SIEMENS

LOGO!

System Manual

This manual applies to LOGO! 9 series devices.

04/2026
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Continued

LOGO!

System Manual

Legal information

Warning notice system

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 only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

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

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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 product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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.

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Ⓟ 03/2026 Subject to change

Preface

With LOGO! you have acquired a logic module that meets the stringent quality requirements of ISO 9001.

You can use LOGO! 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! 9 Base Modules with more enhanced features, the LOGO! TDE (Text Display with Ethernet interfaces), and LOGO! Expansion Modules.

For LOGO! 9 series, LOGO!Soft Comfort uses device type to distinguish different LOGO! device. For more information, you can refer to the following table.

Device	Order number and FS number	Device type in LOGO!Soft Comfort	LOGO!Soft Comfort Version
LOGO! BM	6ED1052-xxx00-0BA8 FS01-FS03	LOGO! 8 (0BA8.Standard)	LOGO!Soft Comfort V9.0
	6ED1052-xxx00-0BA8 FS04-FS06	LOGO! 8.1 & 8.2 (LOGO! 8.FS4)	
	6ED1052-xxx08-0BA0	LOGO! 8.1 & 8.2 (LOGO! 8.FS4)	
	6ED1052-xxx08-0BA1	LOGO! 8.3	
	6ED1052-xxx08-0BA2	LOGO! 8.4	
	6ED1052-xxx08-0BA3	LOGO! 9.0	
LOGO! TDE	6ED1055-4MH00-0BA1 FS01-FS06	LOGO! TDE 6ED1055-4MH08-0-BA1	
	6ED1055-4MH08-0BA0		
	6ED1055-4MH08-0BA1		
	6ED1055-4MH08-0BA3	LOGO! 9 TDE	

LOGO!'s place in information technology

The wiring information in your LOGO! manual can also be found in the LOGO! Product Info, which you can access by scanning the QR code on the device. For more information on programming the LOGO! on your PC, refer to the *LOGO!Soft Comfort Online Help*.

LOGO!Soft Comfort is LOGO! programming software for PCs. It runs under Windows® (Windows 8® , Windows 10® and Windows 11®), Linux® and Mac OS®. It helps you to get started with LOGO! and to write, test, print out and archive your programs, independent of LOGO!.

Valid range of this manual

The manual applies to devices of LOGO! 9 6ED1052-xxx08-0BA3 series.

Compatibility with previous devices

LOGO! 9 device series are incompatible with any previous device series.

For more detailed information about the compatibility between different device series, refer to the topic "Compatibility (Page 22)".

Additional support

Additional support is available on the Siemens LOGO! Web site (http://www.siemens.com/logo)

LOGO! forum

Visit the LOGO! forum (https://sieportal.siemens.com/en-ww/support/forum/category/65?sortCat=default) to explore the community.

Turkey importer information

Country code according to ISO 3166	Country name according to ISO 3166	Importer address
TUR	Türkiye	Siemens San. ve Tic. A.Ş Yakacık Cad. No:111 34870 Kartal/İstanbul

New features of LOGO! 9.0 device series

The following features are new for LOGO! 9.0 devices:

- New series devices with new outlook
  - BM: LOGO! 12/24RCE, LOGO! 230RCE, LOGO! 24CE, LOGO! 24RCE, LOGO! 12/24RCEo, LOGO! 24CEo, LOGO! 24RCEo, LOGO! 230RCEo
  - EM: LOGO! DM8 12/24R, LOGO! DM8 230R, LOGO! AM4 AIAQ
  - TDE: LOGO! 9 TDE

  Additional extension modules are planned to release in the near future: LOGO! DM8 24, LOGO! DM8 24R, LOGO! DM16 24, LOGO! DM16 24R, LOGO! DM16 230R, LOGO! AM4, LOGO! AM4 AQ, LOGO! AM2 RTD.
- Touch screen

  LOGO! Basic and TDE devices are equipped with a touch screen.

- Enhanced security features
  - Secure LOGO! Communication
  - User Management and Access Control (UMAC)
  - Certificate management
  - Audit Log
- Message pages display on device screen

  LOGO! Basic and LOGO! TDE supports displaying message pages containing parameters in text, number or graphics format.
- Enhanced system processing capacity
  - More IOs are supported
  - LOGO! 9.0 BM supports up to 800 function blocks in a circuit diagram
  - Supports float data type processing
  - Configurable analog resolution: 0-1000, 0-4095, 0-10000
- LOGO!Soft Comfort USB stick replaces LOGO!Soft Comfort DVD-ROM.
- The programming software LOGO!Soft Comfort V9.0 and later versions combine the LOGO! Web Editor, supporting to create the user-defined web pages.

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Getting started with LOGO! 1

1.1 Safety information

1.1.1 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://www.siemens.com/cert.

1.1.2 Data protection

Siemens observes the data protection guidelines, especially the requirements regarding data minimization (privacy by design). This means the following for this product: The product does not process / save any personal information, but only technical functional data (e.g. time stamps). If the user links this data to other data (e.g. shift plans) or if the user saves personal information on the same medium (e.g. hard disk) and therefore creates a personal reference in the process, the user has to ensure meeting the guidelines regarding data protection.

NOTE

Notes on protecting administrator accounts

A user with administrator rights has extensive access and manipulation options available to the system.
Therefore, ensure there are adequate safeguards for protecting the administrator accounts to prevent unauthorized changes. To do this, use secure passwords and a standard user account for normal operation. Other measures, such as the use of security policies, should be applied as needed.

NOTE

To protect LOGO!Soft Comfort from any undesired manipulation when your PC suffers malicious attacks from the Internet, Siemens strongly recommends you to install a whitelist tool on the PC. Then use the tool to manage the software installed on your PC.

1.1.3 Safety information

⚠ WARNING

Electric shock due to external supplied plan units

Even if the main supply to the plant is disconnected, externally supplied modules can continue to carry voltage. An electric shock on contact with live parts can lead to death or serious injury.

For special Siemens modules, for example, relay modules, you can connect or switch voltages larger than 24 V DC, for example, 230 V AC. In some applications, these modules are supplied with voltages from outside the system (external power supply). In the event of an external power supply, a dangerous voltage may still be present on these modules even if the system is disconnected.

Ensure the following points before starting work:

- The plant is completely disconnected from the power supply.
- All externally supplied plant units are disconnected from the power supply

⚠ WARNING

Electric shock due to permissible electric potential difference

Due to the permissible electric potential difference, a dangerous voltage may be present at the inputs of modules. An electric shock on contact with live parts can lead to death or serious injury.

Therefore, ensure that the plant is completely disconnected from the power supply before starting work. This means that all externally supplied plant units must also be disconnected from the power supply.

⚠ WARNING

Electrical shock due to isolation failure

For LOGO! modules in high voltage, there is electrical isolation between the inputs and the touch screen. When the electrical isolation fails due to disassembly or damage, continuing to use the module may result in electrical shock. Therefore, do not use disassembled, damaged or broken modules.

For your safety, Siemens recommends that you use leakage protectors with high-voltage LOGO! modules.

Here's LOGO!

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

- Controls
- Touch screen display panel (LOGO! Basic)
- Power supply
- Interface for Expansion Modules
- Interface for a micro SD card
- Interface for an optional text display (TDE) 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
- Interfaces for Ethernet communication
- FE (Functional Earth) terminal for connecting to earth ground
- One LED for indicating Ethernet communication status

LOGO! 9 Basic module provides the touch screen with the following functions:

- Text and graphics display with color
- Touch function for operation and interaction
- Display lightness adjustment

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. It can also offer solutions for switch cabinet engineering, as well as for mechanical and apparatus engineering such as gate control systems, air-conditioning systems, and rainwater pumps.

You can also use LOGO! to implement special control systems in conservatories or greenhouses, for control signal processing and, by connecting a communications module such as an AS-i 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.

Which devices are available?

LOGO! Base Modules are 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 V AC/DC to 240 V AC/DC

LOGO! Base Modules are available in two versions:

- **LOGO! Basic** (version with display): 8 inputs and 4 outputs
- **LOGO! Pure** (version without display): 8 inputs and 4 outputs

Each module has an expansion interface and an Ethernet interface.

Which Expansion Modules are available?

- LOGO! DM8 digital modules are available for operation with 12 V DC, 24 V DC and 115 V AC/DC to 240 V AC/DC, and are equipped with four inputs and four outputs.
- LOGO! AM4 AIAQ analog module is available for operation with 24 V DC. The EM is equipped with two analog inputs, and two analog outputs.

Each digital/analog module has two expansion interfaces for connecting additional modules.

NOTE

You can only use Expansion Modules of the same voltage as the LOGO! Base Module. Mechanical encoding pins in the housing prevent you from connecting devices of a different voltage class.

Exception: The interface on the left side of an analog module is reinforcedly isolated. These types of Expansion Modules can therefore be connected to devices of a different voltage class (Page 35).

Which display modules are available?

- LOGO! Basic (integrated in Base Module)
- LOGO! TDE

Features of the LOGO! 9 TDE

The LOGO! 9 TDE is available for the LOGO! 9 series. It provides an additional touch screen that is wider than the LOGO! Basic. It provides four virtual Function keys and four virtual Cursor keys that you can use as inputs in your circuit program.

You can create and download a power-up screen for the LOGO! TDE from LOGO!Soft Comfort. This screen displays briefly when you initially power on the LOGO! TDE. You can also upload the power-up screen from the LOGO! TDE to LOGO!Soft Comfort.

LOGO! TDE provides four main menu commands, respectively for connecting to a Base Module, the remote settings of the connected Base Module, the independent configuration of the LOGO! TDE and the diagnostics information of the LOGO! TDE. The menus for the LOGO! TDE are shown in Appendix "LOGO! TDE (Page 320)".

LOGO! 9 TDE (6ED1055-4MH08-0BA3) can be scanned by LOGO!Soft Comfort V9.0 and later versions.

It's your choice

The various LOGO! Base Modules, Expansion Modules, LOGO! TDE and communications modules offer you a highly flexible and adaptive system to suit your specific tasks.

The LOGO! system offers you many solutions for small domestic installations, simple automation tasks, and even complex engineering tasks involving its integration into a bus system.

A LOGO! TDE has two Ethernet interfaces. You can connect each interface to a Base Module, a PC, or another LOGO! TDE.

Each LOGO! Base Module supports the following connections for the creation of the circuit program, regardless of the number of connected modules:

- Digital inputs I1 to I64
- Analog inputs AI1 to AI16
- Digital outputs Q1 to Q60
- Analog outputs AQ1 to AQ16
- Digital flag blocks M1 to M128:
  - M8: Initialization Flag (Displays blue in LOGO!Soft Comfort)
  - M27: Message Page Flag (Displays green in LOGO!Soft Comfort)
  - M28: Backlight flag: LOGO! BM displays amber backlight on the device screen status bar
  - M29: Backlight flag: LOGO! BM displays red backlight on the device screen status bar
  - M30: Backlight flag: LOGO! TDE displays amber backlight on the device screen status bar
  - M31: Backlight flag: LOGO! TDE displays red backlight on the device screen status bar
- Analog flag blocks: AM1 to AM128
- Float analog flag blocks: FAM1 to FAM32
- Shift register bits: S1.1 to S4.8 (32 shift register bits)

- 4 Cursor keys
- Open connectors: X1 to X128

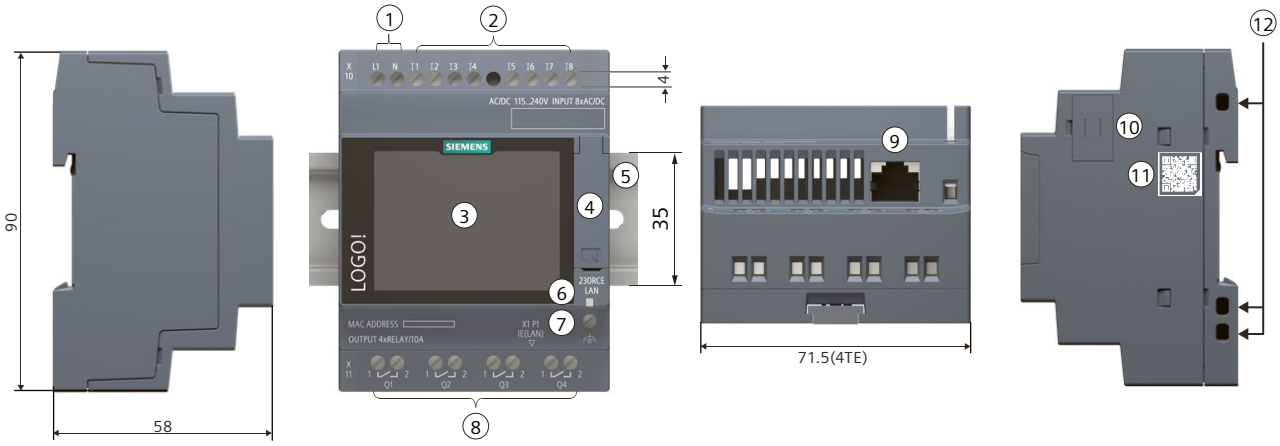
The devices of LOGO! 9 series additionally supports the display of the following network digital/analog inputs and outputs:

- 512 network digital inputs: NI1 to NI512
- 128 network analog inputs: NAI1 to NAI128
- 480 network digital outputs: NQ1 to NQ480
- 128 network analog outputs: NAQ1 to NAQ128
- 16 network float analog inputs: NFAI1 to NFAI16
- 16 network float analog outputs: NFAQ1 to NFAQ16

The LOGO! structure

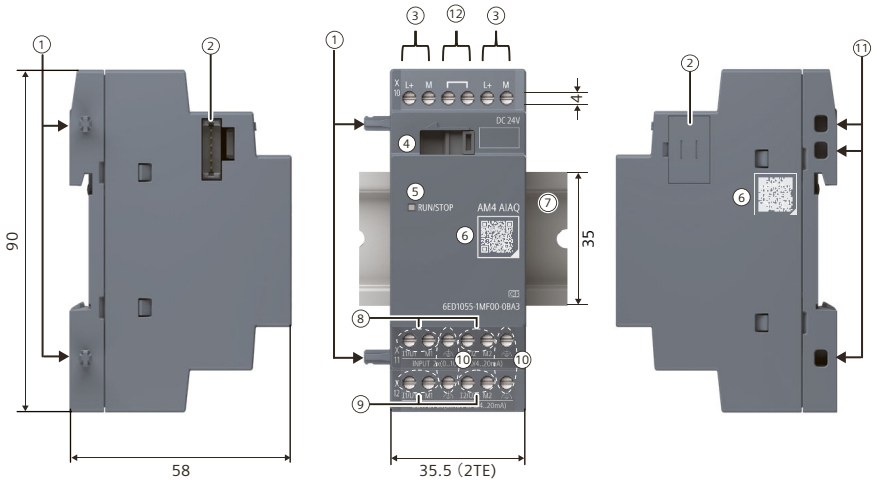
The following figures show LOGO! 230RCE and LOGO! AM4 AIAQ as examples:

LOGO! 230RCE



①	Power supply	②	Inputs
③	Touch screen	④	Micro SD card slot
⑤	Standard DIN rail	⑥	Ethernet communication status LED
⑦	FE terminal, for connecting to earth ground	⑧	Outputs
⑨	RJ45 interface, for connection to Ethernet (10/100 Mbit/s)	⑩	Expansion interface
⑪	ID Link (Page 24)	⑫	Mechanical coding sockets

LOGO! AM4 AIAQ

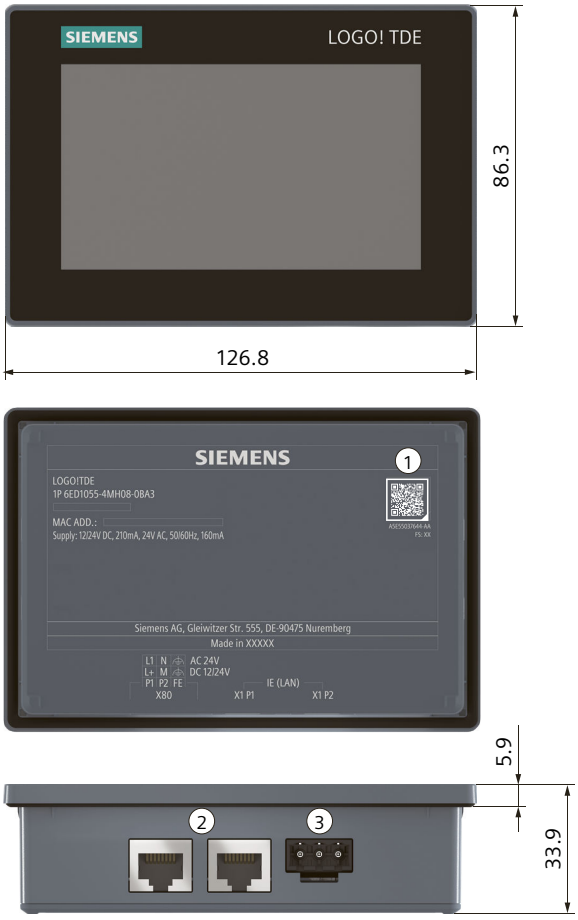


①	Mechanical coding pins	②	Expansion interface
③	Power supply	④	Slide
⑤	RUN/STOP LED	⑥	ID Link (Page 24)
⑦	Standard DIN rail	⑧	Inputs
⑨	Outputs	⑩	FE terminal, for connecting to earth ground
⑪	Mechanical coding sockets		

⑫ Jumper terminals. Connecting the jumper terminals to configure the input signal:
- jumper connected: receiving current signal (0/4 mA to 20 mA)
- jumper disconnected: receiving voltage signal (0 V to 10 V)

The change of connection will not take into effect until the device is powered on again.

LOGO! TDE



① ID Link (Page 24)
Note: the information on the back of the device is subject to the actual device.

② Ethernet interfaces

③ Power supply

The LOGO! TDE provides a bigger display area than the LOGO! onboard display. You use the Ethernet cable to connect from the Ethernet interface on the bottom of the LOGO! TDE to the Ethernet interface on the LOGO! Base Module.

NOTICE
Connecting both Ethernet interfaces of LOGO! TDE to the same local area network (LAN) simultaneously may create a network loop, potentially triggering severe broadcast storms or network loop issues. This can result in the repetitive circulation of large volumes of duplicate packets within the LAN, leading to network congestion, communication delays, or even system failure.

How to identify LOGO!

