AM...</td>
<td></td>
<td>36 x 90 x 53 mm</td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td></td>
<td>Approx. 90 g</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>on a 35 mm profile rail</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td>2 module widths</td>
</tr>
<tr>
<td>LOGO! TD (Text Display)</td>
<td></td>
<td>128.2 x 86 x 38.7 mm</td>
</tr>
<tr>
<td>LOGO! expansion modules DM16...</td>
<td></td>
<td>72 x 90 x 53 mm</td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td></td>
<td>Approx. 190 g</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>on a 35 mm profile rail</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td>4 module widths</td>
</tr>
</tbody>
</table>

#### Climatic conditions

- **Ambient temperature**
  - Horizontal installation: Low temperature to IEC 60068-2-1, High temperature to IEC 60068-2-2
  - Vertical installation: 0 ... 55 °C, 0 ... 55 °C
- **Storage/shipping**: -40 °C ... +70 °C
- **Relative humidity**: 10 to 95 % no condensation
- **Air pressure**: 795 ... 1080 hPa
- **Pollutants**
  - IEC 60068-2-42: SO₂ 10 cm³/m³, 10 days
  - IEC 60068-2-43: H₂S 1 cm³/m³, 10 days

#### Ambient mechanical conditions

- **Degree of protection**
  - IP 20
  - IP 65 for LOGO! TD front panel
### Technical data

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Tested in accordance with</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibrations:</td>
<td>IEC 60068-2-6</td>
<td>5 ... 8.4 Hz (constant amplitude 3.5 mm) 8.4 ... 150 Hz (constant acceleration 1 g)</td>
</tr>
<tr>
<td>Shock</td>
<td>IEC 60068-2-27</td>
<td>18 shocks (half-sine wave 15g/11 ms)</td>
</tr>
<tr>
<td>Free fall (packaged)</td>
<td>IEC 60068-2-32</td>
<td>0.3 m</td>
</tr>
<tr>
<td><strong>Electromagnetic compatibility (EMC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise emission</td>
<td>EN 55011/A EN 55022/B EN 50081-1 (domestic area)</td>
<td>Limit class B group 1</td>
</tr>
<tr>
<td>Electrostatic discharge</td>
<td>IEC 61000-4-2 Severity 3</td>
<td>8 kV air discharge 6 kV contact discharge</td>
</tr>
<tr>
<td>Electromagnetic fields</td>
<td>IEC 61000-4-3</td>
<td>Field strength 1 V/m and 10 V/m</td>
</tr>
<tr>
<td>HF currents on cables and cable shielding</td>
<td>IEC 61000-4-6</td>
<td>10 V</td>
</tr>
<tr>
<td>Burst pulses</td>
<td>IEC 61000-4-4 Severity 3</td>
<td>2 kV (supply and signal lines)</td>
</tr>
<tr>
<td>High-energy surge pulse (applies only to LOGO! 230 ...)</td>
<td>IEC 61000-4-5 Severity 3</td>
<td>1 kV (power lines) symmetrical 2 kV (power lines) asymmetrical</td>
</tr>
<tr>
<td><strong>Safety to IEC / VDE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance and creepage distance rating</td>
<td>IEC 60664, IEC 61131-2, EN 50178 cULus to UL 508, CSA C22.2 No. 142 With LOGO! 230 R/RC, also VDE 0631</td>
<td>Fulfilled</td>
</tr>
<tr>
<td>Insulation strength</td>
<td>IEC 61131-2</td>
<td>Fulfilled</td>
</tr>
<tr>
<td><strong>Cycle time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle time per function</td>
<td></td>
<td>&lt; 0.1 ms</td>
</tr>
<tr>
<td><strong>Startup</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Startup time at power-up</td>
<td></td>
<td>typ. 8 s</td>
</tr>
</tbody>
</table>
### A.2 Technical data: LOGO! 230...

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOGO! 230 RC</th>
<th>LOGO! 230 RCo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>115...240 V AC/DC</td>
<td></td>
</tr>
<tr>
<td><strong>Permissible range</strong></td>
<td>85 ... 265 V AC</td>
<td>100 ... 253 V DC</td>
</tr>
<tr>
<td><strong>Permissible mains frequency</strong></td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 115 V AC</td>
<td>15 ... 40 mA</td>
<td></td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>15 ... 25 mA</td>
<td></td>
</tr>
<tr>
<td>• 115 V DC</td>
<td>10 ... 25 mA</td>
<td></td>
</tr>
<tr>
<td>• 240 V DC</td>
<td>6 ... 15 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage failure buffering</strong></td>
<td>typ. 10 ms</td>
<td>typ. 20 ms</td>
</tr>
<tr>
<td>• 115 V AC/DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 240 V AC/DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power loss at</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 115 V AC</td>
<td>1.7 ... 4.6 W</td>
<td></td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>3.6 ... 6.0 W</td>
<td></td>
</tr>
<tr>
<td>• 115 V DC</td>
<td>1.1 ... 2.9 W</td>
<td></td>
</tr>
<tr>
<td>• 240 V DC</td>
<td>1.4 ... 3.6 W</td>
<td></td>
</tr>
<tr>
<td><strong>Backup of the real-time clock at 25 °C</strong></td>
<td>typ. 80 hours without battery card</td>
<td>typ. 2 years with battery card</td>
</tr>
<tr>
<td><strong>Accuracy of the real-time clock</strong></td>
<td>typ. ± 2 s / day</td>
<td></td>
</tr>
<tr>
<td><strong>Digital inputs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>Input voltage L1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 40 V AC</td>
<td></td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 79 V AC</td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 30 V DC</td>
<td></td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 79 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Input current at</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 0.03 mA</td>
<td></td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 0.08 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Delay time at</strong></td>
<td>typ. 50 ms</td>
<td></td>
</tr>
<tr>
<td>• 0 to 1: 120 V AC</td>
<td>typ. 30 ms</td>
<td></td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>typ. 25 ms</td>
<td></td>
</tr>
<tr>
<td>• 120 V DC</td>
<td>typ. 15 ms</td>
<td></td>
</tr>
<tr>
<td>• 1 to 0: 120 V AC</td>
<td>typ. 65 ms</td>
<td></td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>typ. 105 ms</td>
<td></td>
</tr>
<tr>
<td>• 120 V DC</td>
<td>typ. 95 ms</td>
<td></td>
</tr>
<tr>
<td>• 240 V DC</td>
<td>typ. 125 ms</td>
<td></td>
</tr>
<tr>
<td><strong>Line length (unshielded)</strong></td>
<td>100 m</td>
<td></td>
</tr>
</tbody>
</table>
## Technical data

<table>
<thead>
<tr>
<th>LOGO! 230 RC</th>
<th>LOGO! 230 RCo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital outputs</strong></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
</tr>
<tr>
<td>Output type</td>
<td>Relay outputs</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>In groups of</td>
<td>1</td>
</tr>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
</tr>
<tr>
<td>Continuous current $I_{th}$</td>
<td>max. 10 A per relay</td>
</tr>
<tr>
<td>Surge current</td>
<td>max. 30 A</td>
</tr>
<tr>
<td>Incandescent lamp load (25000 switching cycles) at</td>
<td></td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>1000 W</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>500 W</td>
</tr>
<tr>
<td>Fluorescent tubes with ballast (25000 switching cycles)</td>
<td>10 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Fluorescent tubes, conventionally compensated (25000 switching cycles)</td>
<td>1 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching cycles)</td>
<td>10 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Short circuit-proof cos 1</td>
<td>Power protection B16, 600A</td>
</tr>
<tr>
<td>Short circuit-proof cos 0.5 to 0.7</td>
<td>Power protection B16, 900A</td>
</tr>
<tr>
<td>Derating</td>
<td>none; across the entire temperature range</td>
</tr>
<tr>
<td>Parallel output circuits for power increase</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td>max. 16 A, characteristic B16</td>
</tr>
</tbody>
</table>

## Switching rate

| Mechanical | 10 Hz |
| Ohmic load/lamp load | 2 Hz |
| Inductive load | 0.5 Hz |

Notice: For fluorescent lamps with capacitors, the technical data of fluorescent lamp ballasts must also be considered. If the maximum allowed surge current is exceeded, fluorescent lamps must be switched with appropriate contactor relays.

The data was determined with the following devices:
- Siemens fluorescent tubes 58W VVG 5LZ 583 3–1 uncompensated.
- Siemens fluorescent tubes 58W VVG 5LZ 583 3–1 parallel compensated with 7μF.
- Siemens fluorescent tubes 58W VVG 5LZ 501 1–1N with ballast.
### A.3 Technical data: LOGO! DM8 230R and LOGO! DM16 230R

<table>
<thead>
<tr>
<th></th>
<th>LOGO! DM8 230R</th>
<th>LOGO! DM16 230R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>115...240 V AC/DC</td>
<td>115 ... 240 V AC/DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>85 ... 265 V AC</td>
<td>85 ... 265 V AC</td>
</tr>
<tr>
<td></td>
<td>100 ... 253 V DC</td>
<td>100 ... 253 V DC</td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td>47 ... 63 Hz</td>
<td>47 ... 63 Hz</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 115 V AC</td>
<td>10 ... 30 mA</td>
<td>10 ... 60 mA</td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>10 ... 20 mA</td>
<td>10 ... 40 mA</td>
</tr>
<tr>
<td>• 115 V DC</td>
<td>5 ... 15 mA</td>
<td>5 ... 25 mA</td>
</tr>
<tr>
<td>• 240 V DC</td>
<td>5 ... 10 mA</td>
<td>5 ... 20 mA</td>
</tr>
<tr>
<td><strong>Voltage failure buffering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 115 V AC/DC</td>
<td>typ. 10 ms</td>
<td>typ. 10 ms</td>
</tr>
<tr>
<td>• 240 V AC/DC</td>
<td>typ. 20 ms</td>
<td>typ. 20 ms</td>
</tr>
<tr>
<td><strong>Power loss at</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 115 V AC</td>
<td>1.1 ... 3.5 W</td>
<td>1.1 ... 4.5 W</td>
</tr>
<tr>
<td>• 240 V AC</td>
<td>2.4 ... 4.8 W</td>
<td>2.4 ... 5.5 W</td>
</tr>
<tr>
<td>• 115 V DC</td>
<td>0.5 ... 1.8 W</td>
<td>0.6 ... 2.9 W</td>
</tr>
<tr>
<td>• 240 V DC</td>
<td>1.2 ... 2.4 W</td>
<td>1.2 ... 4.8 W</td>
</tr>
<tr>
<td><strong>Backup of the real-time clock at 25 °C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accuracy of the real-time clock</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digital inputs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Input voltage L1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 40 V AC</td>
<td>&lt; 40 V AC</td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 79 V AC</td>
<td>&gt; 79 V AC</td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 30 V DC</td>
<td>&lt; 30 V DC</td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 79 V DC</td>
<td>&gt; 79 V DC</td>
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<tr>
<td><strong>Input current at</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 0.03 mA</td>
<td>&lt; 0.05 mA</td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 0.08 mA</td>
<td>&gt; 0.08 mA</td>
</tr>
<tr>
<td><strong>Delay time at</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0 to 1: 120 V AC</td>
<td>typ. 50 ms</td>
<td>typ. 50 ms</td>
</tr>
<tr>
<td>: 240 V AC</td>
<td>typ. 30 ms</td>
<td>typ. 30 ms</td>
</tr>
<tr>
<td>: 120 V DC</td>
<td>typ. 25 ms</td>
<td>typ. 25 ms</td>
</tr>
<tr>
<td>: 240 V DC</td>
<td>typ. 15 ms</td>
<td>typ. 15 ms</td>
</tr>
<tr>
<td>• 1 to 0: 120 V AC</td>
<td>typ. 65 ms</td>
<td>typ. 65 ms</td>
</tr>
<tr>
<td>: 240 V AC</td>
<td>typ. 105 ms</td>
<td>typ. 105 ms</td>
</tr>
<tr>
<td>: 120 V DC</td>
<td>typ. 95 ms</td>
<td>typ. 95 ms</td>
</tr>
<tr>
<td>: 240 V DC</td>
<td>typ. 125 ms</td>
<td>typ. 125 ms</td>
</tr>
<tr>
<td><strong>Line length (unshielded)</strong></td>
<td>100 m</td>
<td>100 m</td>
</tr>
</tbody>
</table>
### Technical data

<table>
<thead>
<tr>
<th>LOGO! DM8 230R</th>
<th>LOGO! DM16 230R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital outputs</strong></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
</tr>
<tr>
<td>Output type</td>
<td>Relay outputs</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>In groups of</td>
<td>1</td>
</tr>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
</tr>
<tr>
<td>Continuous current $I_{th}$</td>
<td>max. 5 A per relay</td>
</tr>
<tr>
<td>Surge current</td>
<td>max. 30 A</td>
</tr>
<tr>
<td>Incandescent lamp load (25000 switching cycles) at</td>
<td></td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>1000 W</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>500 W</td>
</tr>
<tr>
<td>Fluorescent tubes with ballast (25000 switching cycles)</td>
<td>10 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Fluorescent tubes, conventionally compensated (25000 switching cycles)</td>
<td>1 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching cycles)</td>
<td>10 x 58 W (at 230/240 V AC)</td>
</tr>
<tr>
<td>Short circuit-proof cos 1</td>
<td>Power protection B16, 600A</td>
</tr>
<tr>
<td>Short circuit-proof cos 0.5 to 0.7</td>
<td>Power protection B16, 900A</td>
</tr>
<tr>
<td>Derating</td>
<td>none; across the entire temperature range</td>
</tr>
<tr>
<td>Parallel output circuits for power increase</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td>max. 16 A, characteristic B16</td>
</tr>
</tbody>
</table>

#### Switching rate

| Mechanical | 10 Hz | 10 Hz |
| Ohmic load/lamp load | 2 Hz | 2 Hz |
| Inductive load | 0.5 Hz | 0.5 Hz |

Notice: For fluorescent lamps with capacitors, the technical data of fluorescent lamp ballasts must also be considered. If the maximum allowed surge current is exceeded, fluorescent lamps must be switched with appropriate contactor relays.

The data was determined with the following devices:
- Siemens fluorescent tubes 58W VVG 5LZ 583 3–1 uncompensated.
- Siemens fluorescent tubes 58W VVG 5LZ 583 3–1 parallel compensated with 7µF.
- Siemens fluorescent tubes 58W VVG 5LZ 501 1–1N with ballast.
## A.4 Technical data: LOGO! 24...

<table>
<thead>
<tr>
<th><strong>Power supply</strong></th>
<th>LOGO! 24</th>
<th>LOGO! 24o</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>24 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Permissible range</strong></td>
<td>20.4 ... 28.8 V DC</td>
<td></td>
</tr>
<tr>
<td><strong>Reverse polarity protection</strong></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Permissible mains frequency</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption from 24 V DC</strong></td>
<td>40 ... 75 mA</td>
<td>0.3 A per output</td>
</tr>
<tr>
<td><strong>Voltage failure buffering</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power loss at 24 V</strong></td>
<td>1.0 ... 1.8 W</td>
<td></td>
</tr>
<tr>
<td><strong>Backup of the real-time clock at 25 °C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accuracy of the real-time clock</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Digital inputs

| **Number** | 8 |
| **Electrical isolation** | No |

#### Input voltage

- **Signal 0**: < 5 V DC
- **Signal 1**: > 12 V DC

#### Input current at

- **Signal 0**: < 0.85 mA (I3...I6) < 0.05 mA (I1, I2, I7, I8)
- **Signal 1**: > 2 mA (I3...I6) > 0.15 mA (I1, I2, I7, I8)

#### Delay time at

- **0 to 1**: typ. 1.5 ms <1.0 ms (I3 ... I6)
- **1 to 0**: typ. 1.5 ms <1.0 ms (I3 ... I6)

#### Line length (unshielded)

- 100 m

### Analog inputs

| **Number** | 4 (I1=AI3, I2=AI4, I7=AI1, I8=AI2) |
| **Range** | 0 ... 10 V DC |
| **Cycle time for analog value generation** | 300 ms |
| **max. input voltage** | 28.8 V |
| **Line length (shielded and twisted)** | 10 m |

#### Error limit

- +/- 1.5%

### Digital outputs

| **Number** | 4 |
# Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>LOGO! 24</th>
<th>LOGO! 24o</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type</td>
<td>Transistor, current-sourcing (1)</td>
<td></td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>In groups of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td>△ Supply voltage</td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td>max. 0.3 A</td>
<td></td>
</tr>
<tr>
<td>Continuous current $I_{th}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incandescent lamp load (25000 switching cycles) at</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes with ballast (25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes, conventionally compensated (25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof and overload-proof</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Short circuit current limitation</td>
<td>Approx. 1 A</td>
<td></td>
</tr>
<tr>
<td>Derating</td>
<td>none; across the entire temperature range</td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof $\cos 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof $0.5$ to $0.7$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel output circuit for power increase</td>
<td>Not permitted</td>
<td></td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Switching rate</strong> (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>10 Hz</td>
<td></td>
</tr>
<tr>
<td>Ohmic load/lamp load</td>
<td>10 Hz</td>
<td></td>
</tr>
<tr>
<td>Inductive load</td>
<td>0.5 Hz</td>
<td></td>
</tr>
</tbody>
</table>