The LOGO! identifier informs you of various properties:

- 12/24: 12/24 V DC version
- 230: 115 V AC/DC to 240 V AC/DC version
- R: Relay outputs (without R: solid-state outputs)
- C: Integrated real-time clock
- E: Ethernet interface
- o: Version without display ("LOGO! Pure")
- DM: Digital module
- AM: Analog module
- TDE: Text Display with Ethernet interfaces

Symbols

	Version with display unit is equipped with 8 inputs, 4 outputs and 1 Ethernet interface.
	Version without display unit is equipped with 8 inputs, 4 outputs and 1 Ethernet interface.
	The digital module is equipped with 4 digital inputs and 4 digital outputs.
	The analog module is equipped with 2 analog inputs or 2 analog outputs, according to the device type.
	The LOGO! TDE module is equipped with 2 Ethernet interfaces.

Versions

The following LOGO! versions are available:

Symbol	Designation	Supply voltage	Inputs	Outputs	Touch screen
	LOGO! 12/24RCE	12/24V DC	8 digital [1]	4 relays (10 A)	2.4" touch screen
	LOGO! 230RCE [2]	115 V AC/DC to 240 V AC/DC	8 digital	4 relays (10 A)	2.4" touch screen

[1] Of those can be used alternatively: 4 analog inputs (0 V to 10 V) 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.

Symbol	Designation	Supply voltage	Inputs	Outputs	Touch screen
	LOGO! 24CE	24 V DC	8 digital [1]	4 solid state 24 V/0.3 A	2.4" touch screen
	LOGO! 24RCE [3]	24 V AC/DC	8 digital	4 relays (10 A)	2.4" touch screen
	LOGO! 12/24RCEo	12/24 V DC	8 digital [1]	4 relays (10 A)	no touch screen
	LOGO! 230RCEo [2]	115 V AC/DC to 240 V AC/DC	8 digital	4 relays (10 A)	no touch screen
	LOGO! 24CEo	24 V DC	8 digital [1]	4 solid state 24 V/0.3 A	no touch screen
	LOGO! 24RCEo [3]	24 V AC/DC	8 digital	4 relays (10 A)	no touch screen

1) Of those can be used alternatively: 4 analog inputs (0 V to 10 V) 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!:

Symbol	Name	Power supply	Inputs	Outputs
	LOGO! DM8 12/24R	12/24 V DC	4 digital	4 relays (5 A)
	LOGO! DM8 230R	115 V AC/DC to 240 V AC/DC	4 digital [1]	4 relays (5 A)
	LOGO! AM4 AIAQ	24 V DC	2 analog 0 V DC to 10 V DC or 0/4 mA to 20 mA [2]	2 analog 0 V DC to 10 V DC or 0/4 mA to 20 mA [3]

1) Different phases are not allowed within the inputs.

2) 0 V to 10 V, 0/4 mA to 20 mA can be configured by wiring.

3) 0 V to 10 V, 0/4 mA to 20 mA can be configured by wiring.

Text display module

The following LOGO! TDE module is available:

Symbol	Name	Supply voltage	Display
	LOGO! 9 TDE	24 V AC/DC 12 V DC	4.3" touch screen (480 x 272 pixels)

LOGO!Soft Comfort USB Stick

The LOGO!Soft Comfort USB Stick includes your installation software for LOGO!Soft Comfort and contains additional useful information, for example, manuals, drivers and user example programs.

Accessory	Order number
LOGO!Soft Comfort USB Stick	6ED1058-0BA08-0YA3

Refer to *LOGO!Soft Comfort Online Help* for the detailed information of the USB Stick content.

Refer to Order numbers (Page 324) section to learn more about LOGO! accessories.

You can order the USB stick from Siemens Industry Mall (https://sieportal.siemens.com/en-ww/home).

1.2 Compatibility

The compatibility of modules

You can only use the LOGO! 9 TDE (6ED1055-4MH08-0BA3) module with equipment LOGO! 9 series (6ED1052-xxx08-0BA3). The LOGO! 9 TDE is only compatible with LOGO! 9.

The LOGO! 9 TDE module provides two Ethernet ports for network connection specifically for the LOGO! 9 device.

All Expansion Modules (with the order number of 6ED1055-1XXXX-0BA3) are completely compatible with the Base Modules of LOGO! 9 series and you can only use them with equipment of LOGO! 9 series.

The table below shows the compatibility for between LOGO! devices in different versions:

	LOGO! 9 BM	LOGO! 9 EM	LOGO! 9 TDE
LOGO! 9 BM	Yes	Yes	Yes
LOGO! 9 EM	Yes	Yes	No
LOGO! 9 TDE	Yes	No	No
LOGO! BM in previous versions	No	No	No
LOGO! EM in previous versions	No	No	No
LOGO! TDE in previous versions	No	No	No

The compatibility of circuit diagram

The table below shows the detailed compatibility information for different device modules and circuit diagrams.

Order number and FS number	Circuit Diagram hardware type				
	LOGO! 8 (0BA8.Standard)	**LOGO! 8.1 & 8.2 (LOGO! 8.FS4)**	**LOGO! 8.3**	**LOGO! 8.4**	**LOGO! 9.0**
6ED1052-xxxxx-0BA8 FS01-FS03	Yes	No	No	No	No
6ED1052-xxxxx-0BA8 FS04-FS06	Yes	Yes	No	No	No
6ED1052-XXX08-0BA0	Yes	Yes	No	No	No
6ED1052-XXX08-0BA1	Yes	Yes	Yes	No	No
6ED1052-XXX08-0BA2	Yes	Yes	Yes	Yes	No
6ED1052-XXX08-0BA3	Yes	Yes	Yes	Yes	Yes

NOTE

To run a circuit diagram created by LOGO!Soft Comfort in previous versions on LOGO! 9 BM, you need to upload the diagram in LOGO!Soft Comfort V9.0 (or later versions) to transfer, then download it to LOGO! 9 BM.

Refer to *LOGO!Soft Comfort Online Help* for more information.

The compatibility of web projects

The table below lists the compatibility between LOGO! modules and web projects created by different tools:

Web project created by	LOGO! 9 BM	LOGO! BM in previous versions [1]
LOGO!Soft Comfort V9.0 (or later versions)	Yes	Yes
LOGO! Web Editor	No	Yes

[1] LOGO! 8.2, LOGO! 8.3, LOGO! 8.4.

NOTE

Refer to *LOGO!Soft Comfort Online Help* for detailed information about User Defined Web Pages project (web project).

The compatibility of LAT (LOGO! Access Tool)

The table below shows the compatibility between LOGO! modules and LAT:

LOGO! modules	LOGO! Access Tool
LOGO! 9	No
LOGO! 8.4	Yes
LOGO! 8.3	Yes
LOGO! 8.1& 8.2 (LOGO! 8.FS4)	Yes
LOGO! 8 (0BA8 Standard)	Yes

The compatibility of communication protocol

The table below shows the compatibility of communication protocol for different LOGO! connections:

Communication	LOGO! 9 BM	LOGO! 0BA8 BM
LOGO! 9 BM	• S7 connection • LOGO! Communication • Modbus connection	• S7 connection • Modbus connection

The compatibility of Master/Slave connection

The table below shows the compatibility of communication protocol for different LOGO! connections:

Slave	Master	
	LOGO! 9 BM	LOGO! 0BA8 BM
LOGO! 9 BM	Yes	Yes
LOGO! 0BA8 BM	Yes	Yes

1.3 ID Link for the digital nameplate

The ID Link is a globally unique identifier according to IEC 61406-1, which you can find as a QR code on your product and the product packaging.

You can recognize the ID Link by the frame with a black frame corner at the bottom right. The ID Link takes you to the digital nameplate of your product. Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app.

In the digital nameplate, you will find product data, manuals, declarations of conformity, certificates and other helpful information about your product.

Below is an example of the ID Link for LOGO! Base Module 12/24RCE and the URL (https://i.siemens.com/1p6ED1052-1MD08-0BA3):

1.4 Certification and approvals

Certification and approvals

LOGO! is certified to cULus and cFMus.

- cULus Haz. and ordinary Loc.
  Underwriters Laboratories Inc. (UL) to
  - UL 61010-1
  - UL 61010-2-201
  - CAN/CSA-C22.2 No. 61010-1-12
  - CAN/CSA-C22.2 No. 61010-2-201
  - UL 121201 (Hazardous Location)
  - CSA C22.2 No.213 (Hazardous Location)

  APPROVED for use in
  Class I, Division 2, Group A, B, C, D T4
  Class I, Zone 2, Group IIC T4
- FM Approval (US Approval and Canada Approval)
  Factory Mutual Research (FM) to
  - Approval Standard Class Number 3611, 3600, 3810
  - ANSI/UL 61010-1
  - ANSI/UL 121201
  - ANSI/IEC60529
  - ANSI/NEMA 250
  - CSN/CSA-C22.2 No. 213
  - CAN/CSA-C22.2 No. 61010-1
  - CAN/CSA-C22.2 No.94

APPROVED for use in
- Class I, Division 2, Group A, B, C, D T4
- Class I, Zone 2, Group IIC T4

⚠ WARNING

Substitution of components can impair the suitability for Class I, Division 2 and Zone 2.

Repair of units must be done by an authorized Siemens Service Center.

NOTE

You will find current approvals on the rating plate of the relevant module.

LOGO! is issued with the CE Certificate of Conformity. It is compliant with following standards:

- EN 61131-2
- EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
- EN IEC 63000
- EN 61010-2-201

ID for Australia

Our products carrying the label shown at the side are compliant with AS/NZS 61000.6.4, AS/NZS 61000.6.3 standard.

ID for Korea

Our products (except the LOGO! CSM modules) carrying the label shown at the side are compliant with Korean standards.

WEEE label (European Union)

Disposal instructions, observe the local regulations and below Recycling and Disposal.

Recycling and disposal

You can fully recycle LOGO! devices due to their low-pollutant equipment. For environmentally friendly recycling and disposal of your old equipment, contact a certified electronic waste disposal company and dispose of the equipment according to the applicable regulations in your country.

UK Conformity Assessed marking

UK CA

The device complies with the designated British standards (BS) for programmable logic controllers published in the official consolidated list of the British Government. The device meets the requirements and protection targets of the following regulations and related amendments:

- Electrical Equipment (Safety) Regulations 2016 (Low-Voltage)
- Electromagnetic Compatibility Regulations 2016 (EMC)
- Regulations on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2012 (RoHS).

UK Declarations of Conformity for the respective authorities are available from:

Siemens AG
Digital Industries
Factory Automation
DI FA TI COS TT
P.O. Box 1963
D-92209 Amberg

The UK Declaration of Conformity is also available for download from the Siemens Industry Online Support website under the keyword "Declaration of Conformity".

FM

c FM us

Approval Standard Class Number 3611, 3600, 3810Factory Mutual Research (FM) in accordance with

Approval Standard Class Number 3611, 3600, 3810

ANSI/UL61010-1, ANSI/UL 121201

CAN/CSA-C22.2 No. 0-10

CSA C22.2 No. 213

CAN/CSA-C22.2 No. 61010-1

APPROVED for use in Class I, Division 2, Group A, B, C, D T4;

Class I, Zone 2, Group IIC T4

Installation Instructions for FM

- WARNING – Explosion Hazard – Do not disconnect while circuit is live unless area is known to be non-hazardous.
- WARNING - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2 or Zone 2.
- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, Group IIC; or non-hazardous locations.

LOGO! modules are therefore suitable for use in industrial and residential areas. Use in Class I, Division 2, Group A, B, C and D locations or in non-hazardous locations is supported.

Identification for Eurasion Customs Union

- EAC (Eurasian Conformity)
- Customs union of Russia, Belarus and Kazakhstan
- Declaration of conformity according to Technical Regulations of the Customs Union (TR CU)

FCC and Canada

USA	
Federal Communications Commission Radio Frequency Interference Statement	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Shielded cables	Shielded cables must be used with this equipment to maintain compliance with FCC regulations.
Modifications	Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
Conditions of operations	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADA	
Canadian notice	This Class A digital apparatus complies with Canadian ICES-003.
Avis Canadian	Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Responsible party for Supplier's Declaration of Conformity

Siemens Industry, Inc.

Digital Factory - Factory Automation

5300 Triangle Parkway, Suite 100

Norcross, GA 30092

USA

Mail to: (amps.automation@siemens.com)

CCCEx approval

The following approvals according to the following standards are valid for a device with the "CCC" marking.

- Standards:
  - GB/T 3836.1-2021 (Explosive atmospheres - Part 1: Equipment - General requirements)
  - GB/T 3836.3-2021 (Explosive atmospheres - Part 3: Equipment protection by increased safety "e")
  - GB/T 3836.8-2021 (Explosive atmospheres - Part 8: Equipment protection by type of protection "n")
- Approvals:
  - Ex ec nC IIC T4 Gc (module with relay outputs)
  - Ex ec IIC T4 Gc
  - -20 °C to +55 °C

Special conditions for safe operation of the devices

- The equipment shall only be used in an area of not more than pollution degree 2, as defined in GB/T 16935.1.
- The equipment shall be installed in an enclosure that provides a minimum ingress protection of IP 54 in accordance with GB/T 3836.1, and accessible only by use of a tool.
- Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.

LOGO! installation and wiring

2

General guidelines

Note the following guidelines for installing and wiring your LOGO!:

- Always ensure you comply with current rules and standards when wiring your LOGO!. 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 (Page 44) from 1.5 mm^2 to 2.5 mm^2.
- Keep the cabling as short as possible. If longer cables are necessary, use shielded cables. Always route your cables in pairs; that it, 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
- Install wires with appropriate strain relief.
- Provide a suitable lightning surge arrester, such as DCO RK E 24, 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.
- Be sure to use only certified components to ensure reliable functioning of equipment.

NOTE

Only qualified personnel who are familiar with and follow general engineering rules, relevant regulations and standards must install LOGO! devices.

⚠ WARNING

Explosion hazard

Do not disconnect equipment while the circuit is live or unless the area is known to be free of ignitable concentrations.

What you must note when installing

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

⚠ WARNING

Attempts to install or wire LOGO! or related equipment with power applied could cause electric shock or faulty operation of the equipment. Failure to disable all power to LOGO! and related equipment during installation or removal procedures could result in death or serious injury to personnel, and/or damage to equipment.

Always follow appropriate safety precautions and be sure to disconnect power from LOGO! before attempting to install or remove LOGO! or related equipment.

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 by authorized or approved personnel.

You can operate LOGO! from the front at any time.

2.1 Modular LOGO! setup

2.1.1 Maximum LOGO! network setup

Maximum LOGO! 9 network setup

LOGO! 9 supports SIMATIC S7/Modbus communication over a 10/100 Mbit/s TCP/IP Ethernet network.

A LOGO! 9 device can support the following network connections:

- A maximum of 16 TCP/IP-based S7/Modbus communication connections with the following devices:
  - All LOGO! devices supporting S7/Modbus connection
  - SIMATIC S7 PLCs with Ethernet functionality
  - Modbus over TCP/IP compatible device
  - A maximum of one SIMATIC HMI that supports Ethernet communication with networked S7 PLCs
  - LOGO! CIM Communication Interface Module devices

  There are two types of connections available for S7/Modbus communication, static connection and dynamic connection. For the static connection, the server reserves the required resources for the connected client to ensure stable data transfer. For the dynamic connection, the server responds to a communication request only when free resources are available. You can configure the static/dynamic connections as required, for example, n static connections and 16-n dynamic connections. LOGO! supports a maximum of eight static connections.

- A maximum of one TCP/IP Ethernet connection with the LOGO! TDE. A LOGO! TDE module can connect with different Base Modules through IP address selection, but can not communicate with more than one Base Module at the same time.
- A maximum of one TCP/IP Ethernet connection between a LOGO! Base Module and a PC with LOGO!Soft Comfort V9.0 (or later versions)

NOTE

LOGO! Communication

For the connection between LOGO! 9 device, Siemens highly recommends LOGO! Communication.

NOTE

For those devices support both S7 and Modbus communications, Siemens highly recommends you connect it to LOGO! network with S7 connection.

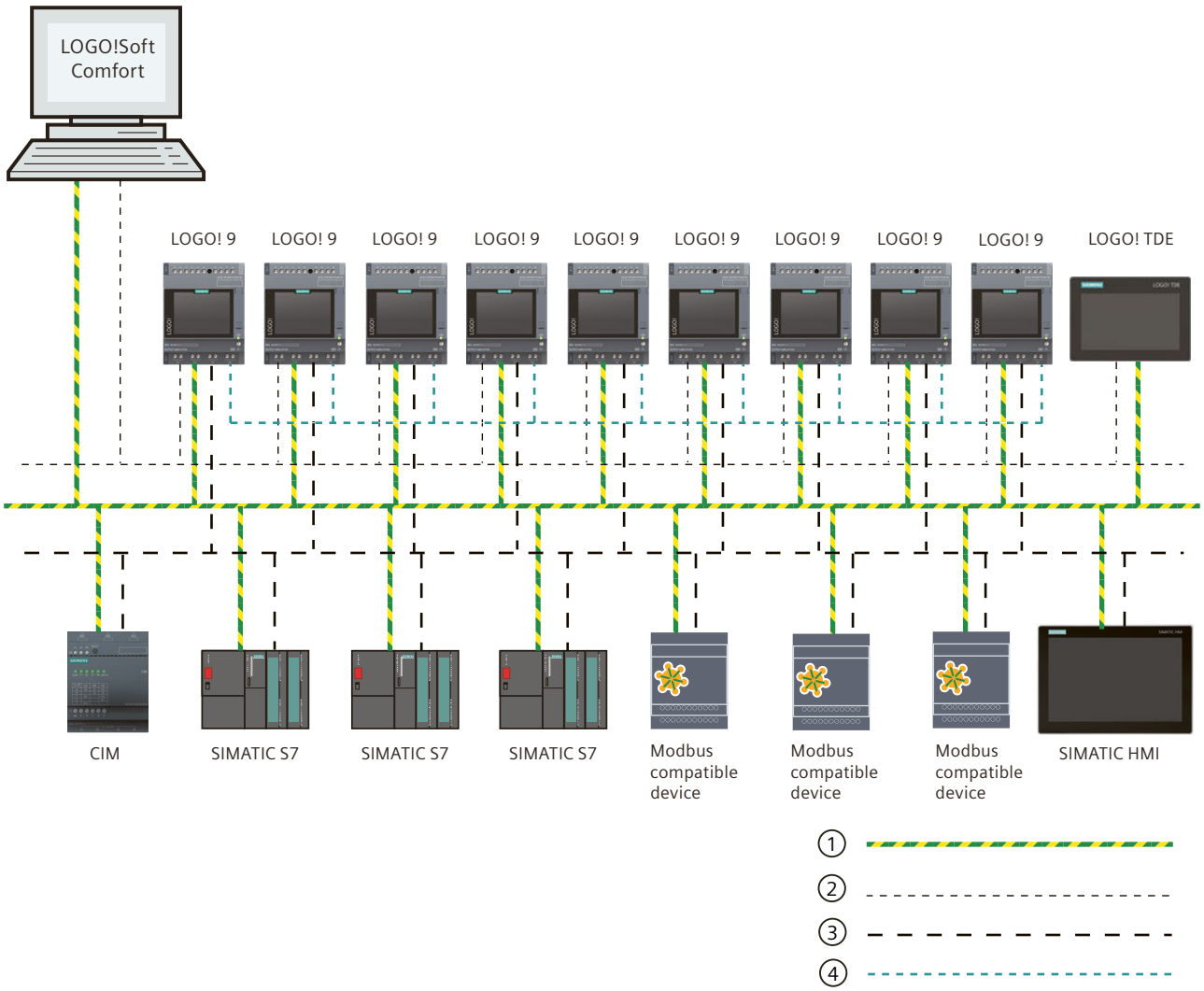
NOTE

For detailed information about security functions on LOGO!, see Chapter Security (Page 256).