(1): When LOGO! 24, LOGO! 24o, LOGO! DM8 24 or LOGO! DM16 24 are switched on, signal 1 is sent to the digital outputs for about 50 microseconds. Take this into account, especially when using devices that react to short pulses.
(2): The maximum switching rate is only dependent on the switching program’s cycle time.
## A.5 Technical data: LOGO! DM8 24 and LOGO! DM16 24

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOGO! DM8 24</th>
<th>LOGO! DM16 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>24 V DC</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>20.4 ... 28.8 V DC</td>
<td>20.4 ... 28.8 V DC</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption from 24 V DC</td>
<td>30 ... 45 mA</td>
<td>30 ... 45 mA</td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power loss at 24 V</td>
<td>0.8 ... 1.1 W</td>
<td>0.8 ... 1.7 W</td>
</tr>
<tr>
<td>Backup of the real-time clock at 25 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy of the real-time clock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Digital inputs

<table>
<thead>
<tr>
<th>Number</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Input voltage**

- **Signal 0**: < 5 V DC
- **Signal 1**: > 12 V DC

**Input current at**

- **Signal 0**: < 0.85 mA
- **Signal 1**: > 2 mA

**Delay time at**

- **0 to 1**: typ. 1.5 ms
- **1 to 0**: typ. 1.5 ms

**Line length (unshielded)**

- 100 m

### Digital outputs

<table>
<thead>
<tr>
<th>Number</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type</td>
<td>Transistor, current-sourcing (1)</td>
<td>Transistor, current-sourcing (1)</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>In groups of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Output voltage**

- Supply voltage

**Output current**

- max. 0.3 A

**Continuous current $I_{th}$**

**Incandescent lamp load (25000 switching cycles) at**

**Fluorescent tubes with ballast (25000 switching cycles)**

---

(1): With hold function
### Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>LOGO! DM8 24</th>
<th>LOGO! DM16 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescent tubes, conventionally compensated (25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof and overload-proof</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Short circuit current limitation</td>
<td>Approx. 1 A</td>
<td>Approx. 1 A</td>
</tr>
<tr>
<td>Derating</td>
<td>none; across the entire temperature range</td>
<td>none; across the entire temperature range</td>
</tr>
<tr>
<td>Short circuit-proof cos 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof cos 0.5 to 0.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel output circuit for power increase</td>
<td>Not permitted</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>10 Hz</td>
<td>10 Hz</td>
</tr>
<tr>
<td>Ohmic load/lamp load</td>
<td>10 Hz</td>
<td>10 Hz</td>
</tr>
<tr>
<td>Inductive load</td>
<td>0.5 Hz</td>
<td>0.5 Hz</td>
</tr>
</tbody>
</table>

(1): When LOGO! 24, LOGO! 24o, LOGO! DM8 24 or LOGO! DM16 24 are switched on, signal 1 is sent to the digital outputs for about 50 microseconds. Take this into account, especially when using devices that react to short pulses.
## A.6 Technical data: LOGO! 24RC...

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOGO! 24RC</th>
<th>LOGO! 24RCo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>24 V AC/DC</td>
<td></td>
</tr>
<tr>
<td><strong>Permissible range</strong></td>
<td>20.4 ... 26.4 V AC</td>
<td>20.4 ... 28.8 V DC</td>
</tr>
<tr>
<td><strong>Reverse polarity protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Permissible mains frequency</strong></td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 24 V AC</td>
<td>45 ... 130 mA</td>
<td></td>
</tr>
<tr>
<td>• 24 V DC</td>
<td>40 ... 100 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage failure buffering</strong></td>
<td>typ. 5 ms</td>
<td></td>
</tr>
<tr>
<td><strong>Power loss</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 24 V AC</td>
<td>1.1 ... 3.1 W</td>
<td></td>
</tr>
<tr>
<td>• 24 V DC</td>
<td>1.0 ... 2.3 W</td>
<td></td>
</tr>
<tr>
<td><strong>Backup of the real-time clock at 25 °C</strong></td>
<td>typ. 80 hours without battery card</td>
<td>typ. 2 years with battery card</td>
</tr>
<tr>
<td><strong>Accuracy of the real-time clock</strong></td>
<td>typ. ±2 s / day</td>
<td></td>
</tr>
</tbody>
</table>

### Digital inputs

<table>
<thead>
<tr>
<th>Number</th>
<th>8, optional P action or N action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
<td>L</td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 5 V AC/DC</td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 12 V AC/DC</td>
</tr>
<tr>
<td><strong>Input current at</strong></td>
<td>&lt; 1.0 mA</td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&gt; 2.5 mA</td>
</tr>
<tr>
<td><strong>Delay time at</strong></td>
<td>typ. 1.5 ms</td>
</tr>
<tr>
<td>• 0 to 1</td>
<td>typ. 15 ms</td>
</tr>
<tr>
<td>• 1 to 0</td>
<td></td>
</tr>
<tr>
<td><strong>Line length (unshielded)</strong></td>
<td>100 m</td>
</tr>
<tr>
<td><strong>Analog inputs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td></td>
</tr>
<tr>
<td><strong>max. Input voltage</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Digital outputs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Output type</strong></td>
<td>Relay outputs</td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>In groups of</strong></td>
<td>1</td>
</tr>
</tbody>
</table>
### Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>LOGO! 24RC</th>
<th>LOGO! 24RCo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous current $I_{th}$</td>
<td>max. 10 A per relay</td>
<td></td>
</tr>
<tr>
<td>Surge current</td>
<td>max. 30 A</td>
<td></td>
</tr>
<tr>
<td>Incandescent lamp load (25000 switching cycles)</td>
<td>1000 W</td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes with ballast (25000 switching</td>
<td>$10 \times 58$ W</td>
<td></td>
</tr>
<tr>
<td>cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes, conventionally compensated</td>
<td>$1 \times 58$ W</td>
<td></td>
</tr>
<tr>
<td>(25000 switching cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching</td>
<td>$10 \times 58$ W</td>
<td></td>
</tr>
<tr>
<td>cycles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>overload-proof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit current limitation</td>
<td>none; across the entire</td>
<td></td>
</tr>
<tr>
<td>temperature range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof cos 1</td>
<td>Power protection B16, 600A</td>
<td></td>
</tr>
<tr>
<td>Short circuit-proof cos 0.5 to 0.7</td>
<td>Power protection B16, 900A</td>
<td></td>
</tr>
<tr>
<td>Parallel output circuits for power increase</td>
<td>Not permitted</td>
<td></td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td>max. 16 A, characteristic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B16</td>
<td></td>
</tr>
<tr>
<td><strong>Switching rate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>10 Hz</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohmic load/lamp load</td>
<td>2 Hz</td>
<td></td>
</tr>
<tr>
<td>Inductive load</td>
<td>0.5 Hz</td>
<td></td>
</tr>
</tbody>
</table>

Notice: For fluorescent lamps with capacitors, the technical data of fluorescent lamp ballasts must also be considered. If the maximum allowed surge current is exceeded, fluorescent lamps must be switched with appropriate contactor relays.

The data was determined with the following devices:
- Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 uncompensated.
- Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 parallel compensated with 7μF.
- Siemens fluorescent tubes 58W VVG 5LZ 501 1-1N with ballast.
### A.7 Technical data: LOGO! DM8 24 R and LOGO! DM16 24 R

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOGO! DM8 24 R</th>
<th>LOGO! DM16 24 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>24 V AC/DC</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>20.4 ... 26.4 V AC</td>
<td>20.4 ... 28.8 V DC</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 24 V AC</td>
<td>40 ... 110 mA</td>
<td>30 ... 90 mA</td>
</tr>
<tr>
<td>- 24 V DC</td>
<td>20 ... 75 mA</td>
<td></td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>typ. 5 ms</td>
<td>typ. 5 ms</td>
</tr>
<tr>
<td>Power loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 24 V AC</td>
<td>0.9 ... 2.7 W</td>
<td></td>
</tr>
<tr>
<td>- 24 V DC</td>
<td>0.4 ... 1.8 W</td>
<td>0.7 ... 2.5 W</td>
</tr>
<tr>
<td>Backup of the real-time clock at 25 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy of the real-time clock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Digital inputs

<table>
<thead>
<tr>
<th>Number</th>
<th>4, optional P action or N action</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Input voltage</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>- Signal 0</td>
<td>&lt; 5 V AC/DC</td>
<td>&lt; 5 V DC</td>
</tr>
<tr>
<td>- Signal 1</td>
<td>&gt; 12 V AC/DC</td>
<td>&gt; 12 V DC</td>
</tr>
<tr>
<td>Input current at</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Signal 0</td>
<td>&lt; 1.0 mA</td>
<td>&lt; 1.0 mA</td>
</tr>
<tr>
<td>- Signal 1</td>
<td>&gt; 2.5 mA</td>
<td>&gt; 2.0 mA</td>
</tr>
<tr>
<td>Delay time at</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 0 to 1</td>
<td>typ. 1.5 ms</td>
<td>typ. 1.5 ms</td>
</tr>
<tr>
<td>- 1 to 0</td>
<td>typ. 15 ms</td>
<td>typ. 15 ms</td>
</tr>
<tr>
<td>Line length (unshielded)</td>
<td>100 m</td>
<td>100 m</td>
</tr>
</tbody>
</table>

### Digital outputs

<table>
<thead>
<tr>
<th>Number</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type</td>
<td>Relay outputs</td>
<td>Relay outputs</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>In groups of</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Control of a digital input</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Output voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous current $I_{th}$</td>
<td>max. 5 A per relay</td>
<td>max. 5 A per relay</td>
</tr>
<tr>
<td>Surge current</td>
<td>max. 30 A</td>
<td>max. 30 A</td>
</tr>
</tbody>
</table>

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## Technical data

<table>
<thead>
<tr>
<th></th>
<th>LOGO! DM8 24 R</th>
<th>LOGO! DM16 24R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent lamp load (25000 switching cycles) at</td>
<td>1000 W</td>
<td>1000 W</td>
</tr>
<tr>
<td>Fluorescent tubes with ballast (25000 switching cycles)</td>
<td>10 x 58 W</td>
<td>10 x 58 W</td>
</tr>
<tr>
<td>Fluorescent tubes, conventionally compensated (25000 switching cycles)</td>
<td>1 x 58 W</td>
<td>1 x 58 W</td>
</tr>
<tr>
<td>Fluorescent tubes, uncompensated (25000 switching cycles)</td>
<td>10 x 58 W</td>
<td>10 x 58 W</td>
</tr>
<tr>
<td>Short circuit-proof and overload-proof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit current limitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Derating</td>
<td>none; across the entire temperature range</td>
<td>none; across the entire temperature range</td>
</tr>
<tr>
<td>Short circuit-proof cos 1</td>
<td>Power protection B16, 600A</td>
<td>Power protection B16, 600A</td>
</tr>
<tr>
<td>Short circuit-proof cos 0.5 to 0.7</td>
<td>Power protection B16, 900A</td>
<td>Power protection B16, 900A</td>
</tr>
<tr>
<td>Parallel output circuits for power increase</td>
<td>Not permitted</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Protection of output relay (if desired)</td>
<td>max. 16 A, characteristic B16</td>
<td>max. 16 A, characteristic B16</td>
</tr>
</tbody>
</table>

### Switching rate

<table>
<thead>
<tr>
<th></th>
<th>Mechanical</th>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohmic load/lamp load</td>
<td>2 Hz</td>
<td>2 Hz</td>
</tr>
<tr>
<td>Inductive load</td>
<td>0.5 Hz</td>
<td>0.5 Hz</td>
</tr>
</tbody>
</table>

Notice: For fluorescent lamps with capacitors, the technical data of fluorescent lamp ballasts must also be considered. If the maximum allowed surge current is exceeded, fluorescent lamps must be switched with appropriate contactor relays.

The data was determined with the following devices:
Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 uncompensated.
Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 parallel compensated with 7μF.
Siemens fluorescent tubes 58W VVG 5LZ 501 1-1N with ballast.
## A.8 Technical data: LOGO! 12/24... and LOGO! DM8 12/24R

<table>
<thead>
<tr>
<th></th>
<th>LOGO! 12/24RC</th>
<th>LOGO! 12/24RCo</th>
<th>LOGO! DM8 12/24R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>12/24 V DC</td>
<td>12/24 V DC</td>
<td></td>
</tr>
<tr>
<td>Permissible range</td>
<td>10.8 ... 28.8 V DC</td>
<td>10.8 ... 28.8 V DC</td>
<td></td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>60 ... 175 mA</td>
<td>40 ... 100mA</td>
<td>30 ... 140 mA</td>
</tr>
<tr>
<td>• 12 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>typ. 2 ms</td>
<td>typ. 5 ms</td>
<td>typ. 2 ms</td>
</tr>
<tr>
<td>• 12 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power loss</td>
<td>0.7 ... 2.1 W</td>
<td>1.0 ... 2.4 W</td>
<td>0.3 ... 1.7 W</td>
</tr>
<tr>
<td>• 12 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backup of the real-time clock at 25 °C</td>
<td>typ. 80 hours without battery card</td>
<td>typ. 2 years with battery card</td>
<td></td>
</tr>
<tr>
<td>Accuracy of the real-time clock</td>
<td>typ. ±2 s / day</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>Digital inputs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>8</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Input voltage L+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 5 V DC</td>
<td>&lt; 5 V DC</td>
<td></td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 8.5 V DC</td>
<td>&gt; 8.5 V DC</td>
<td></td>
</tr>
<tr>
<td>Input current at</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Signal 0</td>
<td>&lt; 0.85 mA (I3...I6)</td>
<td>&lt; 0.05 mA (I1, I2, I7, I8)</td>
<td>&lt; 0.85 mA</td>
</tr>
<tr>
<td>• Signal 1</td>
<td>&gt; 1.5 mA (I3...I6)</td>
<td>&gt; 0.1 mA (I1, I2, I7, I8)</td>
<td>&gt; 1.5 mA</td>
</tr>
<tr>
<td>Delay time at</td>
<td>typ. 1.5 ms</td>
<td>&lt;1.0 ms (I3 ... I6)</td>
<td>typ. 1.5 ms</td>
</tr>
<tr>
<td>• 0 to 1</td>
<td></td>
<td>typ. 1.5 ms</td>
<td></td>
</tr>
<tr>
<td>• 1 to 0</td>
<td></td>
<td>&lt;1.0 ms (I3 ... I6)</td>
<td>typ. 1.5 ms</td>
</tr>
<tr>
<td>Line length (unshielded)</td>
<td>100 m</td>
<td>100 m</td>
<td></td>
</tr>
<tr>
<td><strong>Analog inputs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>4 (I1=AI3, I2=AI4, I7=AI1, I8=AI2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0 ... 10 V DC</td>
<td>input impedance 72 kΩ</td>
<td></td>
</tr>
<tr>
<td>Cycle time for analog value generation</td>
<td>300 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>max. Input voltage</td>
<td>28.8 V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line length (shielded and twisted)</td>
<td>10 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error limit</td>
<td>+/- 1.5 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Technical data

<table>
<thead>
<tr>
<th>LOGO! 12/24RC</th>
<th>LOGO! DM8 12/24R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital outputs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Number</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Output type</strong></td>
<td>Relay outputs</td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>In groups of</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Control of a digital input</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Output voltage</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Output current</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Continuous current (I_{th}) (per terminal)</strong></td>
<td>max. 10 A per relay</td>
</tr>
<tr>
<td><strong>Surge current</strong></td>
<td>max. 30 A</td>
</tr>
<tr>
<td><strong>Incandescent lamp load (25000 switching cycles) at</strong></td>
<td>1000 W</td>
</tr>
<tr>
<td><strong>Fluorescent tubes with ballast (25000 switching cycles)</strong></td>
<td>10 x 58 W</td>
</tr>
<tr>
<td><strong>Fluorescent tubes, conventionally compensated (25000 switching cycles)</strong></td>
<td>1 x 58 W</td>
</tr>
<tr>
<td><strong>Fluorescent tubes, uncompensated (25000 switching cycles)</strong></td>
<td>10 x 58 W</td>
</tr>
<tr>
<td><strong>Short circuit-proof and overload-proof</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Derating</strong></td>
<td>none; across the entire temperature range</td>
</tr>
<tr>
<td><strong>Short circuit-proof (\cos 1)</strong></td>
<td>Power protection B16, 600A</td>
</tr>
<tr>
<td><strong>Short circuit-proof (\cos 0.5) to 0.7</strong></td>
<td>Power protection B16, 900A</td>
</tr>
<tr>
<td><strong>Parallel output circuits for power increase</strong></td>
<td>Not permitted</td>
</tr>
<tr>
<td><strong>Protection of output relay (if desired)</strong></td>
<td>max. 16 A, characteristic B16</td>
</tr>
<tr>
<td><strong>Switching rate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td>10 Hz</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ohmic load/lamp load</strong></td>
<td>2 Hz</td>
</tr>
<tr>
<td><strong>Inductive load</strong></td>
<td>0.5 Hz</td>
</tr>
</tbody>
</table>

Notice: For fluorescent lamps with capacitors, the technical data of fluorescent lamp ballasts must also be considered. If the maximum allowed surge current is exceeded, fluorescent lamps must be switched with appropriate contactor relays.