NOTE

You can only construct a LOGO! 9 network topology using LOGO!Soft Comfort V9.0 and later versions.

A **typical** LOGO! 9 network setup shows as below:



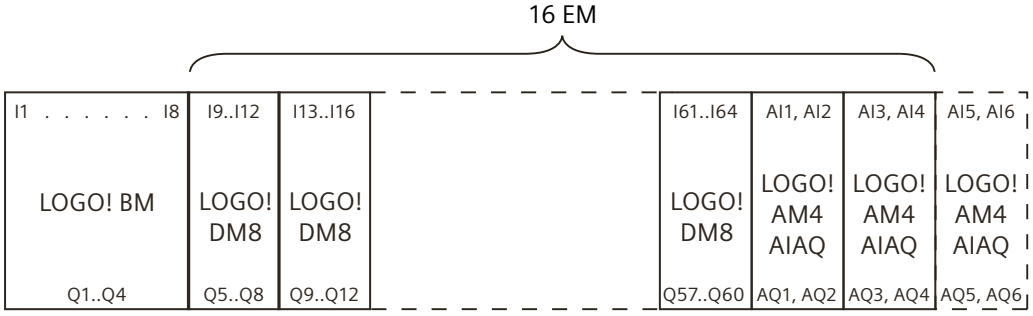
① Physical Ethernet connections
② Logical connection for communication between LOGO! and PC (by TCP/IP-based Ethernet)
③ Logical connections for S7 and Modbus communication between SIMATIC devices (with S7 protocol over TCP/IP)
④ Logical connection for LOGO! 9 Base Modules (with LOGO! Communication)

2.1.2 Setup with Expansion Modules

LOGO! supports a maximum of 64 digital inputs, 16 analog inputs, 60 digital outputs, and 16 analog outputs (Page 14). LOGO! Base Module supports to connect to the maximum of 16 Expansion Modules.

Setup of LOGO! with more than 16 Expansion Modules

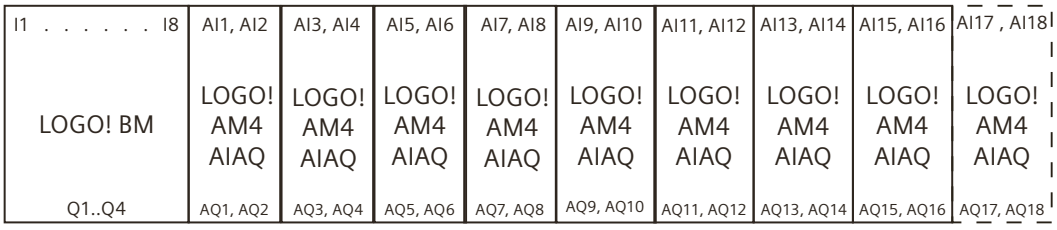
LOGO! Base Module (without analog input), 14 LOGO! DM8 digital modules and 3 LOGO! AM4 AIAQ analog modules (example):



LOGO! Base Module supports to connect to the maximum of 16 Expansion Modules. In this example, the 17th Expansion Module is not detected by LOGO! Base Module thus not functional.

Setup of LOGO! Expansion Modules exceeding AI limits

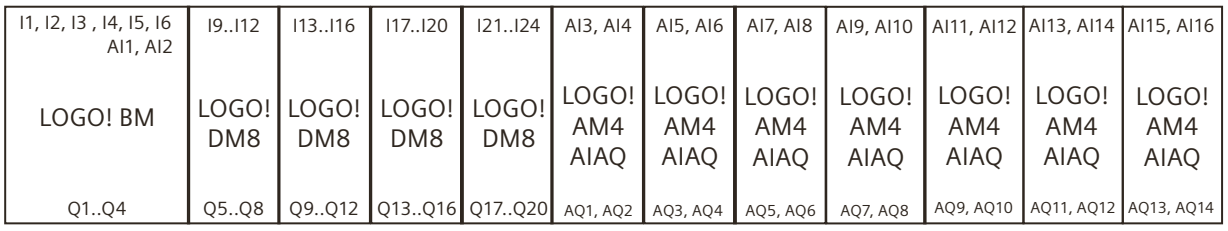
LOGO! Base Module (without analog input), 9 LOGO! AM4 AIAQ analog modules (example):



LOGO! supports at most 16 analog input and 16 analog outputs. In this example, the last LOGO! AM4 AIAQ Expansion Module with AI17, AI18. AQ17, AQ18 is not detected by LOGO! Base Module thus not functional.

Setup of LOGO! with digital and analog Expansion Modules

LOGO! Base Module, 4 digital modules and 7 analog modules (example):



For LOGO! 12/24RCE/12/24RCEo and LOGO! 24CE/24CEo modules, you can configure whether the module uses zero, two or four of the four possible analog inputs. AI inputs are numbered consecutively depending on how many you configure the LOGO! Base Module to use. If you configure two inputs, they are numbered AI1 and AI2, and correspond to the I7 and I8 input terminals. Subsequent AI expansions modules would begin numbering at AI3. If you configure four inputs, they are numbered AI1, AI2, AI3, and AI4, and correspond to I7, I8, I1, and I2 in that order. Subsequent AI expansions modules would begin numbering at AI5. See topics "Constants and connectors (Page 126)" and "Setting the number of AIs in LOGO! (Page 86)".

High-speed/optimal communication performance

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

You install the LOGO! TDE module separately and connect it to the LOGO! Base Module with the Ethernet interface.

2.1.3 Setup with different voltage classes

Rules

You can only connect digital modules to devices of the same voltage class.

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

Overview: Connecting an Expansion Module to the LOGO! Base Module

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

LOGO! Base Module	Expansion modules		
	DM8 12/24R	DM8 230R	AM4 AIAQ
LOGO! 12/24RCE	x	-	x
LOGO! 230RCE	-	x	x
LOGO! 24CE	x	-	x
LOGO! 24RCE	x	-	x
LOGO! 12/24RCEo	x	-	x
LOGO! 230RCEo	-	x	x
LOGO! 24CEo	x	-	x
LOGO! 24RCEo	x	-	x

Overview: Connecting an additional Expansion Module to an Expansion Module

Expansion module	Additional Expansion Modules		
	DM8 12/24R	DM8 230R	AM4 AIAQ
DM8 12/24R	x	-	x
DM8 230R	-	x	x
AM4 AIAQ	x	-	x

2.2 Installing/removing LOGO!

The LOGO! installation dimensions are compliant with DIN 43880.

LOGO! can be mounted to 35 mm DIN rails according to EN 60715 or mounted on the wall with two M4 screws.

LOGO! width:

- LOGO! 9 TDE has a width of 126.8 mm.
- LOGO! 9 Base Modules have a width of 71.5 mm.
- LOGO! 9 Expansion Modules have a width of 35.5 mm.

⚠ WARNING

Hazardous Voltage

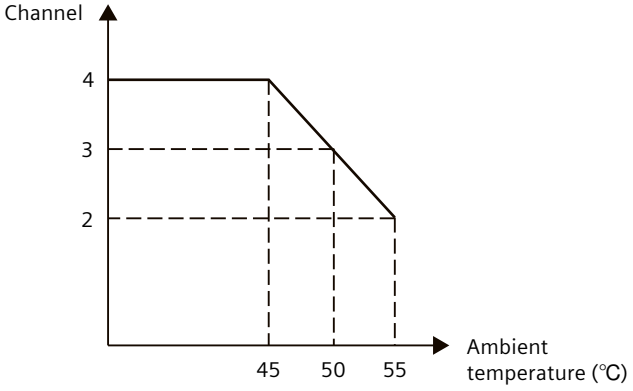
Hazardous electrical voltage can cause electric shock, burns and property damage.

Disconnect your system and devices from the power supply before starting any assembly tasks.

NOTE

LOGO! DM8 230R temperature derating

When the DQ channels of LOGO! DM8 230R are operating at full load (5A), refer to the following temperature derating curve for thermal risk considerations:

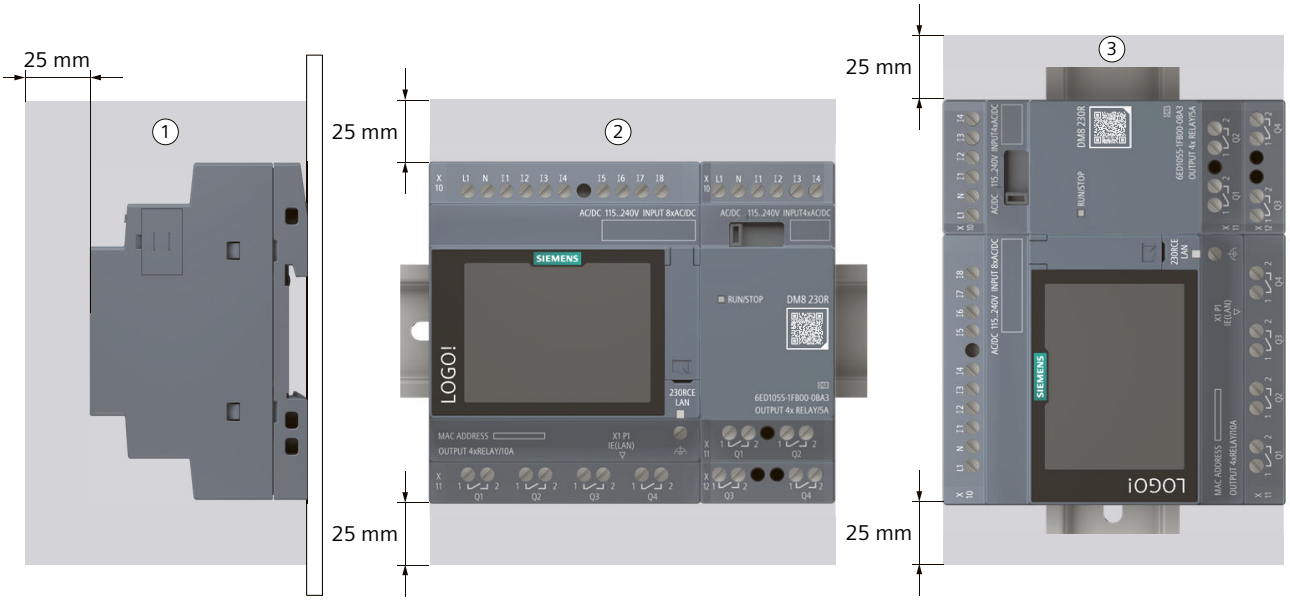


2.2.1 Mounting position

For proper cooling, you must provide a clearance of at least 25 mm above and below the mounting devices. Also, allow at least 25 mm of space between the front of modules and the inside of the enclosure.

LOGO! BM/EM

LOGO! BM and EM support vertical and horizontal mounting position. When planning your layout for LOGO! modules, allow enough clearance for the wiring and communication cable connections.



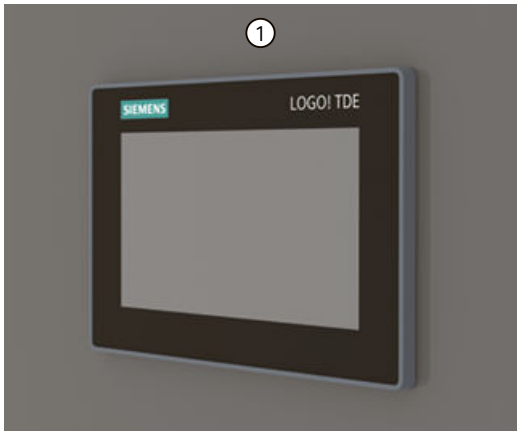
① Side view

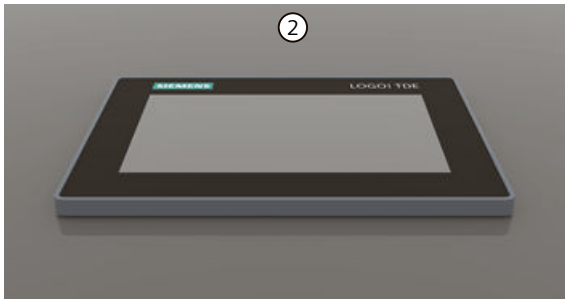
② Horizontal mounting (the mounting devices sit upright)

③ Vertical mounting (the mounting DIN rail is perpendicular to the ground)
Note: it's recommended to mount the Base Module below.

LOGO! TDE

LOGO! TDE supports vertical and horizontal mounting positions.





① Vertical mounting (the mounting plane is perpendicular to the ground)

② Horizontal mounting (the mounting plane is parallel to the ground)

2.2.2 DIN rail mounting

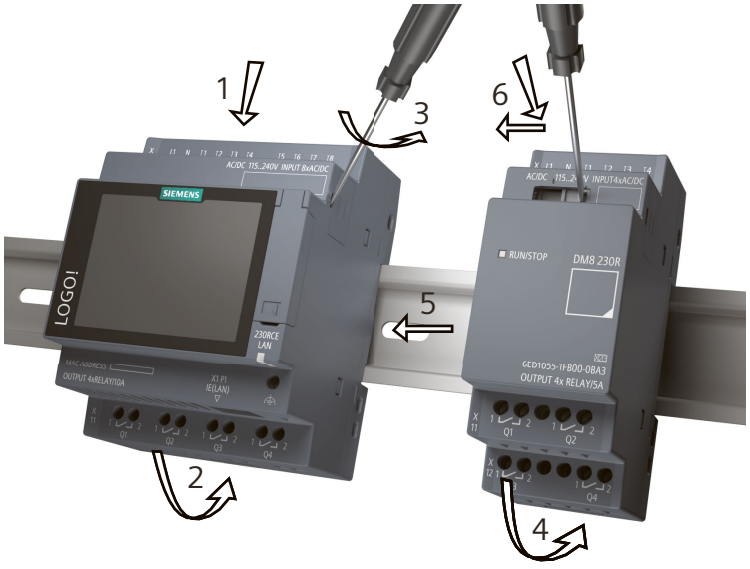
NOTE

The figures below show you an example of the installation and removal of a LOGO! 230RCE and an Expansion Module. The measures shown apply to all other LOGO! Base Module versions and Expansion Modules.

Mounting

To mount a LOGO! Base Module and a digital module onto a DIN rail, follow these steps:

1. Hook the LOGO! Base Module onto the rail.



2. Push down the lower end to snap it on. The mounting interlock at the rear must engage.
3. On the right side of the LOGO! Base Module/LOGO! Expansion Module, remove the connector cap.
4. Place the digital module onto the DIN rail on the right-hand side of the LOGO! Base Module.
5. Slide the digital module towards the left until it contacts the LOGO! Base Module.

6. Using a screwdriver, push the interlock to the left. In its end position the slide interlock engages in the LOGO! Base Module.

Repeat the digital module steps to mount further Expansion Modules.

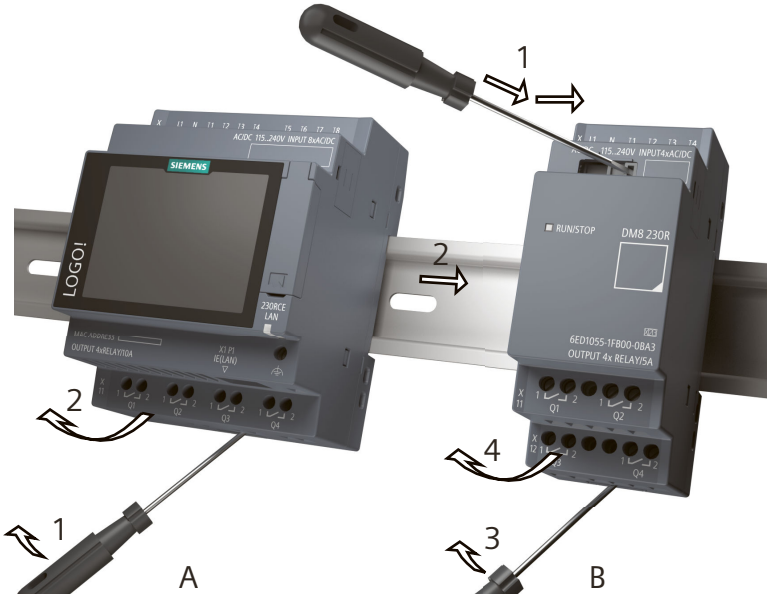
NOTE

Be sure to cover the expansion interface on the last Expansion Module.

Removal

To remove LOGO! if you have installed only one LOGO! Base Module, follow these steps:

1. Insert a screwdriver into the eyelet at the bottom of the slide interlock and move the latch downward.
2. Swing the LOGO! Base Module off the DIN rail.