The data was determined with the following devices:
- Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 uncompensated.
- Siemens fluorescent tubes 58W VVG 5LZ 583 3-1 parallel compensated with 7 \(\mu\)F.
- Siemens fluorescent tubes 58W VVG 5LZ 501 1-1N with ballast.
A.9 Switching capacity and service life of the relay outputs

Switching capacity and service life of the contents with ohmic load (heating):

- **Switching cycles/million**
- **Switched current/A**
  - 0.1
  - 0.2
  - 0.3
  - 0.4
  - 0.5

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Maximum Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/24 V AC/DC</td>
<td>10 A</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>10 A</td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>10 A</td>
</tr>
<tr>
<td>120 V DC</td>
<td>0.2 A</td>
</tr>
<tr>
<td>240 V DC</td>
<td>0.1 A</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>10 A</td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>10 A</td>
</tr>
<tr>
<td>120 V DC</td>
<td>0.2 A</td>
</tr>
<tr>
<td>240 V DC</td>
<td>0.2 A</td>
</tr>
</tbody>
</table>

Switching capacity and service life of the contacts with high inductive load to IEC 947–5–1 DC 13/AC 15 (contractors, solenoid coils, motors)

- **Switching cycles/million**
- **Switched current/A**
  - 0.1
  - 0.2
  - 0.3
  - 0.4
  - 0.5

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Maximum Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/24 V AC/DC</td>
<td>2 A</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>3 A</td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>3 A</td>
</tr>
<tr>
<td>120 V DC</td>
<td>0.2 A</td>
</tr>
<tr>
<td>240 V DC</td>
<td>0.1 A</td>
</tr>
<tr>
<td>115/120 V AC</td>
<td>3 A</td>
</tr>
<tr>
<td>230/240 V AC</td>
<td>3 A</td>
</tr>
<tr>
<td>120 V DC</td>
<td>0.2 A</td>
</tr>
<tr>
<td>240 V DC</td>
<td>0.2 A</td>
</tr>
</tbody>
</table>
## A.10 Technical data: LOGO! AM 2

<table>
<thead>
<tr>
<th></th>
<th>LOGO! AM 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td>12/24 V DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>10.8 ... 28.8 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>25 ... 50 mA</td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>typ. 5 ms</td>
</tr>
<tr>
<td>Power loss at</td>
<td></td>
</tr>
<tr>
<td>12 V</td>
<td>0.3 ... 0.6 W</td>
</tr>
<tr>
<td>24 V</td>
<td>0.6 ... 1.2 W</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Ground terminal</td>
<td>for connecting ground and shielding of the analog measuring line</td>
</tr>
</tbody>
</table>

**Analog inputs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>2</td>
</tr>
<tr>
<td>Type</td>
<td>Unipolar</td>
</tr>
<tr>
<td>Input range</td>
<td>0 ... 10 V DC (input impedance 76 kΩ) or 0 ... 20 mA (input impedance &lt;250 Ω)</td>
</tr>
<tr>
<td>Resolution</td>
<td>10 bit, normalized to 0 ... 1000</td>
</tr>
<tr>
<td>Cycle time for analog value generation</td>
<td>50 ms</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
</tr>
<tr>
<td>Line length (shielded and twisted)</td>
<td>10 m</td>
</tr>
<tr>
<td>Encoder supply voltage</td>
<td>none</td>
</tr>
<tr>
<td>Error limit</td>
<td>+/- 1.5 %</td>
</tr>
<tr>
<td>Interference frequency suppression</td>
<td>55 Hz</td>
</tr>
</tbody>
</table>
A.11  Technical data: LOGO! AM 2 PT100

<table>
<thead>
<tr>
<th><strong>Power supply</strong></th>
<th>LOGO! AM 2 PT100</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>12/24 V DC</td>
</tr>
<tr>
<td><strong>Permissible range</strong></td>
<td>10.8 ... 28.8 V DC</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>25 ... 50 mA</td>
</tr>
<tr>
<td><strong>Voltage failure buffering</strong></td>
<td>typ. 5 ms</td>
</tr>
<tr>
<td><strong>Power loss at</strong></td>
<td></td>
</tr>
<tr>
<td>12 V</td>
<td>0.3 ... 0.6 W</td>
</tr>
<tr>
<td>24 V</td>
<td>0.6 ... 1.2 W</td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Reverse polarity protection</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Ground terminal</strong></td>
<td>for connecting ground and shielding of the measuring line</td>
</tr>
</tbody>
</table>

**Sensor inputs**

| **Number** | 2 |
| **Type** | RTD Pt100 |
| **Connection of sensors** |               |
| 2-wire technique | Yes |
| 3-wire technique | Yes |
| **Measurement range** | -50 °C... +200 °C |
|                     | -58 °F ... +392 °F |
| **Settings for the measurement display on the basic module:** |                 |
| 1 °C steps          | Offset: -200, Gain: 25 |
| 0.25 °C steps       | Offset: -200, Gain: 250 |
| (rounded to one decimal) | Offset: -128, Gain: 45 |
| 1 °C steps          | Offset: -128, Gain: 450 |
| 0.25 °C steps       |                         |
| (rounded to one decimal) |                         |
| **Curve linearization** | No                   |
| **Measuring current Ic** | 1.1 mA              |
| **Measurement rate** | depends on the installation typical: 50 ms |
| **Resolution** | 0.25 °C |
| **Error limits** | of the final measured value: |
| 0 °C ... +200 °C    | +/- 1.0 %          |
| -50 °C ... +200 °C  | +/- 1.5 %          |
| **Electrical isolation** | No                   |
| **Cable length (shielded)** | 10 m                |
| **Interference frequency suppression** | 55 Hz                |
### A.12 Technical data: LOGO! AM 2 AQ

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOGO! AM 2 AQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>20.4 ... 28.8 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>65 ... 90 mA</td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>typ. 5 ms</td>
</tr>
<tr>
<td>Power loss at 24 V</td>
<td>1.6 ... 2.2 W</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>No</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Ground terminal</td>
<td>for connecting ground and shielding of the analog output line.</td>
</tr>
</tbody>
</table>

### Analog outputs

| Number | 2 |
| Voltage range | 0 ... 10 V DC |
| Voltage load | >=5 kΩ |
| Current output | 0/4...20mA |
| Current load | <=500Ω |
| Resolution | 10 bit, normalized to 0 ... 1000 |
| Cycle time for analog output | depending on installation (50 ms) |
| Electrical isolation | No |
| Line length (shielded and twisted) | 10 m |
| Error limit | +/- 2.5 % |
| Short circuit protection | Yes |
| Response at short-circuit | affected output = 0 V |
| Overload protection | Yes |
| Response at overload | affected output = 0 V |

neighboring output reverts
## A.13 Technical data: CM EIB/KNX

<table>
<thead>
<tr>
<th>Mechanical data</th>
<th>CM EIB/KNX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (WxHxD)</td>
<td>36 x 90 x 55 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 107 g</td>
</tr>
<tr>
<td>Installation</td>
<td>on a 35 mm profile rail, 2 module widths, or wall mounting must be mounted as the last module on the right of LOGO!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>24 V AC/DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>-15% ... +10% AC / -15% ... +20% DC</td>
</tr>
<tr>
<td>Power consumption from power supply</td>
<td>max. 25 mA</td>
</tr>
<tr>
<td>Power consumption via bus</td>
<td>5 mA</td>
</tr>
<tr>
<td>EIB data transmission rate</td>
<td>9600 baud</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connections</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs (I)</td>
<td>virtual max. 16</td>
</tr>
<tr>
<td>Digital outputs (Q)</td>
<td>virtual max. 12</td>
</tr>
<tr>
<td>Analog inputs (AI)</td>
<td>virtual max. 8</td>
</tr>
<tr>
<td>Analog outputs (AQ)</td>
<td>virtual max. 2</td>
</tr>
<tr>
<td>Group addresses</td>
<td>max. 56</td>
</tr>
<tr>
<td>Associations</td>
<td>max. 56</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Climatic conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Climatic withstand capability</td>
<td>EN 50090-2-2</td>
</tr>
<tr>
<td>Ambient operating conditions</td>
<td>0 ... 55 °C natural convection</td>
</tr>
<tr>
<td>Storage and transport temperature</td>
<td>-40 °C ... +70 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>95 % at +25 °C (not condensing)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical safety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of protection</td>
<td>IP 20 (in accordance with EN 60529)</td>
</tr>
<tr>
<td>Interference suppression</td>
<td>EN 55011 (limit class B)</td>
</tr>
<tr>
<td>Certification</td>
<td>VDE 0631 / IEC 61131-2</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>Slow-blowing fuse 80 mA (recommended)</td>
</tr>
</tbody>
</table>

**Electromagnetic compatibility (EMC)**

| EMC requirements | Complies with EN 61000-6-1 and EN 61000-6-2 |

**Approval**

<table>
<thead>
<tr>
<th>KNX/EIB certified</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 508</td>
</tr>
<tr>
<td>FM</td>
</tr>
</tbody>
</table>

**CE mark**

| In accordance with the EMC guideline (residential and functional buildings), low voltage guideline |
## A.14 Technical data: CM AS Interface

<table>
<thead>
<tr>
<th><strong>Mechanical data</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (WxHxD)</td>
<td>36 x 90 x 58 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 90 g</td>
</tr>
<tr>
<td>Installation</td>
<td>on a 35 mm profile rail</td>
</tr>
<tr>
<td></td>
<td>2 module widths</td>
</tr>
<tr>
<td></td>
<td>or wall mounting</td>
</tr>
<tr>
<td></td>
<td>must be mounted as the last module on the right of LOGO!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power supply</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>30 V DC</td>
</tr>
<tr>
<td>Permissible range</td>
<td>19.2 ... 28.8 V DC</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes</td>
</tr>
<tr>
<td>Total current drain</td>
<td>( I_{\text{tot max}} ) max. 70 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Connections</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs (I)</td>
<td>the next four inputs after the physical inputs of LOGO! ((I_n \ldots I_{n+3}))</td>
</tr>
<tr>
<td>Digital outputs (Q)</td>
<td>the next four outputs after the physical outputs of LOGO! ((Q_n \ldots Q_{n+3}))</td>
</tr>
<tr>
<td>I/O configuration (hex)</td>
<td>7</td>
</tr>
<tr>
<td>ID code (hex)</td>
<td>F</td>
</tr>
<tr>
<td>ID1 code (hex)</td>
<td>F (default, variable from 0 ... F)</td>
</tr>
<tr>
<td>ID2 code (hex)</td>
<td>F</td>
</tr>
<tr>
<td>Bus connection</td>
<td>AS interface in accordance with specification</td>
</tr>
<tr>
<td>Analog inputs (AI)</td>
<td>none</td>
</tr>
<tr>
<td>Analog outputs (AQ)</td>
<td>none</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Climatic conditions</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient operating conditions</td>
<td>0 °C ... +55 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 °C ... +70 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electrical safety</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical data</td>
<td>to AS interface specification</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 20</td>
</tr>
<tr>
<td>Interference suppression</td>
<td>Limit class A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Approval</strong></th>
<th><strong>CM AS Interface</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61131-2</td>
<td></td>
</tr>
<tr>
<td>EN 50178</td>
<td></td>
</tr>
<tr>
<td>cULus to UL 508</td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No. 142</td>
<td></td>
</tr>
</tbody>
</table>
A.15 Technical data: LOGO! Power 12 V

LOGO! Power 12 V is a primary-switched power supply unit for LOGO! devices. Two current ranges are available.

<table>
<thead>
<tr>
<th>Input data</th>
<th>LOGO! Power 12 V / 1.9 A</th>
<th>LOGO! Power 12 V / 4.5 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 ... 240 V AC</td>
<td></td>
</tr>
<tr>
<td>Permissible range</td>
<td>85 ... 264 V AC</td>
<td></td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>&gt; 40 ms (at 187 V AC)</td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>0.53 ... 0.3 A</td>
<td>1.13 ... 0.61 A</td>
</tr>
<tr>
<td>Make current (25 °C)</td>
<td>≤ 15 A</td>
<td>≤ 30 A</td>
</tr>
<tr>
<td>Device protection</td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>Recommended circuit breaker</td>
<td>≥ 16 A characteristic B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 10 A characteristic C</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output data</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>12 V DC</td>
<td></td>
</tr>
<tr>
<td>Overall tolerance</td>
<td>+/- 3 %</td>
<td></td>
</tr>
<tr>
<td>Adjustment range</td>
<td>10.5 ... 16.1 V DC</td>
<td></td>
</tr>
<tr>
<td>Residual ripple</td>
<td>&lt; 200/300 mVpp</td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td>1.9 A</td>
<td>4.5 A</td>
</tr>
<tr>
<td>Overcurrent limiting</td>
<td>typ. 2.5 A</td>
<td>typ. 5.9 A</td>
</tr>
<tr>
<td>Efficiency</td>
<td>typ. 80 %</td>
<td>typ. 85 %</td>
</tr>
<tr>
<td>Parallel circuit for power increase</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electromagnetic compatibility</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interference suppression</td>
<td>EN 50081-1, Class B to EN 55022</td>
<td></td>
</tr>
<tr>
<td>Interference immunity</td>
<td>EN 61000-6-2, EN 61000-4-2/-3/-4/-5/-6/-11</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Safety</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical isolation, primary/sec-</td>
<td>Yes, SELV (to EN 60950 and EN 50178)</td>
<td></td>
</tr>
<tr>
<td>ondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety class</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 20 (to EN 60529)</td>
<td></td>
</tr>
<tr>
<td>CE marking</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>UL/cUL certification</td>
<td>Yes; UL 508 / UL 60950</td>
<td></td>
</tr>
<tr>
<td>FM approval</td>
<td>Yes; Class I, Div. 2, T4</td>
<td></td>
</tr>
<tr>
<td>GL approval</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General details</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature range</td>
<td>-20 ... +55 °C, natural convection</td>
<td></td>
</tr>
<tr>
<td>Storage and shipping temperature</td>
<td>-40 ... +70 °C</td>
<td></td>
</tr>
<tr>
<td>Connections at input</td>
<td>One terminal (1 x 2.5 mm² or 2 x 1.5 mm²) per L1 and N</td>
<td></td>
</tr>
<tr>
<td>Connections at output</td>
<td>Two terminals (1x.2.5 mm² or 2 x 1.5 mm²) per + and -</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>On 35 mm DIN rail, snap-on</td>
<td></td>
</tr>
<tr>
<td>Dimensions in mm (WxHxD)</td>
<td>54 x 80 x 55</td>
<td>72 x 90 x 55</td>
</tr>
<tr>
<td>Approx. weight</td>
<td>0.2 kg</td>
<td>0.3 kg</td>
</tr>
</tbody>
</table>
### Technical data: LOGO!Power 24 V

LOGO! Power 24 V is a primary-switched power supply module for LOGO! devices. Two current ranges are available.