To remove LOGO! if you have connected at least one Expansion Module to the LOGO! Base Module, follow these steps:

1. Using a screwdriver, push the integrated 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.

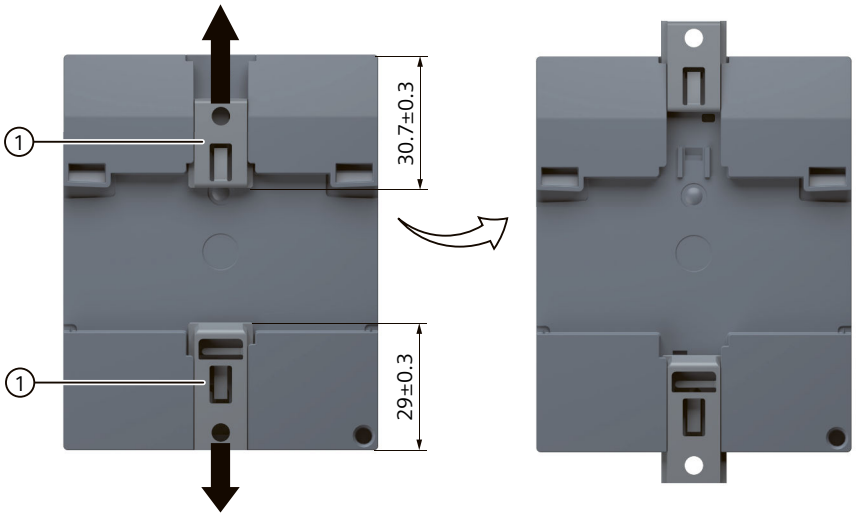
Repeat steps 1 to 4 for all other Expansion Modules.

NOTE

When removing modules, be sure to disengage the slide interlock of the module that connects it to the next module. When removing multiple modules, it is easier to start with the last module on the right side.

2.2.3 Wall-mounting

Follow the instructions below to wall-mount LOGO! by means of two mounting slides and two M4 screws (tightening torque 0.8 Nm to 1.2 Nm).



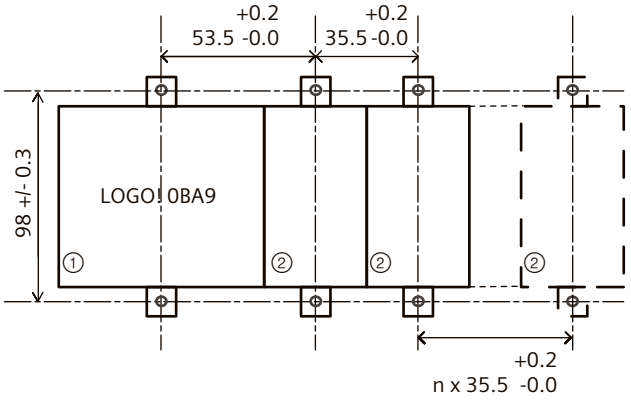
① Mounting slides

NOTE

When you do not wall-mount LOGO!, always keep the mounting slides in the factory default positions, that is, within the data area given in the illustration above; otherwise, the mounting slides may deform if they are exposed to hot and humid surroundings for a long term.

Drilling template for wall-mounting

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



All dimensions in mm

Bore hole for M4 screw, tightening torque 0.8 Nm to 1.2 Nm

① LOGO! Base Module

② LOGO! Expansion Modules

2.2.4 Mounting the LOGO! TDE

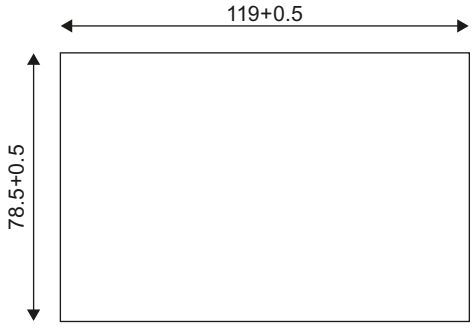
Mounting procedure

NOTE

Make sure you mount the LOGO! TDE vertically on a flat surface of an IP 65 or Type 4X/12 enclosure.

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

1. Cut a 119 mm × 78.5 mm (tolerance: +0.5 mm) hole in the mounting surface. The thickness of the mounting surface (cabinet door or control panel) should be 1.5 mm to 4 mm.



2. Fit the LOGO! TDE into the cutout you made in the mounting surface.
3. Attach the mounting brackets (included) to the LOGO! TDE.

4. Tighten the mounting screws on the mounting brackets to 0.2 Nm torque to secure the LOGO! TDE.

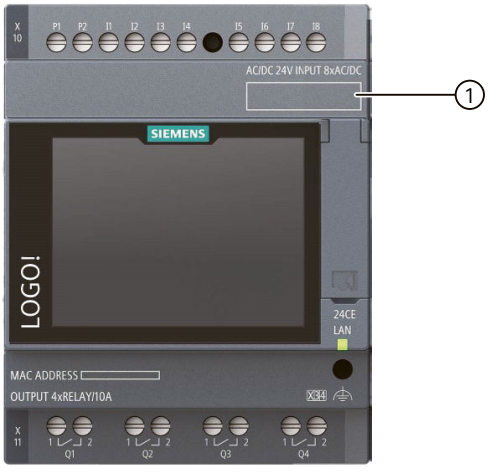
NOTE

The approval information on the back of the device is subject to the actual device.

You can then connect the LOGO! TDE to the LOGO! Base Module through the Ethernet interface.

2.2.5 Labeling LOGO!

The rectangular areas on the LOGO! modules are intended for labeling.



① Labelling area

In the case of Expansion Modules, you can use the rectangular 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 LOGO! Base Module already has 8 inputs or 4 outputs.

2.3 Wiring LOGO!

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

Wire ferrules are not mandatory when wiring terminals. You can use conductors fulfilled the following requirements:

- Cross-sections of up to the following thicknesses:
  - 1 × 2.5 mm^2
  - 2 × 1.5 mm^2 for each second terminal chamber
- Conductor material: Cu
- Tightening torque:
  - LOGO! BM/EM: I/O & power terminals: 0.6 Nm; FE terminals: 0.5 Nm
  - LOGO! TDE: 0.5 Nm

NOTE

Insulation temperature

When LOGO! modules are operating in the worst conditions, that is, an ambient temperature of 55°C and full load (10A continuous) with 14AWG wire, the insulation temperature of the wiring cables should exceed 90°C. If the operating conditions are better than this (lower temperature, lower load, thicker wire), the insulation temperature of the wiring cables can be reduced based on the actual conditions.

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.

⚠ CAUTION

Use copper cables at connectors with terminal connections

Use copper (Cu) cables for all supply lines that are connected to the device with terminals, e.g. 24/240 V DC/AC power supply cables to the 24/240 V DC/AC power supply connectors.

Utiliser des câbles en cuivre sur les connexions à bornes

Utilisez des câbles en cuivre (Cu) pour tous les câbles d'alimentation qui sont raccordés à l'appareil par des bornes, par exemple les câbles d'alimentation 24/240 V CC/CA sur le connecteur d'alimentation 24/240 V CC/CA.

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

⚠ WARNING

Power supply

The device is designed for operation with Safety Extra Low Voltage (SELV) by a limited energy.

The power supply that is connected to the supply connections therefore need to meet the following conditions:

- Limited energy according to IEC 61010-1 / EN IEC 61010-1 / UL 61010-1

Only Safety Extra Low Voltage (SELV) or Protective Extra Low Voltage (PELV) complying with IEC/EN/DIN EN IEC/UL 61010-2-201 can be connected to the power supply terminals.

⚠ CAUTION

Expansion modules DM8 230R must be operated with the same type of power supply (DC or AC) as for the connected 230 V version of the LOGO! Base Module. The same supply output "+/- "on DC power supplies or "N/L" on AC power supplies must connect to the same phase on both the Expansion Module DM8 230R and the connected LOGO! 230 .... Failure to follow the instructions could result in personal injury.

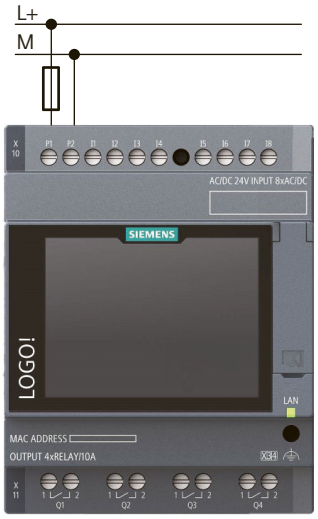
NOTE

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!

Connect LOGO! to the power supply as shown below, depending on whether your power supply is DC or AC:

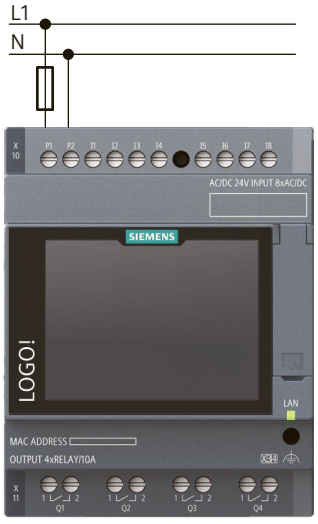
LOGO! with DC power supply



Protection with safety fuse for:

- 12/24RCE/RCEo: ≥ 0.8 A
- 230RCE/RCEo: 1.0 A (UL-listed, CLASS-CC)
- 24RCE/RCEo: ≥ 0.8 A
- DM8 230R: 1.0 A (UL-listed, CLASS-CC)

LOGO! with AC power supply



Protection with safety fuse for:

- 230RCE/RCEo: 1.0 A (UL-listed, CLASS-CC)
- 24RCE/RCEo: ≥ 0.8 A
- DM8 230R: 1.0 A (UL-listed, CLASS-CC)

NOTE

LOGO! provides double and reinforced insulation between the accessible parts and hazardous voltages. Siemens recommends that you connect FE terminal to the earth ground to improve EMC performance.

Circuit protection with AC voltage

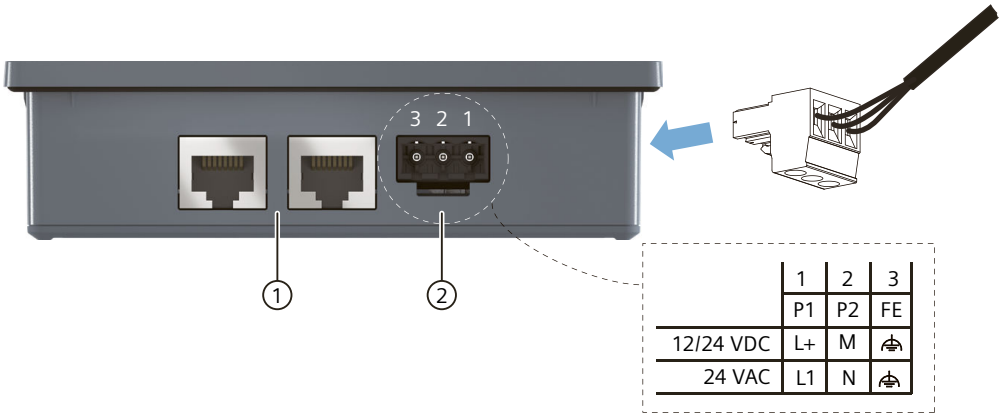
To suppress voltage peaks on the power supply lines, you can install a metal oxide varistor (MOV). Make sure the operating voltage of the varistor (MOV) used lies at least 20% above the rated voltage (for example S10K300E2K1).

Circuit protection with DC voltage

To suppress voltage peaks on the power supply lines, install a protection device, for example DEHN (order number BVT AVD 24).

2.3.2 Connecting the LOGO! TDE power supply

You must connect the LOGO! TDE to an external power supply that supplies a voltage of 12 V DC or 24 V AC/DC. The LOGO! TDE includes a power connector. Connect the power supply to the power connector then plug the power connector to the power supply interface on LOGO! TDE.



① Ethernet interfaces

② Power supply

- The power connection is non-polar. If you connect a DC power supply to the LOGO! TDE, you can connect the positive supply wire or negative supply wire to either pin 1 or pin 2.
- Pin 3 must be connected to the ground.

NOTE

Siemens recommends that you protect the LOGO! TDE with a 0.5 A safety fuse on the power supply.

2.3.3 Connecting LOGO! inputs

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

Refer to Technical data (Page 293) to learn the detailed technical data of module inputs.

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 size of the circuit program determines the program execution time. The appendix "Determining the cycle time (Page 312)" contains a benchmark test routine that you can use to determine the current scan cycle time.

Special features of LOGO! 12/24RCE/RCEo and LOGO! 24CE/24CEo

Fast digital inputs: I3, I4, I5 and I6

These modules include fast digital inputs (up/down counters, threshold triggers). The restrictions mentioned earlier do not apply to these fast digital inputs.

NOTE

Expansion modules do not have fast digital inputs.

Analog inputs: I1 and I2, I7 and I8

You can use the inputs I1, I2, I7 and I8 of LOGO! versions 12/24RCE/RCEo and 24CE/24CEo as either digital inputs or analog inputs. The LOGO! circuit program defines the input mode (digital or analog).

The inputs I1, I2, I7 and I8 provide digital inputs, and the inputs AI3, AI4, AI1 and AI2 provide analog inputs, as described in the topic "Constants and connectors (Page 126)". AI3 corresponds to the input terminal I1; AI4 corresponds to I2; AI1 corresponds to I7; AI2 corresponds to I8. The use of AI1, AI2, AI3 and AI4 is optional. You configure your LOGO! to use either two or four analog inputs as the topic "Setting the number of AIs in LOGO! (Page 86)" describes.

When using inputs I1, I2, I7 and I8 as analog inputs, the only available input signal type is 0 - 10 V.

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:

Voltage	Potentiometer	Series Resistor
12 V	5 kΩ	-
24 V	5 kΩ	6.6 kΩ

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 to ensure a maximum supply of 10 V when you turn the potentiometer one full rotation. With a voltage of 12 V, you can neglect this.

NOTE

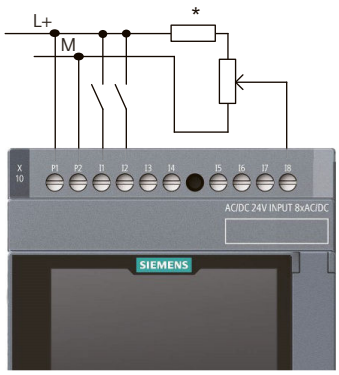
The LOGO! AM4 AIAQ Expansion Module provides additional analog inputs and analog outputs.

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

Sensor connections

Connect sensors to LOGO! as shown below.

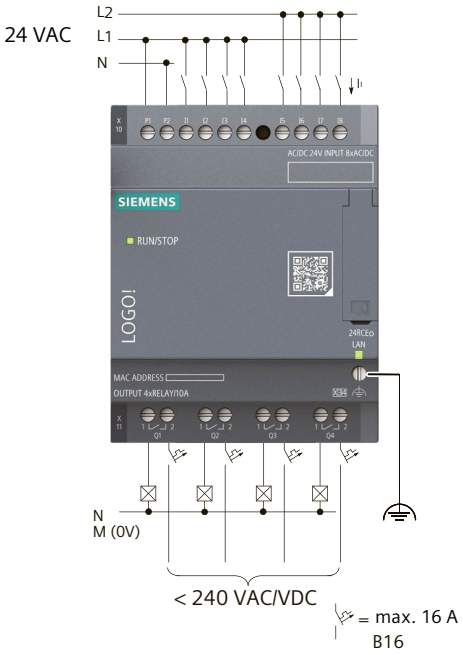
LOGO! 12/24.... and LOGO! 24...



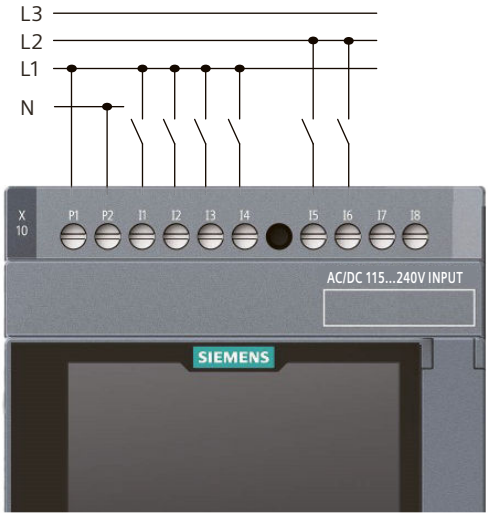
The inputs of these devices are not isolated and therefore require a common reference potential (chassis ground).

With LOGO! 12/24RCE/RCEo and LOGO! 24CE/24CEo modules, you can tap analog signals between the supply voltage and chassis ground (* = series resistor (6.6 kΩ) at 24 V DC).

Connection example



LOGO! 230....

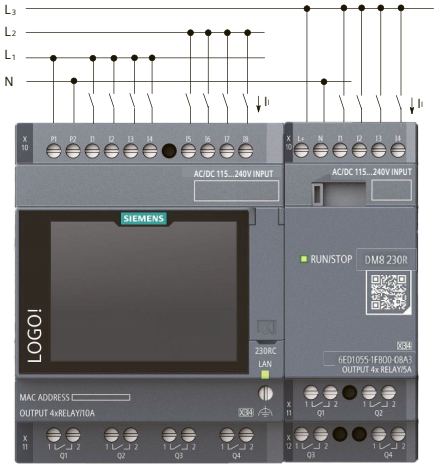


The inputs of these devices are in two groups, each consisting of four inputs. Different phases are only possible between groups, but not within the groups.

Connection example

Two-phase connection of the Base Module

Three-phase connection of the Base Module with an Expansion Module



NOTE

The fuse should be added to each mains input line (L), including power and digital input.

⚠ WARNING

Current safety regulations (VDE 0110, ... and IEC 61131-2, ... as well as cULus) do not permit different phases be connected to one AC input group, whether it is group 1 (I1~I4) or group 2 (I5~I8) or the input of an Expansion Module.

NOTE

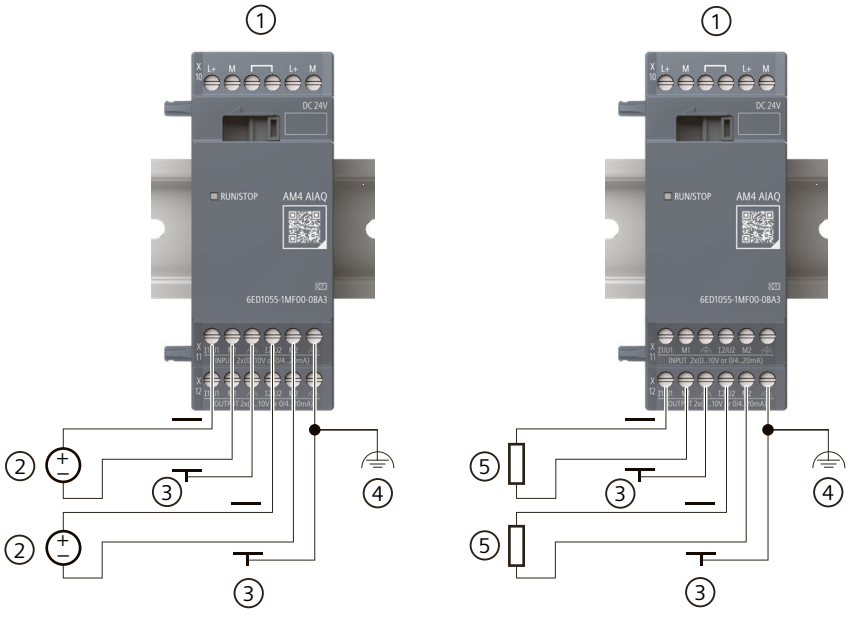
LOGO! 230RCE/230RCEo contains two groups of four inputs, for a total of eight. Within each group, you must operate all inputs on the same phase. Different phases are only possible between the groups.