<table>
<thead>
<tr>
<th>Input data</th>
<th>LOGO! Power 24 V / 1.3 A</th>
<th>LOGO! Power 24 V / 2.5 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 ... 240 V AC</td>
<td></td>
</tr>
<tr>
<td>Permissible range</td>
<td>85 ... 264 V AC</td>
<td></td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
<tr>
<td>Voltage failure buffering</td>
<td>40 ms (at 187 V AC)</td>
<td></td>
</tr>
<tr>
<td>Input current</td>
<td>0.70 ... 0.35 A</td>
<td>1.22 ... 0.66 A</td>
</tr>
<tr>
<td>Inrush current (25°C)</td>
<td>&lt; 15 A</td>
<td>&lt; 30 A</td>
</tr>
<tr>
<td>Device protection</td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>Recommended circuit breaker</td>
<td>≥ 16 A characteristic B</td>
<td>≥ 10 A characteristic C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td>24 V DC</td>
<td></td>
</tr>
<tr>
<td>Overall tolerance</td>
<td>+/- 3 %</td>
<td></td>
</tr>
<tr>
<td>Adjustment range</td>
<td>22.2 ... 26.4 V DC</td>
<td></td>
</tr>
<tr>
<td>Residual ripple</td>
<td>&lt; 200/300 mVpp</td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td>1.3 A</td>
<td>2.5 A</td>
</tr>
<tr>
<td>Overcurrent limiting</td>
<td>typ. 2.0 A</td>
<td>typ. 3.4 A</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&gt; 82 %</td>
<td>&gt; 87 %</td>
</tr>
<tr>
<td>Parallel circuit for power increase</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

### Electromagnetic compatibility

Interference suppression: EN 50081-1, Class B to EN 55022

Interference immunity: EN 61000-6-2, EN 61000-4-2/-3/-4/-5/-6/-11

### Safety

Electrical isolation, primary/secondary: Yes, SELV (to EN 60950 and EN 50178)

Safety class: II

Degree of protection: IP 20 (to EN 60529)

CE marking: Yes

UL/cUL certification: Yes; UL 508 / UL 60950

FM approval: Yes; Class I, Div. 2, T4

GL approval: Yes

### General details

Ambient temperature range: -20 ... +55°C, natural convection

Storage and shipping temperature: -40 ... +70°C

Connections at input: One terminal (1 x. 2.5 mm² or 2 x 1.5 mm²) per L1 and N

Connections at output: Two terminals (1x.2.5 mm² or 2 x 1.5 mm²) per + and -

Installation: On 35 mm DIN rail, snap-on

Dimensions in mm (WxHxD): 54 x 80 x 55

Approx. weight: 0.2 kg
## A.17 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 Amps and motors up to 4 kW (without noise emission, hum-free).

<table>
<thead>
<tr>
<th></th>
<th>LOGO! Contact 24</th>
<th>LOGO! Contact 230</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>24 V DC</td>
<td>230 V AC; 50/60 Hz</td>
</tr>
<tr>
<td><strong>Switching capacity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilization category AC-1: Switching of ohmic loads at 55 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating current at 400 V</td>
<td>20 A</td>
<td></td>
</tr>
<tr>
<td>Output with three-phase loads at 400 V</td>
<td>13 kW</td>
<td></td>
</tr>
<tr>
<td>Utilization category AC-2, AC-3: Motor with slip ring induction/cage armature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating current at 400 V</td>
<td>8.4 A</td>
<td></td>
</tr>
<tr>
<td>Output with three-phase loads at 400 V</td>
<td>4 kW</td>
<td></td>
</tr>
<tr>
<td>Short-circuit protection:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assignment type 1</td>
<td>25 A</td>
<td></td>
</tr>
<tr>
<td>Assignment type 2</td>
<td>10 A</td>
<td></td>
</tr>
<tr>
<td>Connecting leads</td>
<td>Fine-wire with wire end ferrules</td>
<td>Solid wire</td>
</tr>
<tr>
<td></td>
<td>2 x (0.75 to 2.5) mm²</td>
<td>2 x (1 to 2.5) mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 x 4 mm²</td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td>36 x 72 x 55</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-25 ... +55 °C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-50 ... +80 °C</td>
<td></td>
</tr>
</tbody>
</table>
## A.18 Technical data: LOGO! TD (Text Display)

<table>
<thead>
<tr>
<th>Mechanical data</th>
<th>LOGO! TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (WxHxD)</td>
<td>128.2 x 86 x 38.7 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 220 g</td>
</tr>
<tr>
<td>Installation</td>
<td>Bracket mounting</td>
</tr>
</tbody>
</table>

### Power supply

<table>
<thead>
<tr>
<th>Input voltage</th>
<th>24 V AC/DC</th>
<th>12 V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible range</td>
<td>20.4 ... 26.4 V AC</td>
<td>10.8 ... 28.8 V DC</td>
</tr>
<tr>
<td>Permissible mains frequency</td>
<td>47 ... 63 Hz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power consumption</th>
<th>12 V DC</th>
<th>24 V DC</th>
<th>24 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>typ. mA</td>
<td>typ. 64.1 mA</td>
<td>typ. 39.1 mA</td>
<td>typ. 89.6 mA</td>
</tr>
</tbody>
</table>
Determining the cycle time

The program cycle is the complete execution of the circuit program, that is, primarily the reading in of the inputs, the processing of the circuit program and the subsequent reading out of the outputs. The cycle time is the time required to execute a circuit program once in full.

The time required for a program cycle can be determined using a short test program. This test program is created in LOGO! and returns a value during its execution in parameter assignment mode from which the current cycle time is derived.
Determining the cycle time

Test program

1. Create the test program by linking an output to a threshold trigger and connecting the trigger input with an inverted flag.

```
Par
Qx
B1
M1
Output Qx or other flag Mx

M1
B2
1
Press

M1
```

2. Configure the threshold trigger as shown below. A pulse is generated in each program cycle due to the inverted flag. The trigger interval is set to 2 seconds.

```
B1 1+
On =1000
Off=0000
G_T=02:00s
```

3. Now start the circuit program and switch LOGO! to parameter assignment mode. In this mode, view the trigger parameters.

```
B1
On =1000
Off =0000
fa =2130
```

4. The reciprocal value of \(fa\) is equivalent to the LOGO! execution time of the current circuit program in its memory.

\[
\frac{1}{fa} = \text{cycle time in s}
\]
**Explanation**

The inverted flag block changes its output signal at each program execution. 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 trigger indicates the ratio of periods per 2 seconds, which results in the ratio of cycles per second.

![Diagram of cycle time and period]

- **Cycle time**
- **Period**

1 period = 1 pulse = 2 cycles
LOGO! without display

Because some specific applications do not require operator control and monitoring units such as buttons or a display, we provide the LOGO! 12/24RCo, LOGO! 24o, LOGO! 24RCo and LOGO! 230RCo versions without display.

View of a LOGO! 230RCo, for example:

Less is definitely more!

The versions without display offer you the following benefits:

- Even more cost-effective 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
- Access protected
- Compatible to LOGO! versions with display
- Offers the option to read data by means of LOGO!Soft Comfort
Creating a circuit program without operator panel

There are two ways to create a circuit program for a LOGO! without display:

- You create the circuit program with LOGO!Soft Comfort on your PC and then download it to LOGO! (see Chapter 7).
- You download the circuit program from a LOGO! memory card or combined memory/battery card to your LOGO! without display (see Chapter 6).

Operating characteristics

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 were removing the plug.

The circuit program of LOGO!...o versions cannot be started or stopped by means of buttons. This is why the LOGO!...o versions have other startup characteristics:

Startup characteristics

If there is no circuit program in LOGO! or on the inserted memory card or combined memory/battery card, LOGO! remains in STOP.

If there is a valid circuit program in LOGO! memory, the LOGO! automatically switches from STOP to RUN when power is switched on.

The circuit program on an inserted memory card or combined memory/battery card is automatically copied to LOGO!, immediately after power is switched on. The existing circuit program in LOGO! memory is overwritten. The system automatically changes from STOP to RUN.

Provided the PC cable is connected to LOGO!, you can download the circuit program to LOGO! and start it by means of LOGO!Soft Comfort PC software (see Chapter 7.1).

Operating status indication

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 current data

LOGO!Soft Comfort (see Chapter 7) provides an online test for reading the current data of all functions while the system is in RUN.

If your LOGO! without display holds a protected memory card or combined memory/battery card, you cannot read the current data unless you enter the correct password for the circuit program. The circuit program is otherwise deleted from LOGO! memory when you remove the memory card or combined memory/battery card to connect the PC cable. (See Chapter 6.1).

Deleting the circuit program

Use LOGO!Soft Comfort to delete the circuit program and password if a password exists.
LOGO! menu structure

Menu overview

Main menu (ESC / >Stop)

Programming menu (ESC / >Stop — >Program)

Editing the program (Chapter 3.7 cont.)

Editing the program name (Chapter 3.7.4)

Selecting analog output values and type (Chapters 3.7.11 and 3.7.12)

Show available memory space (Chapter 3.8)

Deleting the program (Chapter 3.7.13)

Input/change of password (Chapter 3.7.5)

Configure global parameters for message texts (Chapter 4.4.23)
Transfer menu (ESC / Stop → Card)

- >Card → Copying the circuit program from LOGO! to the memory card or combined memory/battery card (Chapter 6.3)
- Card → Setting the program/copy protection (Chapter 6.4)
- CopyProtect → Setting the display contrast (Chapter 5.2.2)

Setup menu (ESC / Stop → Setup)

- >Clock... → Setting the time/date (Chapter 5.2.1)
- S/W Time → Setting the summertime/wintertime (Chapter 3.7.14)
- Sync → Synchronizing the times of LOGO! Basic and CM EIB/KNX (Chapter 5.7.15)

- >Contrast → Setting the display contrast (Chapter 5.2.2)
- Back light → Setting the display back light setting (Chapter 5.2.2)

- >Menu Lang → Setting the menu language (Chapter 5.2.3)
- BM AI NUM → Setting the number of Basic module AIs (Chapter 5.2.4) for select modules

Parameter assignment menu

- ESC+C → Flags
- Cursor keys
- >Stop
- Set Param
- Set.. Prg Name

MAX. 50 MESSAGE TEXTS

LOGO!
## Order numbers

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<thead>
<tr>
<th>Variant</th>
<th>Designation</th>
<th>Order number</th>
</tr>
</thead>
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<tr>
<td>Basic</td>
<td>LOGO! 12/24 RC (AC/DC)*</td>
<td>6ED1052-1MD00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24 *</td>
<td>6ED1052-1CC00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24 RC (AC/DC)</td>
<td>6ED1052-1HB00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 230 RC (AC/DC)</td>
<td>6ED1052-1FB00-0BA6</td>
</tr>
<tr>
<td>Basic without display (pure)</td>
<td>LOGO! 12/24 RCo (AC/DC)*</td>
<td>6ED1052-2MD00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24o *</td>
<td>6ED1052-2CC00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 24 RCo (AC)</td>
<td>6ED1052-2HB00-0BA6</td>
</tr>
<tr>
<td></td>
<td>LOGO! 230 RCo (AC/DC)</td>
<td>6ED1052-2FB00-0BA6</td>
</tr>
<tr>
<td>Digital modules</td>
<td>LOGO! DM 8 12/24R</td>
<td>6ED1055-1MB00-0BA1</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 8 24</td>
<td>6ED1055-1CB00-0BA0</td>
</tr>
<tr>
<td></td>
<td>LOGO! DM 8 24R</td>
<td>6ED1055-1HB00-0BA0</td>
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<td></td>
<td>LOGO! DM 8 230R</td>
<td>6ED1055-1FB00-0BA1</td>
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<td>LOGO! DM 16 24</td>
<td>6ED1055-1CB10-0BA0</td>
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<td></td>
<td>LOGO! DM 16 24R</td>
<td>6ED1055-1NB10-0BA0</td>
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<td>LOGO! DM 16 230R</td>
<td>6ED1055-1FB10-0BA0</td>
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<tr>
<td>Analog modules</td>
<td>LOGO! AM 2</td>
<td>6ED1055-1MA00-0BA0</td>
</tr>
<tr>
<td></td>
<td>LOGO! AM 2 PT100</td>
<td>6ED1055-1MD00-0BA0</td>
</tr>
<tr>
<td></td>
<td>LOGO! AM 2 AQ</td>
<td>6ED1055-1MM00-0BA1</td>
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<tr>
<td>Communication modules</td>
<td>CM EIB/KNX</td>
<td>6BK1700-0BA00-0AA1</td>
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<tr>
<td></td>
<td>CM AS Interface</td>
<td>3RK1400-0CE10-0AA2</td>
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<tr>
<td>Text Display module</td>
<td>LOGO! TD</td>
<td>6ED1055-4MH00-0BA0</td>
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*: Also with analog inputs
## Order numbers

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Designation</th>
<th>Order number</th>
</tr>
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<tbody>
<tr>
<td>Software</td>
<td>LOGO!Soft Comfort V6.0</td>
<td>6EP1321-1SH02</td>
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<tr>
<td></td>
<td>Upgrade to LOGO!Soft Comfort V6.0</td>
<td>6EP1331-1SH02</td>
</tr>
<tr>
<td>Memory card</td>
<td>LOGO! Memory Card</td>
<td>6ED1056-1DA00-0BA0</td>
</tr>
<tr>
<td>Battery card</td>
<td>LOGO! Battery card</td>
<td>6ED1056-1CA00-0BA0</td>
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<tr>
<td>Combined memory/battery card</td>
<td>LOGO! Combined Memory/Battery Card</td>
<td>6ED1056-1DA00-0BA0</td>
</tr>
<tr>
<td>Switching modules</td>
<td>LOGO!Contact 24 V</td>
<td>6EP1321-1SH02</td>
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<tr>
<td></td>
<td>LOGO!Contact 230 V</td>
<td>6EP1331-1SH02</td>
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<tr>
<td>Power modules</td>
<td>LOGO!Power 12V/1.9A</td>
<td>6EP1321-1SH02</td>
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<td></td>
<td>LOGO!Power 12V/4.5A</td>
<td>6EP1331-1SH02</td>
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<td>LOGO!Power 24V/1.3A</td>
<td>6EP1322-1SH02</td>
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<td></td>
<td>LOGO!Power 24V/2.5A</td>
<td>6EP1332-1SH02</td>
</tr>
<tr>
<td></td>
<td>LOGO!Power 24V/4A</td>
<td>6EP1332-1SH51</td>
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<td>LOGO!Power 5V/3A</td>
<td>6EP1311-1SH02</td>
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<td>LOGO!Power 5V/6.3A</td>
<td>6EP1311-1SH12</td>
</tr>
<tr>
<td></td>
<td>LOGO!Power 15V/1.9A</td>
<td>6EP1351-1SH02</td>
</tr>
<tr>
<td></td>
<td>LOGO!Power 15V/4A</td>
<td>6EP1352-1SH02</td>
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<td>Others</td>
<td>PC cable</td>
<td>6ED1057-1AA00-0BA0</td>
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<tr>
<td></td>
<td>USB PC cable</td>
<td>6ED1057-1AA01-0BA0</td>
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<td>Expansion cable</td>
<td>6ED1057-1BA00-0BA0</td>
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<td>Modem cable</td>
<td>6ED1057-1CA00-0BA0</td>
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<td></td>
<td>Manual</td>
<td>6ED1050-1AA00-0AE7</td>
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### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Analog module</td>
</tr>
<tr>
<td>B1</td>
<td>Block number B1</td>
</tr>
<tr>
<td>BN</td>
<td>Block Number</td>
</tr>
<tr>
<td>C</td>
<td>LOGO! device designation: integrated clock</td>
</tr>
<tr>
<td>CM</td>
<td>Communication Module</td>
</tr>
<tr>
<td>Cnt</td>
<td>Count = Counter input</td>
</tr>
<tr>
<td>Co</td>
<td>Connector</td>
</tr>
<tr>
<td>Dir</td>
<td>Direction (of count, for example)</td>
</tr>
<tr>
<td>DM</td>
<td>Digital Module</td>
</tr>
<tr>
<td>EIB</td>
<td>European Installation Bus</td>
</tr>
<tr>
<td>EIS</td>
<td>EIB Interoperability Standard</td>
</tr>
<tr>
<td>En</td>
<td>Enable = switching on (e.g. clock generators)</td>
</tr>
<tr>
<td>ETS</td>
<td>EIB Tool Software</td>
</tr>
<tr>
<td>Fre</td>
<td>Input for frequency signals to be analyzed</td>
</tr>
<tr>
<td>GF</td>
<td>Basic Functions</td>
</tr>
<tr>
<td>Inv</td>
<td>Input for inverting the output signal</td>
</tr>
<tr>
<td>KNX</td>
<td>Konnex Association Standard for home and building electronic systems</td>
</tr>
<tr>
<td>No</td>
<td>Cam (parameter of the timer)</td>
</tr>
<tr>
<td>o</td>
<td>in LOGO! designations: without display</td>
</tr>
<tr>
<td>Par</td>
<td>Parameter</td>
</tr>
<tr>
<td>R</td>
<td>Reset input</td>
</tr>
<tr>
<td>R</td>
<td>in LOGO! designations: Relay outputs</td>
</tr>
<tr>
<td>Ral</td>
<td>Reset all = Input for resetting all internal values</td>
</tr>
<tr>
<td>S</td>
<td>Set (latching relay, for example)</td>
</tr>
<tr>
<td>SF</td>
<td>Special functions</td>
</tr>
<tr>
<td>SU</td>
<td>Subunit</td>
</tr>
<tr>
<td>T</td>
<td>Time = parameter</td>
</tr>
<tr>
<td>TD</td>
<td>Text Display</td>
</tr>
<tr>
<td>Trg</td>
<td>Trigger (parameter)</td>
</tr>
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