Example: I1 to I4 on phase L1, I5 to I8 on phase L2.

You must not connect the inputs of the LOGO! DM8 230R to different phases.

LOGO! AM4 AIAQ

Voltage measurement and output



① Jumper terminals disconnected, voltage measurement (0 to 10 V)

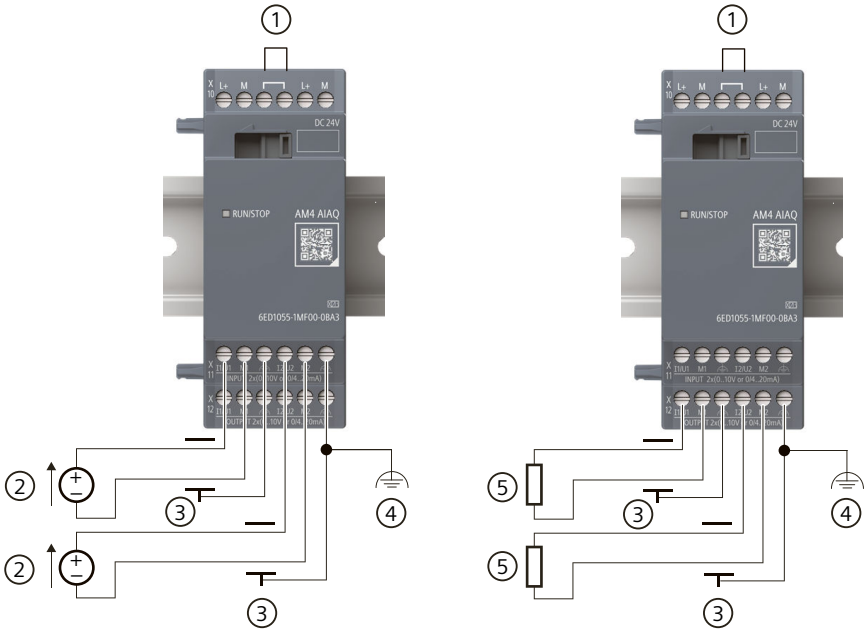
② Voltage source

③ Cable shielding

④ Earth

⑤ Voltage load > 5 kΩ

Current measurement and output



① Jumper terminals connected, current measurement (0/4 to 20 mA)

② Current source

③ Cable shielding

④ Earth

⑤ Current load < 250 Ω

Connecting a two-wire sensor to the LOGO! AM4 AIAQ

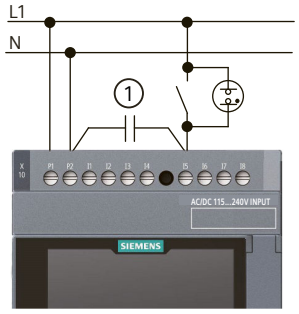
Wire up the two-wire sensor's connecting wires as follows:

1. Connect the sensor's output to connection U/I of the AM4 AIAQ module.
2. Connect the plus connector on the sensor to the 24 V supply voltage (L+).
3. Connect the ground connection of the output M (on the right side of the sensor, as shown in the figure above) to the corresponding M input on the AM4 AIAQ module.
4. Connect/disconnect the mode selection pin (connect for current mode; open for voltage mode).

Example of abnormal working condition

Connecting glow lamps and two-wire proximity switches (Bero) to LOGO! 230RCE/230RCEo or LOGO! DM8 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 that has the glow lamp fitted with a power supply, this response does not occur.



① X1/X2-type capacitor 100 nF, 275 V AC

Take into account the quiescent current of any two-wire proximity switches that you use. The level of the quiescent current of some two-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 (Page 293).

Remedy

To suppress this response, use an X1/X2-type capacitor rated at 100 nF and 275 V AC. 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.

2.3.4 Connecting outputs

LOGO! ...R...

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

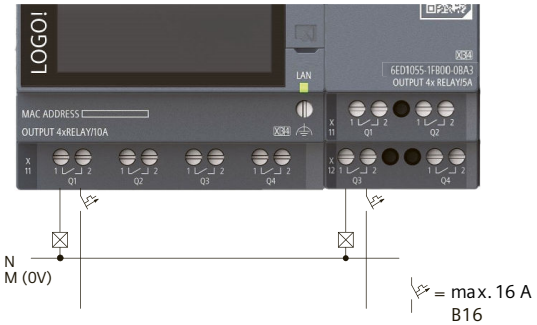
Requirements for relay outputs

You can connect various loads to the outputs; for example lamps, fluorescent lamps, motors and so on. For information on the properties required for the loads connected to LOGO! **...R...**, refer to the technical data (Page 293).

NOTICE
LOGO! Relay contacts may be damaged by a high inrush current.
When low energy lamps or LED Lamps are controlled by LOGO! relay outputs, the energy lamps and/or LED lamps may have a very high inrush current. If the inrush current is not limited, the LOGO! relay contacts may be damaged after some switch cycles.
Use an inrush current limiter to protect the relay contacts.

Connecting

Connect the load to LOGO! **...R...** as shown below:



Load

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

You can identify LOGO! versions with solid-state outputs 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.

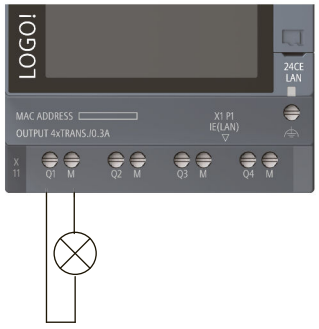
Requirements for solid-state outputs

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

- The maximum switched current is 0.3 A per output.

Connecting

Connect the load to a LOGO! with solid-state outputs as shown below:



Load: 24 VDC, 0.3 A max.

2.3.5 Connecting the Ethernet interface

LOGO! ...E

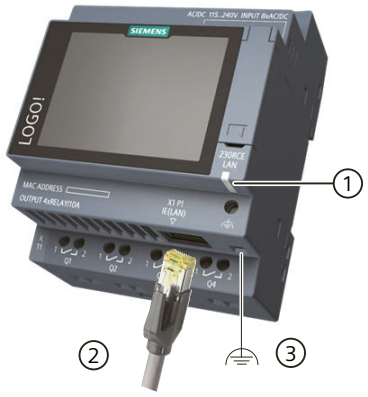
The LOGO! ...**E** version is equipped with a 10/100 Mbit/s Ethernet RJ45 interface.

Requirements for the network cable

Use a shielded Ethernet cable to connect to the Ethernet interface. To minimize electromagnetic interference, make sure you use a standard Category 5 shielded twisted-pair Ethernet cable with a shielded RJ45 connector on each end.

Connecting

You connect the FE terminal to earth ground, and connect a network cable to the Ethernet interface.



① Ethernet status LED

② Ethernet cable, for connecting to the Ethernet interface

③ Earth ground

Ethernet status LED

LED type	Color	Description
Status LED	Flashing green	LOGO! is receiving/sending data across Ethernet.
	Steady green	LOGO! is already connected to Ethernet.

2.4 Putting into operation

2.4.1 Powering on LOGO!

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 micro SD card is inserted
- Whether this is a LOGO! version without display unit (LOGO!...o)
- Whether LOGO! is in RUN mode or STOP mode at the time of power failure

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! Base 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! Base Module.

The reactions of LOGO! when powering on are as follows:

1. If neither LOGO! nor the inserted card contains a circuit program, the LOGO! Basic will display the error notification "Empty program" when you start running it.
2. LOGO! automatically copies the circuit program on the card to memory and overwrites the existing circuit program.
3. If there is a circuit program in LOGO! or on the card, LOGO! adopts the operational state it had prior to power-off. Versions without a display unit (LOGO!...o) automatically change from STOP to RUN (LED changes from red to green).
4. If you have enabled retentivity function, or a function is permanently retentive, LOGO! retains the current values at power-off.

NOTE

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

Before you modify the circuit program, save a backup copy of your original to a card or to a computer using LOGO!Soft Comfort.

2.4.2 Operating states

LOGO! Base Module operating states

LOGO! Base Modules (LOGO! Basic or LOGO! Pure) have two operating states: STOP and RUN.

STOP	RUN
• LOGO! Basic: display the home page • LOGO! Pure: LED is red	• LOGO! Basic: display message page • LOGO! Pure: LED is green
Action of LOGO!: • The input data is not read. • The circuit program is not executed. • The relay contacts are permanently open or the solid-state outputs are switched off.	Action of LOGO!: • LOGO! reads the status of the inputs. • LOGO! uses the circuit program to calculate the status of the outputs. • LOGO! switches the relay/solid-state outputs on or off.

NOTE

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

LOGO! Expansion Modules, operating states

The color of the LED on the Expansion Module indicates the following operating states for LOGO! Expansion Modules.

LED color	Operating states
Steady orange	The Expansion Module receives signals from the Base Module, and is trying to connect to the Base Module.
Steady red	The Expansion Module is disconnected from the Base Module and waiting for signals from the Base Module.
Flashing red	Error. The Expansion Module is connected to the Base Module, yet no I/O is available in the Expansion Module (I/O number configured in the circuit diagram exceeds the limit).
Steady green	The Expansion Module is connected to the Base Module. All the I/O ports on the Expansion Module are in use.
Flashing green	The Expansion Module is connected to the Base Module. Part of the I/O ports on the Expansion Module are in use.

Configuring LOGO! 3

LOGO! 9 supports running a circuit program transferred from LOGO!Soft Comfort, and modifying parameters in the circuit program.

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. To learn how to create a circuit diagram, refer to LOGO!Soft Comfort Online Help.

In this chapter, you will learn how to use LOGO! menu commands to run or stop a circuit program, modify parameters, configure the device, for example, setting the time, network, LCD, menu display language and so on.

NOTE

LOGO! versions without a LCD display unit, that is, the LOGO! 24CEo, LOGO! 12/24RCEo, LOGO! 24RCEo and LOGO! 230RCEo versions, do not have a LCD display unit. These devices are ideal for use in small machine and process equipment engineering systems for series production.

You do not configure LOGO!...o versions directly on the device. Instead, you download a program containing circuit diagram and device configurations to the device from LOGO!Soft Comfort or from memory cards with the program.

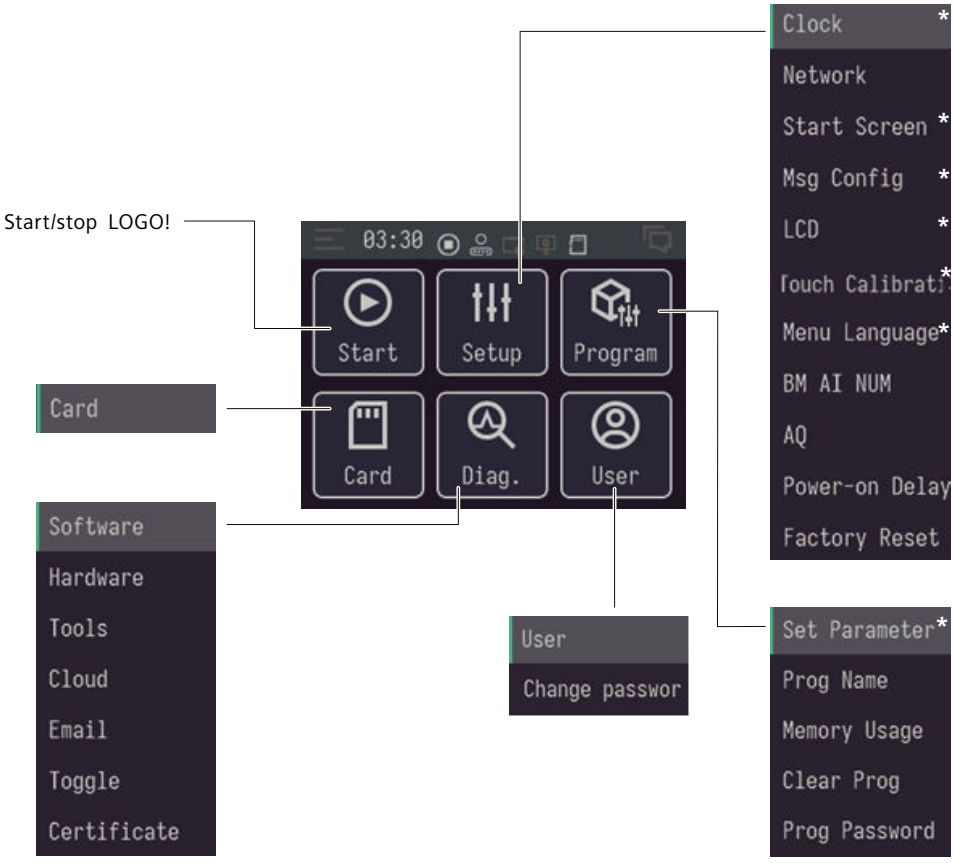
See Chapters "Using memory cards (Page 114)", "LOGO! software (Page 287)" and the Appendix "LOGO! without display ("LOGO! Pure") (Page 314)" for more information.

3.1 LOGO! menus

3.1.1 LOGO! menus overview

LOGO! BM menus overview

The following illustration shows an overview of LOGO! 9 menus with the user of Admin. These commands are only available for LOGO! user role Admin and Maintainer: Start/stop LOGO!, Program Name, Clear Program, Program Password. For more information on menu access with different user roles, refer to Menu access security (Page 279).

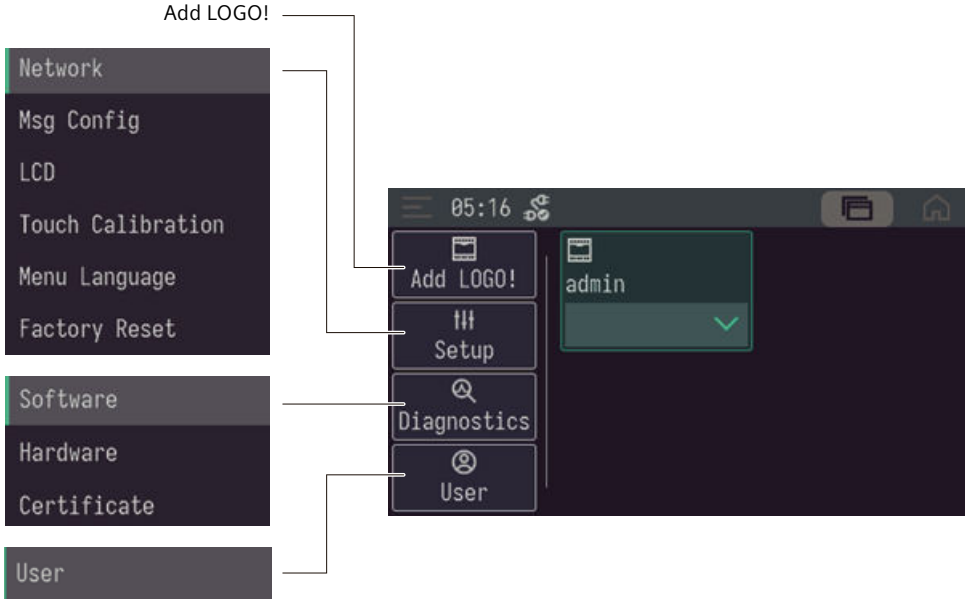


*: these commands are available for configuration regardless of whether LOGO! is in STOP mode or RUN mode. When LOGO! is in RUN mode, certain commands are not available for configuration but only view.

For more information on the menus, refer to the Appendix "LOGO! Basic (Page 316)".

LOGO! TDE menus overview

The following illustration shows an overview of LOGO! TDE menus:



The LOGO! TDE provides the following menus:

- Add BM

  You can use this menu to add at most 6 BM devices. To connect the TDE to a BM device, press the corresponding BM tag. Once connected successfully, the BM tag will be highlighted in green.

  LOGO! BM Admin account and password are required to add and connect BM.

  NOTE

  Connection between TDE and BM

  When the TDE is connected to a LOGO! BM, if you change the LOGO! BM user password, the connection between the BM and the TDE will be cut off immediately. The new password won't be synchronized to the TDE. To restore the connection, you need to update the LOGO! BM user password on the BM tag in the TDE.

- Setup

  You can use commands in this menu to perform the independent configuration of the LOGO! TDE, for example, network setting, menu language setting.

- Diagnostics

  You can use commands in this menu to check the TDE information:

  – Software: TDE firmware version
  – Hardware: MAC address
  – Certificate: TDE certificate strategy and the certificate status

- User

  Display the current LOGO! TDE Admin user information. You can also change the TDE Admin password here. You can also change the TDE Admin password in TDE online settings in LOGO!Soft Comfort.

NOTE

TDE Admin user name and password

There is only one user role of LOGO! TDE: Admin.

You cannot change the user name of Admin.

When you power-on the TDE for the first time or after the device factory reset, you are required to set the Admin password. Then you will automatically log in the TDE as the Admin.

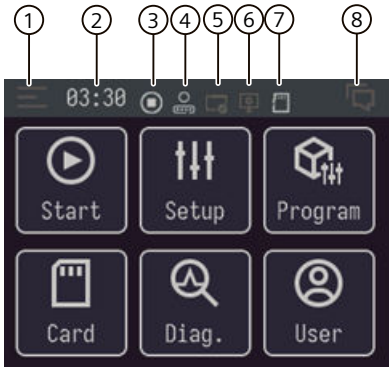
For more information on the menus, refer to the Appendix "LOGO! TDE (Page 320)".

3.1.2 LOGO! status bar and toolbar introduction

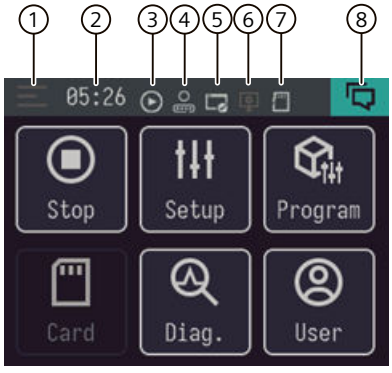
LOGO! status bar

LOGO! provides a status bar on the top of the touch screen.

LOGO! in STOP mode



LOGO! in RUN mode



① Menu button.

When in Program/Setup/Network/Diagnostics/Card menu, press the menu button to call the menu with detailed configuration items.

② Show the LOGO! time.

③ Show LOGO! operating state: STOP or RUN.

④ Show the current login use role: admin, maintainer, operator or viewer.

Refer to Menu access security (Page 279) to learn more about LOGO! user management.

⑤ Show the connection state between the BM and TDE.

⑥ Show if the BM and the connected LOGO!Soft Comfort are in the state of online test.

Learn detailed information about LOGO! online test, refer to *LOGO!Soft Comfort Online Help*.

⑦ Show the micro SD card state.

⑧ Home page button. Press to switch to the home page; switch between the home page and message page when LOGO! is in RUN mode.

Press this button to go to the home page in the menu page.

NOTE

Special flag block

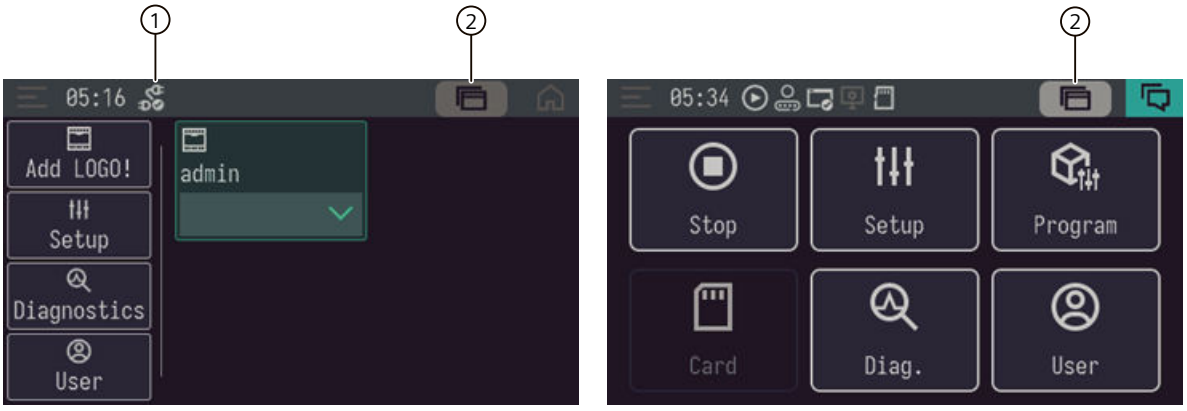
You can use the special flag blocks to control the backlight color display of the status bar:

- M28: LOGO! BM displays amber backlight on the LCD status bar
- M29: LOGO! BM displays red backlight on the LCD status bar
- M30: LOGO! TDE displays amber backlight on the LCD status bar
- M31: LOGO! TDE displays red backlight on the LCD status bar

LOGO! TDE status bar

After LOGO! TDE connects to the BM, you can switch the display of TDE itself and BM.

TDE display view **LOGO! display view on TDE**



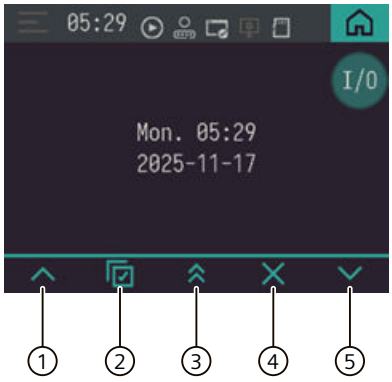
① Show the Ethernet connection status.

② Switch the display of TDE and BM.

When TDE displays the connected BM, only part of the LOGO! menu and settings are available for access on TDE. Refer to LOGO! TDE menu (Page 320) to learn more about LOGO! TDE menu structure.

LOGO! toolbar

When LOGO! is in RUN mode, LOGO! offers you the toolbar in the circuit diagram running page.



① Switch the circuit program message page.

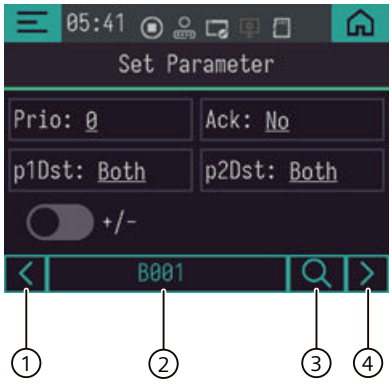
② Acknowledge LCD message (Page 197).

③ Show the four Cursor keys to use.
For LOGO! TDE, in addition to Cursor keys, you can also find the Function keys with this tool.

④ Return to the start screen (Page 98).

⑤ Switch the circuit program message page.

LOGO! offers you the toolbar to select function block for parameter modification. To learn how to set parameters, refer to Configuring parameters (Page 77).



① Switch function block.

② Display the list of all the special function blocks in the circuit program.

③ Block search tool.

④ Switch function block.

3.2 Configuring menu access protection for LOGO!

LOGO! provides the following user roles to limit access to specific menus on LOGO! BM:

- Admin
- Maintainer
- Operator
- Viewer

LOGO! supports at most 11 users. As the Admin, you have the full access to LOGO! BM and LOGO! TDE. You will automatically log in LOGO! as the last login user after powering off and on again.

When you power-on the LOGO! BM for the first time or after the device factory reset, you are required to set the Admin password.

You can create and manage users in LOGO!Soft Comfort. You can only have one LOGO! BM Admin and one LOGO! TDE Admin.

To learn how to manage LOGO! users in LOGO!Soft Comfort, refer to the section Tools -> Transfer -> Access control (LOGO! 9 and later versions only) in *LOGO!Soft Comfort Online Help*.

To learn more about the LOGO! users, refer to Menu access security (Page 279).

NOTE

LOGO! TDE Admin

LOGO! TDE has only one user: Admin. LOGO! TDE Admin is not LOGO! BM Admin.

When you power-on the LOGO! TDE for the first time or after the device factory reset, you are required to set the TDE Admin password.

You can change the TDE Admin password through the menu: User -> Change password in TDE, or through TDE online settings in LOGO!Soft Comfort.

NOTE

User name of Admin

The default user name of LOGO! Admin or LOGO! TDE Admin is admin. Changing Admin's user name is not allowed.

Logging in LOGO! as the Admin

When you power-on the LOGO! BM for the first time or after the device factory reset, you are required to set the Admin password, then log in LOGO! as the Admin.

To log in LOGO! BM as the Admin for the first time, follow these steps:

1. Press the password input field to enter the editing page.
2. Enter the password using the touch keyboard (Page 69).
3. Press ✓ button to confirm the password.
4. Press Apply button.

   Then you log in LOGO! as the Admin and the home page displays.

NOTE

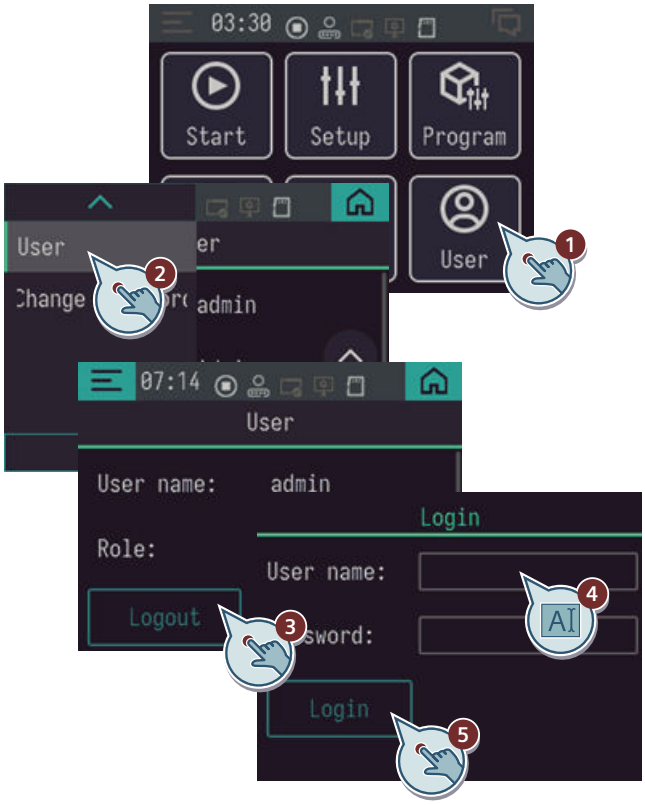
Strong password

For menu access security, Siemens recommend that you set a strong password. Strong passwords are at least eight characters in length; mix letters, numbers, and special character; are not words that can be found in a dictionary; and are not names or identifiers that can be derived from personal information. Keep the password secret and change it frequently.

Switching LOGO! users

You can switch user when LOGO! is in RUN or STOP mode. But if you log in LOGO! as a Viewer or Operator, you don't have the access to start or stop LOGO!.

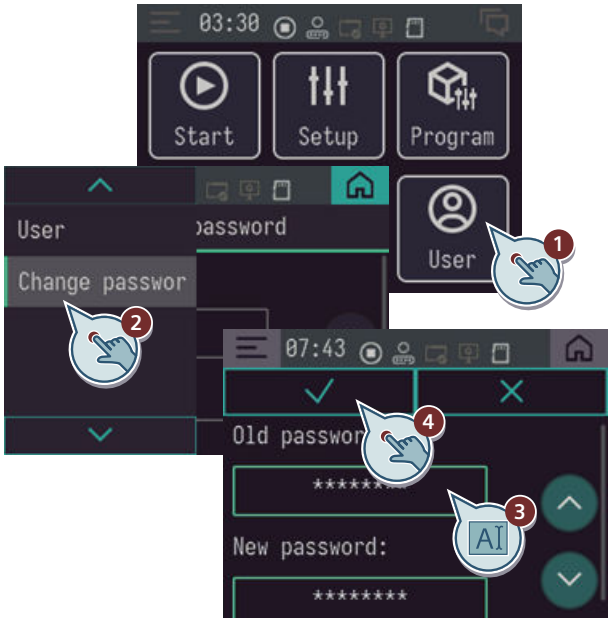
To switch user, follow these steps:



1. Press User in the home page.
2. Press User in the menu.
3. Now you can see the current user name and role.
4. Press Logout button to log out the current user.
5. Enter the another user name and the password using the touch keyboard.
6. Press Login button.
7. Then you log in LOGO! as another user and the home page displays.

Changing user password

To change the user password, follow these steps:



1. Press User in the home page.
2. Press Change password in the menu.
3. Enter the old password and new password using the touch keyboard.
4. Press ✓ button to implement the change.
5. After the change succeeds, the home page displays.

You can also change the user password in LOGO!Soft Comfort. Refer to section "Tools -> Transfer -> Access Control" in *LOGO!Soft Comfort Online Help* for the detailed information.

3.3 Using touch keyboard

You can use the touch keyboard in LOGO! BM and LOGO! TDE to enter characters for parameter setting, program name setting or password setting.

Using touch keyboard

Here we take entering program name as an example. Press the text field to enter the editing page:

① Text input field
② Delete key
③ Upper/lower case switch key
④ Number switch key
⑤ Special character switch key
⑥ Character selection cursor

To enter texts using the touch keyboard, press the corresponding key. A letter key or special character key represents three or four characters. Thus, to enter certain characters, you need to press one key multiple times continuously. For example, to enter the program name as "LOGO", follow these steps:

1. Press the upper case switch key.
2. Press the JKL key three times continuously till the letter L appears in the selection cursor. Then the selection cursor moves behind the letter L automatically. You have entered letter L successfully.
3. Press the MNO key three times continuously to enter letter O.
4. Press the GHI key one time to enter letter G.
5. Press the MNO key three times continuously to enter letter O. Now you have entered "LOGO" in the text input field successfully.
6. Press ✓ button to confirm the input. Or press X button to cancel the input.

Available character set

The following character set is available in the soft keyboard:

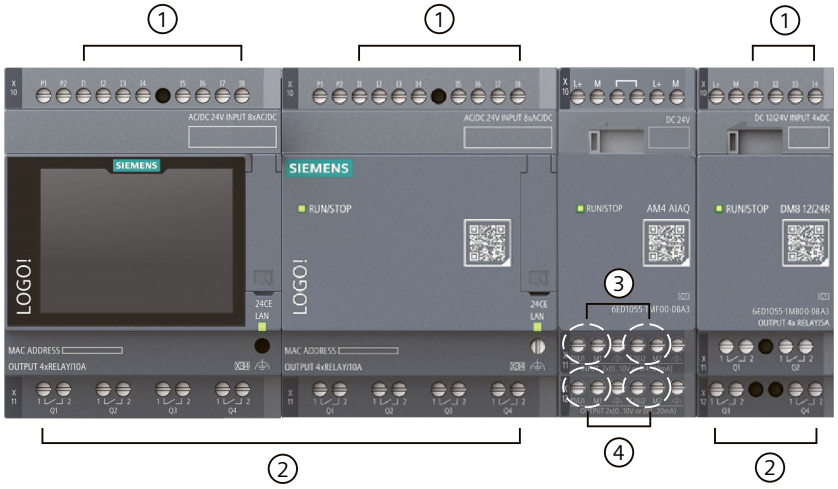
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	0	1	2	3	4
5	6	7	8	9	!	"	#	$	%	&	'	(	)	*	+
,	-	.	/	:	;	<	=	>	?	@	[	\	]	^	_
`	{	|	}	~	a	b	c	d	e	f	g	h	i	j	k
l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	

3.4 LOGO! circuit program

3.4.1 Connectors and blocks

LOGO! is equipped with inputs and outputs

Example of a configuration with several modules:



① Digital inputs
② Digital outputs
③ Analog inputs
④ Analog outputs

The illustration shows the conceptual usage of the inputs, not the actual physical markings on the module.

The letters I followed by numerals identify the inputs. When you look at LOGO! from the front, you can see the input terminals at the top. Only analog modules LOGO! AM4 AIAQ has the inputs and outputs at the bottom.

The letters Q followed by numerals identify the outputs. 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/O numbers follow the installation order of the modules.

For LOGO! 9 series, the following I/O and flag blocks are available for creating your circuit program from LOGO!:

- I1 to I64, AI1 to AI16, Q1 to Q60, AQ1 to AQ16, M1 to M128, AM1 to AM128, and FAM1 to FAM32
- 32 shift register bits S1.1 to S4.8
- 4 digital Cursor keys C1 ▲, C2 ▼, C3 ◄ and C4 ►
- 4 digital LOGO! TDE Function keys: F1, F2, F3, and F4
- 128 open connectors X1 to X128

If you have previously configured any of the network digital or analog inputs/outputs NI1 to NI512, NAI1 to NAI128, NQ1 to NQ480, NAQ1 to NAQ128, NFAI1 to NFAI16, and NFAQ1 to NFAQ16 in your circuit program from LOGO!Soft Comfort, after downloading the circuit program to LOGO!, these network digital or analog inputs/outputs are available in the LOGO!; however, you can not edit the rest of the program from the LOGO!, except for the Par parameter.

See the "Constants and connectors (Page 126)" topic for more details.

The following applies to inputs I1, I2, I7 and I8 of LOGO! 12/24... and LOGO! 24CE/24CEo 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. With the addition of two new analog inputs, these modules optionally use I1 for AI3 and I2 for AI4. See the graphical representation in the topic on "Setup with Expansion Modules (Page 34)". 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' and 'lo' connectors make it easier for you to create the circuit program. 'hi' (high) is assigned the status '1', and '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.

LOGO! has the following connectors :

Connectors	LOGO! BM		DM8	AM4 AIAQ
Inputs	LOGO! 230RCE LOGO! 230RCEo LOGO! 24RCE LOGO! 24RCEo	Two groups: I1 to I4 and I5 to I8	I9 to I12	AI1 to AI2
	LOGO! 12/24RCE LOGO! 12/24RCEo LOGO! 24CE LOGO! 24CEo	I1, I2, I3-I6, I7, I8 AI3, AI4 ... AI1, AI2		
Outputs	Q1 to Q4		Q5 to Q8	AQ1 to AQ2
lo	Logical '0' signals (off)			
hi	Logical '1' signals (on)			
Flags	Digital flags: M1 to M128 Analog flags: AM1 to AM128 Float analog flags: FAM1 to FAM32			
Shift register bits	S1.1 to S4.8			
Network inputs	NI1 to NI512			
Network analog inputs	NAI1 to NAI128			
Network outputs	NQ1 to NQ480			
Network analog outputs	NAQ1 to NAQ128			
Network float analog inputs	NFAI1 to NFAI16			
Network float analog outputs	NFAQ1 to NFAQ16			

DM: Digital Module

AM: Analog Module

LOGO! function blocks

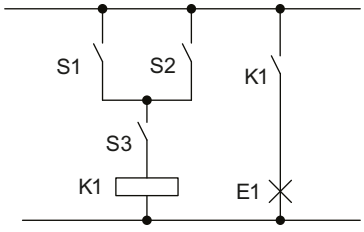
A function block represents a function that is used to convert input information into output information. Previously you have to wire the individual elements in a control cabinet or terminal box. When you create the circuit program in LOGO!Soft Comfort, you interconnect the blocks.

To learn detailed information of LOGO! function blocks, refer to LOGO! functions (Page 126) and LOGO!Soft Comfort Online Help.

3.4.2 From circuit diagram to LOGO! program

View of a circuit diagram

The following illustration shows a typical circuit diagram that represents the circuit logic:

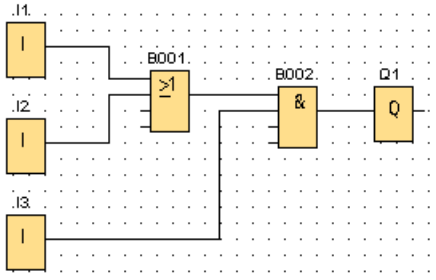


The switches (S1 OR S2) AND S3 activate the relay K1 and switch on the load at E1.

Wiring and the circuit diagram in LOGO!Soft Comfort

Wiring of the LOGO!

Circuit diagram in LOGO!Soft Comfort



The above wiring takes a 24 V AC version of LOGO! as an example.

NOTE

Although you have four inputs available for logic operations (Page 131), most of the views 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.

Unused inputs

The circuit program automatically assigns the unused connectors a status that ensures proper functioning of the relevant block.

In our example we shall use only two inputs of the OR block and two inputs of the AND block; the third and fourth inputs are unused.

Now connect the I/O to LOGO! .

Wiring

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

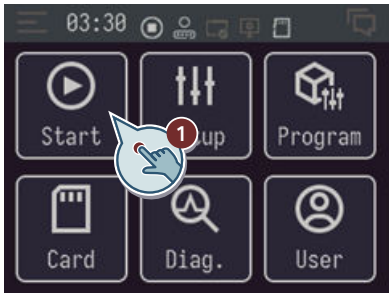
- S1 to connector I1 of LOGO!
- S2 to connector I2 of LOGO!
- S3 to connector I3 of LOGO!

The output of the AND block controls the relay at output Q1. The load E1 connects to output Q1.

3.5 Starting the circuit program

3.5.1 Switching LOGO! to RUN mode

To switch LOGO! to RUN mode, follow these steps:



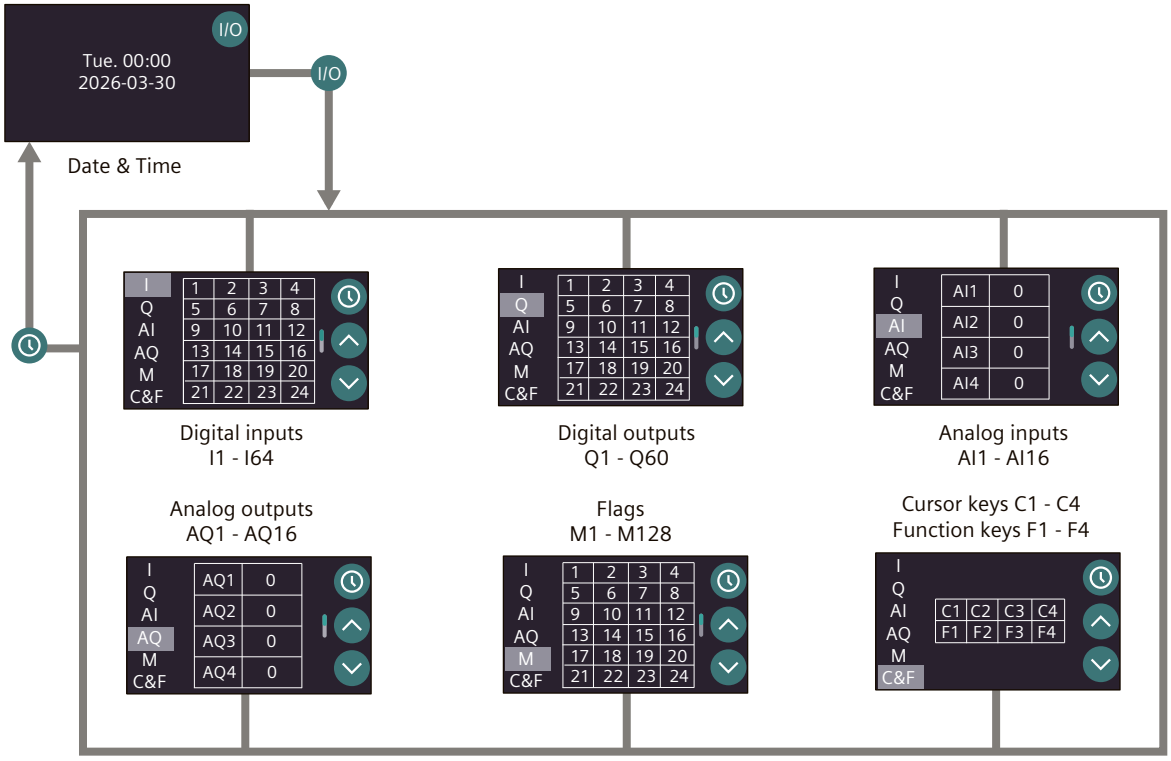
1. Press Start in the home page.

   LOGO! runs the circuit program and shows either the message page or the start screen depending on your configuration.

The start screen of LOGO! displays one of the following:

- Clock: date and current time-of-day (only for versions with real-time clock).
- Input DI
- Output DQ
- Input AI
- Output AQ
- M flags
- Cursor keys
- Menu

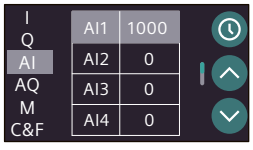
You can select the default setting for the start screen that LOGO! displays in RUN mode. For more information, see Section "Setting the start screen (Page 98)".



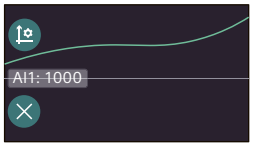
Viewing the analog value changes

You can view the value changes of each analog I/O in the form of a trend curve when LOGO! is in RUN mode. For example, to view the value changes of AI1, follow these steps:

1. Switch LOGO! to RUN mode.
2. Press to go to the AI status page.



3. Press AI1. The display now shows the AI3 value changes in the form of a curve, for example:



The display refreshes continuously and the curve shifts to the left of the display bit by bit. Press to use the tools to adjust the display of the trend view: full screen, zoom in or out, move up or down. Press to close the analog value trend view.

NOTE

Analog value record

LOGO! refreshes the display of analog values every one second, and keeps recording analog values continuously for five minutes. If you power off and on again, or change the operating mode START → STOP → START, the previous analog values record will be lost.

What is meant by: "LOGO! is in RUN"?

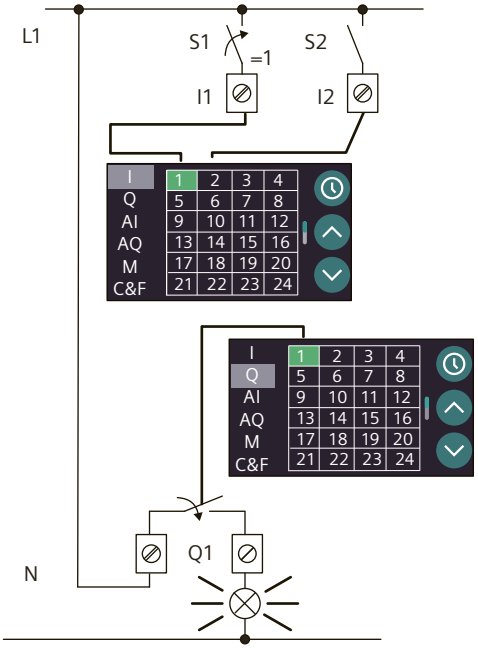
In RUN mode, LOGO! executes the circuit program. LOGO! first reads the status at the inputs, determines the status of the outputs by means of the circuit program, and switches these on or off according to your settings.

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

In this example, only the inputs I1, I2 and I4, and the outputs Q1 and Q8 are set "high".

Status indication on the display

Using the example, you can see how LOGO! displays the input and output states:



When switch S1 is closed, the status at input I1 is high.

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.

3.5.2 Configuring parameters

When LOGO! is running a circuit program and blocks are not in protection mode, you can configure block parameters.

NOTE

Block protection mode

If a block is in protection mode, all parameters of the block are not configurable when LOGO! is in RUN mode.

Refer to Parameter protection (Page 138) and setting parameter protection (Page 79) for more information.

Parameters

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

A block number (Bxxx) and the short name of the parameter identifies each 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 LOGO! Software (Page 287)).

Selecting a function block

To select a function block, follow these steps:

1. Press Program in the home page.
2. Press Set Parameter in the menu.
3. Select the function block using the toolbar (Page 62).
4. If the selected block is programmable, all the parameters of the block will be displayed.

Setting parameters

LOGO! displays parameters that can be configured with an underline. You cannot configure parameters without an underline.

To configure parameters, follow these steps:

1. Long-press the parameter with an underline to enter the editing page.
2. Use the touch keyboard to modify the value, then press ✓ button the confirm the input.
3. The parameter is now marked with a green rectangle to show is has been modified.
4. Press the ✓ button to apply the setting.

You can also modify a parameter on an active message page for a running circuit diagram. Refer to LCD Message (Page 197) for more information.

NOTE

When changing the time parameter if 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 the "On-delay (Page 145)" topic). In this case you can neither change the value nor the timebase. The current time is reset to zero when you change the timebase.

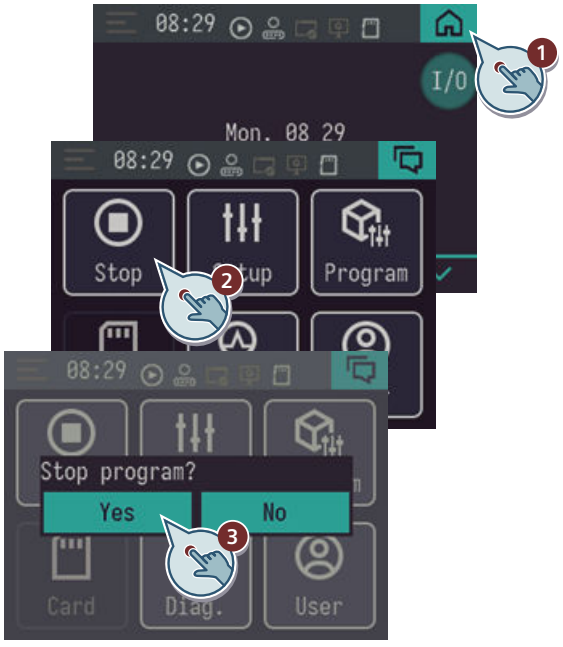
3.6 Configuring LOGO! in STOP mode

The menu commands listed in this section are only available to configure when LOGO! is in STOP mode.

3.6.1 Switching LOGO! to STOP mode

Stopping the circuit program

To switch the LOGO! from RUN mode to STOP mode, follow these steps:



1. Press the home page button in the status bar to go to the home page.
2. Press Stop.
3. Press Yes to confirm the operation.

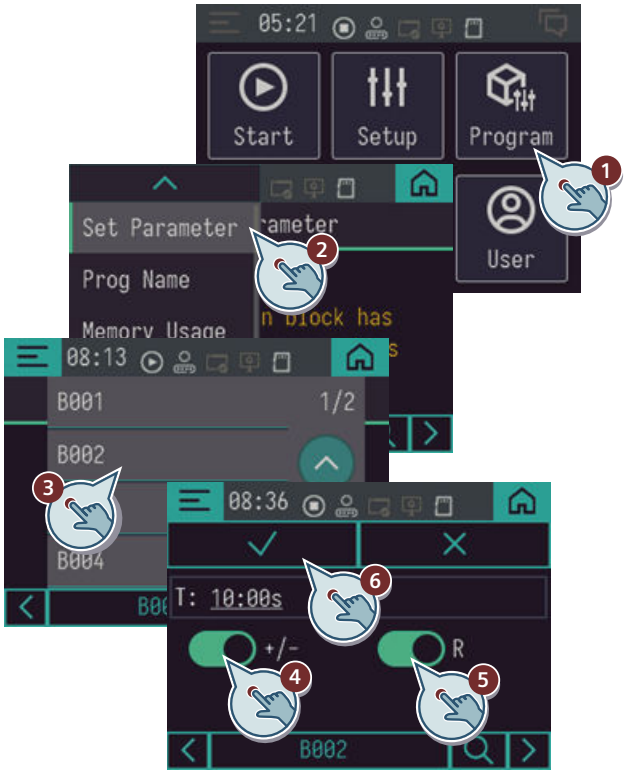
Setting the parameter protection and retentivity

When the parameters are in protection mode, you cannot configure these parameters when LOGO! is in RUN mode. Refer to Parameter protection (Page 138) to learn more about it.

When the special function block is set to retentive, LOGO! remains current data values after a power failure, and that the block resumes operation at the break point. Refer to Retentivity (Page 138) to learn more about it.

You can only enable or disable parameter protection or retentivity for a block when LOGO! is in STOP mode.

To enable or disable parameter protection and retentivity when LOGO in STOP mode, follow these steps:



1. Press Program in the home page.
2. Press Set Parameter in the navigation menu.
3. Select the function block (Page 77) you want to enable or disable the parameter mode.
4. Press the **+ / -** button to enable or disable the parameter protection mode.
5. Press the **R** button to enable or disable the retentivity.
6. Press the ✓ button to apply the setting.

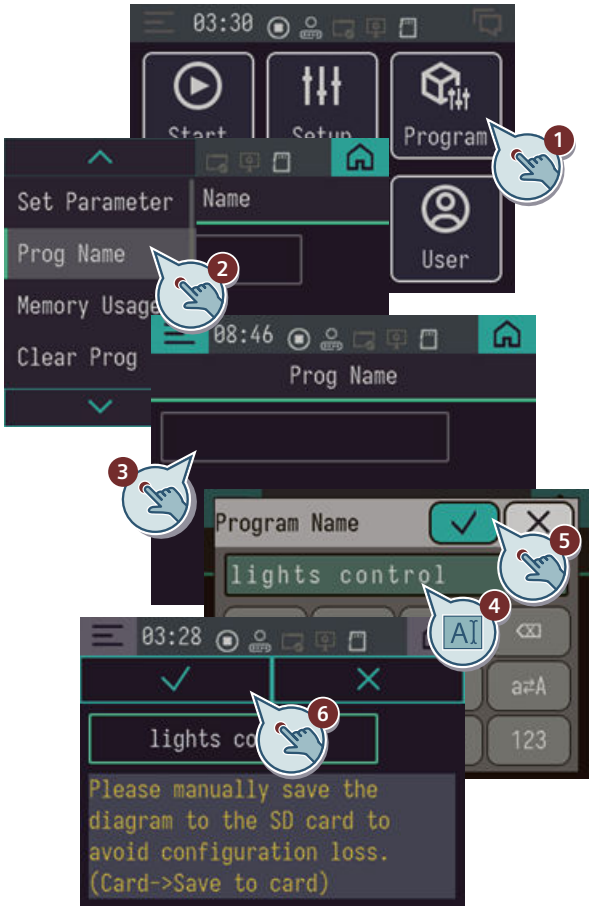
3.6.2 Assigning a circuit program name

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

NOTE

You can change the name of the circuit program in STOP mode only. If you have saved a password-protected circuit program, you can change the name of the circuit program only after you have entered the correct password (refer to section "Setting circuit program password (Page 82)"). You can read the circuit program name in both STOP mode and RUN mode.

To assign or change the circuit program name, follow these steps:



1. Press Program in the home page.
2. Press Prog Name in the menu.
3. Press the text field to enter the editing page.
4. Use the touch keyboard to enter the program name.
5. Press ✓ button to confirm the input.
6. Press ✓ button to confirm the operation.

NOTE

Circuit program name input limit

The length of circuit program name cannot exceed 16 bytes. All characters in the touch keyboard are supported for the circuit program name. To learn about the supported character set, refer to Using touch keyboard (Page 69).

NOTE

Save to SD card

The assigned or changed program name and program password will not be automatically synchronized to the inserted micro SD card. You need to save the settings to the micro SD card manually using the command Save to card (Page 116)in the BM menu. Otherwise, the program name and program password will be overwritten by the configuration loaded from the micro SD card after BM power off and on again.

3.6.3 Setting circuit program password

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

You can assign, change, or deactivate a program password from a LOGO! Basic, LOGO!Soft Comfort or a LOGO! TDE.

NOTE

There is only one circuit program protection password that you can assign for LOGO!.

NOTE

Siemens recommends you transfer password with secure communication (Page 257).

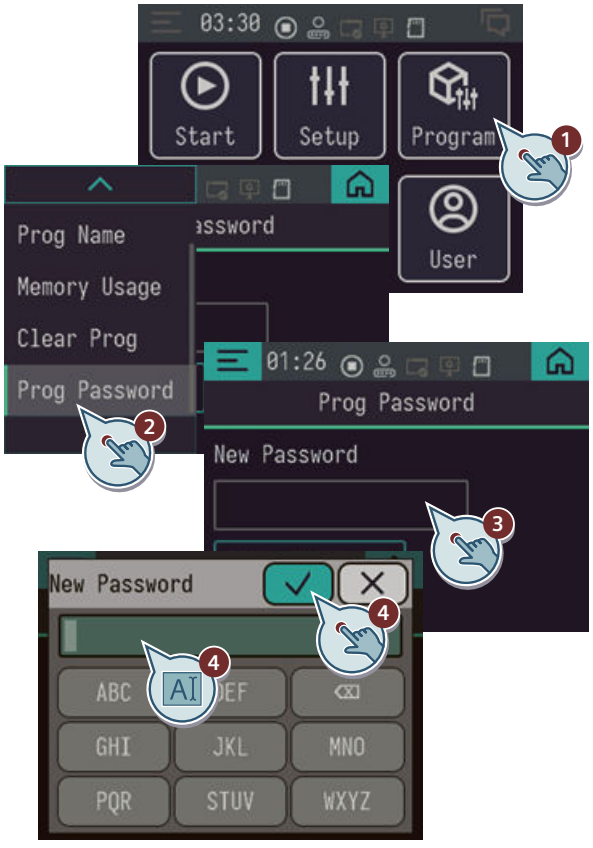
NOTE

You can assign a password with the maximum length of 10 bytes and only consisting of upper case letters.

You can assign, edit or deactivate the password on LOGO! Basic only in STOP mode.

Assigning a program password from LOGO! Basic

To enter a password, follow these steps:



1. Press Program in home page.
2. Press Prog Password in the menu.
3. Press the text filed to enter the editing page.
4. Use the touch keyboard to enter the password.

   Then press ✓ button to confirm the input.

   A message dialog appears to remind you that the password is changed successfully.

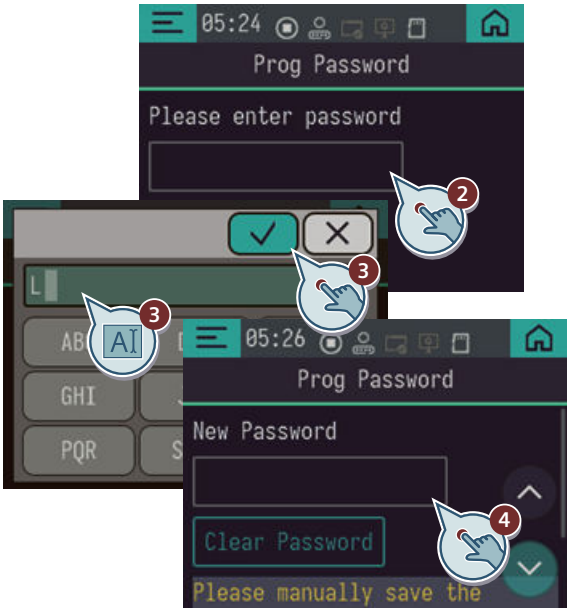
NOTE

You can also set your password using LOGO!Soft Comfort or LOGO! TDE. You cannot edit a password-protected circuit program in a LOGO! Base Module 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 (with micro SD card), you first need to assign a password to this new program. Refer to Program copy protection (Page 260) to learn more about program copy protection on a micro SD card.

Changing the password from LOGO! Basic

You must know the current password in order to change it. From the Program menu, follow these steps to change the password:



1. Press Prog Password in the menu.
2. Press the text field to enter the editing page.
3. Use the touch keyboard to enter the current password.

   Then press ✓ button to confirm the input.
4. If the input password is verified, now you access the new password assigning page.

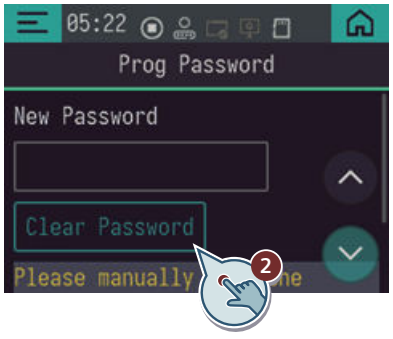
   Press the text field to input the new password.

   A message dialog appears to remind you that the password is changed successfully.

Clearing the password from LOGO! Basic

To clear the password to allow, for example, another user to configure parameters in the program, you must know your current password.

To clear the password, follow these steps in the Program menu:



1. Follow the above steps to enter the current password and access the new password assigning page.
2. Press Clear Password button.

   A message dialog appears to remind you that the password is cleared.

NOTE

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

Password: Wrong Password!

If you enter the **wrong** password and confirm the input, you are not authorized to access the desired parameter configuration pages.

NOTE

Save to SD card

The assigned or changed program name and program password will not be automatically synchronized to the inserted micro SD card. You need to save the settings to the micro SD card manually using the command Save to card (Page 116)in the BM menu. Otherwise, the program name and program password will be overwritten by the configuration loaded from the micro SD card after BM power off and on again.

3.6.4 Clearing the circuit program and password

To clear a circuit program and the password if one is defined, follow these steps:

1. Press Program in the home page.
2. Press Clear Prog in the menu.
3. Press Apply button.
4. Press Yes to confirm the operation.

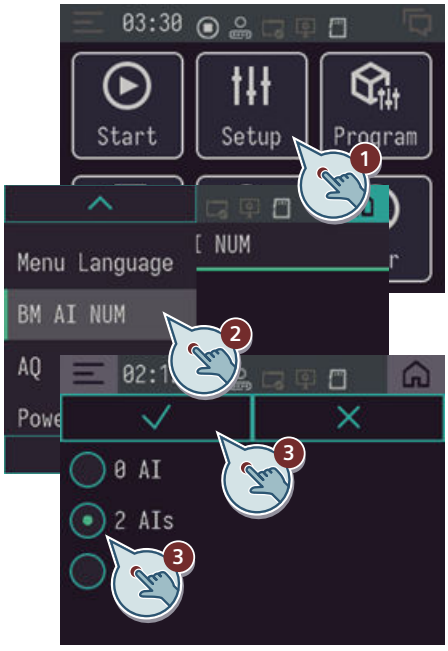
   LOGO! goes back to the home page automatically after the clearing completes.

3.6.5 Setting the number of AIs in LOGO!

LOGO! 12/24RCE/RCEo and LOGO! 24CE/24CEo support up to four onboard inputs that can be used as either digital or analog inputs (0 V to 10V). Inputs I7 (AI1) and I8 (AI2) are available as analog inputs by default, whether you use them or not. Inputs I1 (AI3) and I2 (AI4) are optional analog inputs. LOGO! provides a menu where you can choose to use two analog inputs (the default, AI1 and AI2), or four, or even zero. Regardless of the settings, inputs I1 and I2 can be used as digital inputs. To use them as analog inputs AI3 and AI4, you must set the number of analog inputs to four. Note that the number of configured analog inputs on LOGO! affects the subsequent numbering of analog inputs on attached Expansion Modules (refer to Setup with Expansion Modules (Page 34)).

You can set the number of AIs in STOP mode only.

Follow these steps to set the number of analog inputs:



1. Press Setup in the home page.
2. Press BM AI NUM in the navigation menu.
3. Press the radio button to make the selection.

   Then press ✓ button to confirm the selection. The setting take effect immediately.

3.6.6 Setting analog outputs

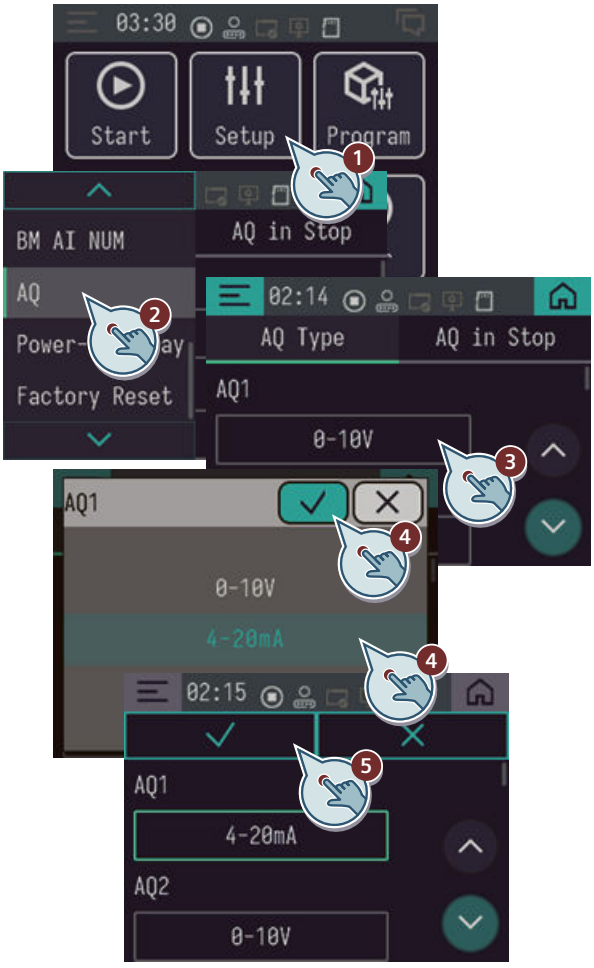
Defining the type of analog outputs

You can set the following types of analog outputs:

- 0-10 V
- 4-20 mA
- 0-20 mA

The default setting is 0-10 V.

To change the type of analog outputs, follow these steps:



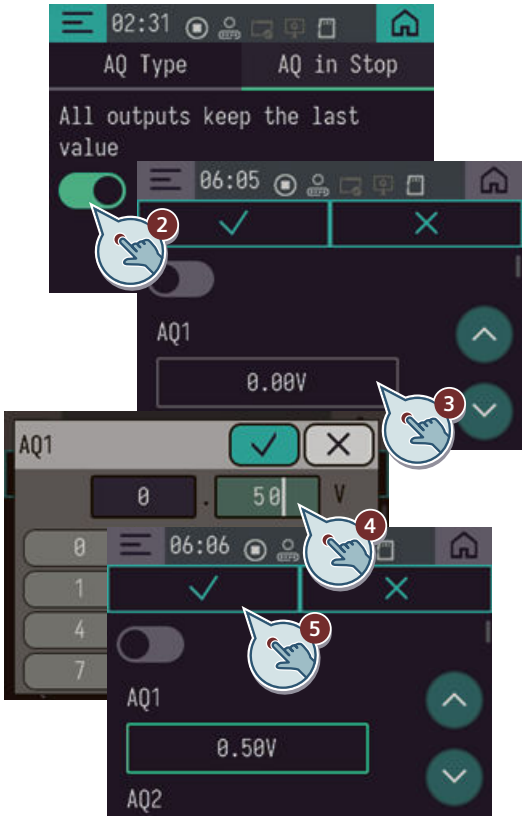
1. Press Setup in the home page.
2. Press AQ in the menu.

   Now you can see all the AQ type default settings. To see all the 16 AQ settings, swipe the LCD up/down, or press ▲ ▼ button.
3. Press the AQ type configuration you want to change to enter the configuration page.
4. Scroll the LCD up/down, or just press the configuration to select. Then press ✓ button to confirm the selection.
5. Now you can see the changed setting field is highlighted in green rectangle.

   Press ✓ button to take the change into effect.

Selecting analog outputs values for RUN/STOP transition

You can set the behavior of up to 16 analog outputs when LOGO! changes from RUN mode to STOP mode. To view the default behavior for analog outputs for a RUN-to-STOP transition, follow these steps:



1. Press AQ in Stop tab.

   You can see that the default setting, that LOGO! holds the values of the analog outputs at their last values.
2. Press the button to disable the default setting.
3. Now you need to define specific values for the AQs.

   Press the text filed to enter the editing page.
4. Use the touch keyboard to enter the value. Then press ✓ button to confirm the input.
5. The modified field is highlighted in green rectangle.

   Press ✓ button to apply the setting.

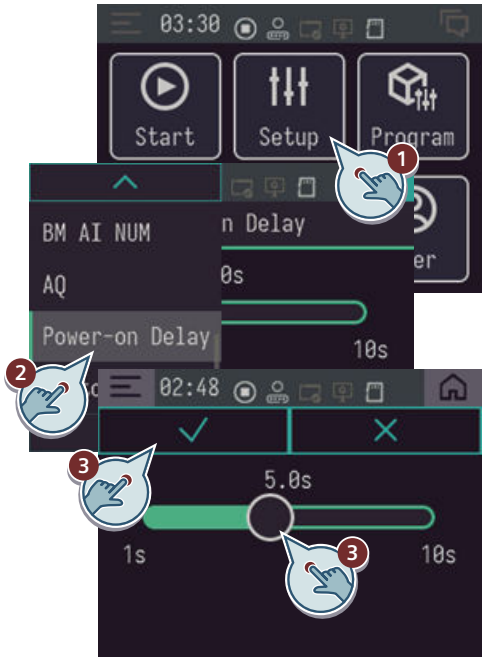
3.6.7 Setting the power-on delay of LOGO!

You can set a power-on delay for LOGO! to make sure all the connected Expansion Modules are powered on and ready to use before LOGO! runs the circuit program.

NOTE

Note: When LOGO! starts running the diagram but receives unexpected I/O values (for example, 0), it means that the connection between BM and EM is not ready while the diagram is running. In this case, you need to set a longer power-on delay time.

To set the power-on delay, follow these steps:



1. Press Setup in the home page.
2. Press Power-on Delay in the navigation menu.
3. Drag the slider left or right to decrease or increase the delay time. Or press any point on the bar to define the delay time. The delay time value range is 1 to 10 seconds.

   Press ✓ button to confirm the configuration.

3.6.8 Configuring network settings

A LOGO! 9 device can establish network communication with other LOGO! 9 devices, SIMATIC S7 PLCs, a SIMATIC HMI, CIM (Communicative Interface Module) devices or a PC with LOGO!Soft Comfort V9.0 or later versions. For more detailed information, refer to the Maximum LOGO! network setup (Page 31) topic.

You can configure the LOGO! 9 network only from LOGO!Soft Comfort V9.0 or later versions. From LOGO! 9, you can configure your LOGO!'s network settings including IP address, subnet mask, gateway and DNS.

NOTE

You can configure LOGO!'s network settings including IP address, subnet mask and gateway with the access level of administrator only. With the access level of operator, you can only view but cannot change the network settings.

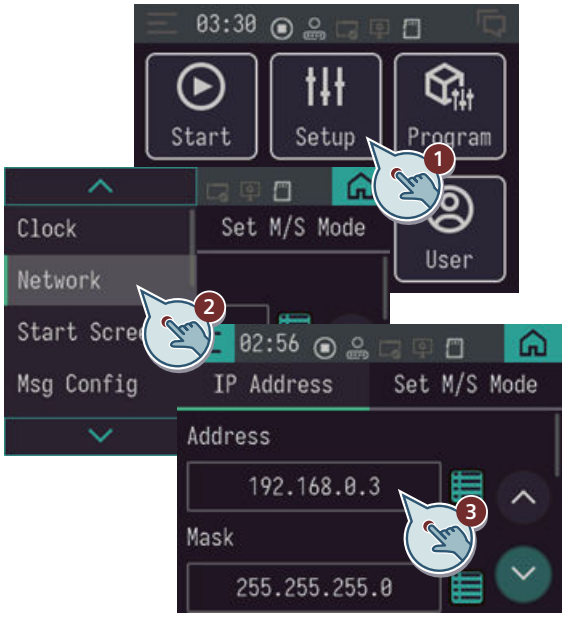
For detailed information about Network security on LOGO!, see Chapter Security (Page 256).

Configuring the network settings

LOGO! 9 provides a menu command for configuring network settings when LOGO! is in STOP mode.

NOTE

You can only view the LOGO!'s network information when the BM is in RUN mode.



1. Press Setup in the home page.
2. Press Network in the menu.

   Now you can see the default network information of the LOGO!. To see all the information, swipe the LCD up/down, or press ⌃ ⌄ button.
3. To change the network settings, press the corresponding text field to call the touch keyboard. Change the settings then press ✓ button to save the changes.

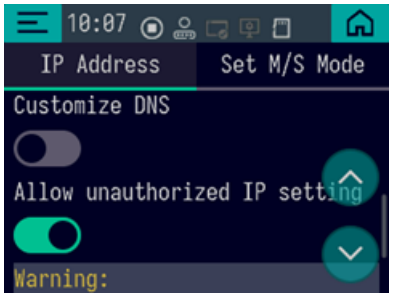
   You can also press ☰ to call the list of history settings. Select one from the list, then press ✓ button to confirm the selection.

NOTE

The default IP address for LOGO! 9 BM: 192.168.0.3.

The default IP address for LOGO! 9 TDE: 192.168.0.2.

Here in the Network menu, you can also customize the DNS, and set Allow unauthorized IP setting.



Customize DNS:

1. Press to enable Customize DNS.
2. Input the DNS address.

Note: Customize DNS is disabled by default. If you choose to use the customized DNS, to ensure that LOGO! can access to the service provider server, for example, IoT Cloud, MQTT, email service, you need to configure the correct DNS address.

Contact the corresponding service provider for the correct DNS address.

Allow unauthorized IP setting:

Allow unauthorized IP setting is enabled by default. This allows IP settings by LOGO!Soft Comfort in case of IP conflicts. However, this may also lead to unauthorized IP settings from LOGO!Soft Comfort.

It's highly recommend to disable this option after IP settings are finished in the system.

Transferring the circuit program to LOGO!Soft Comfort

After you have finished the network settings, you can transfer the circuit program from LOGO! to LOGO!Soft Comfort using the transfer command LOGO!→PC in LOGO!Soft Comfort. For further information on uploading the circuit program to LOGO!Soft Comfort with this transfer menu command, refer to *LOGO!Soft Comfort Online Help*.

3.6.9 Changing LOGO! to master/slave mode

LOGO! 9 provides a menu command for network communication settings. This section shows you how to change LOGO!'s network communication mode.

A LOGO! 9 device works in either **master** or **slave** communication mode.

Master mode versus slave mode

A LOGO! 9 in master mode supports client-server communication with SIMATIC S7 PLCs, a SIMATIC HMI, CIM devices or other LOGO! 9 devices across Ethernet. This LOGO! can additionally act as a master to communicate with one or more LOGO! 9 devices in slave mode.

A LOGO! in slave mode functions as a LOGO! Expansion Module. LOGO! slave devices do not require a circuit program. A master LOGO! can read one or more slave LOGO!'s digital/analog input/output values and write its own digital/analog output values to these slaves. This helps LOGO! achieve network I/O expansion.

NOTE

A LOGO! in slave mode can also have its own Expansion Modules. It also supports a maximum of 64 digital inputs, 16 analog inputs, 60 digital outputs and 16 analog outputs.

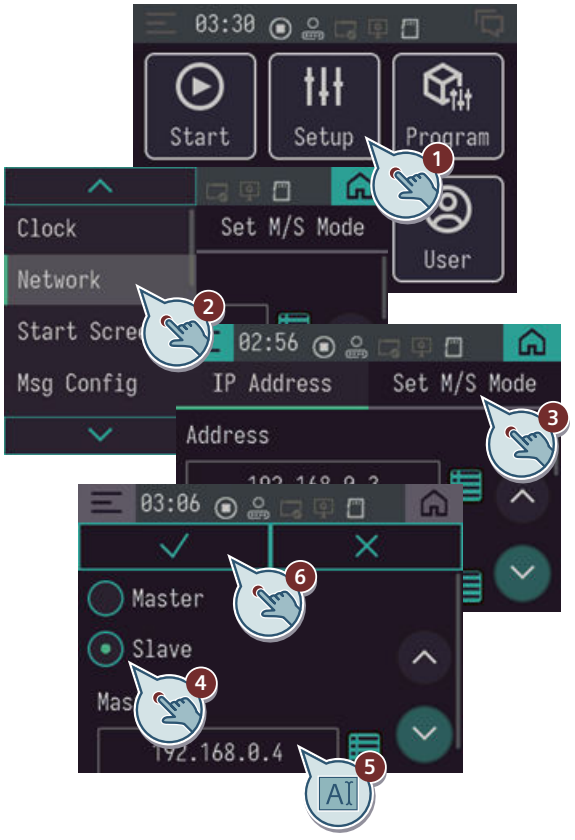
NOTE

Change LOGO! to slave mode will enable the unsecure port 102 and 8102.

NOTE

You can only change LOGO! to master/slave mode when LOGO! is in STOP mode.

Changing LOGO! from master mode to slave mode



1. Press Setup in the home page.
2. Press Network in the menu.
3. Press Set M/S Mode tab.

   You can see that LOGO! is in Master mode.
4. Press the radio button in front of Slave.
5. Now you need to configure the IP of the master device. Press the text field to call the touch keyboard. Change the settings then press ✓ button to save the changes.

   You can also press ☰ to call the list of history settings. Select one from the list, then press ✓ button to confirm the selection.
6. Press ✓ button to save the changes.

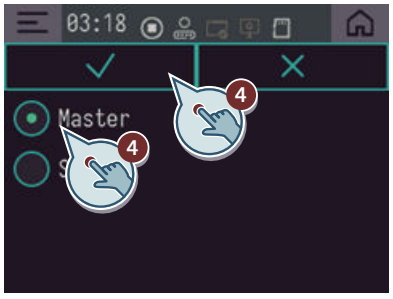
   You have now successfully changed LOGO! from master mode to slave mode. LOGO! restarts automatically and then displays the home page.

   For both LOGO! Basic and LOGO! Pure, the device automatically switches to RUN mode after being powered off and on again.

NOTE

When LOGO! is in slave mode, you can not edit contents in the circuit program and the inserted micro SD card.

Changing LOGO! from slave mode to master mode



1. Press Setup in the home page.
2. Press Network in the menu.
3. Press Set M/S Mode tab.

   You can see that LOGO! is in Slave mode and the IP information of the Master device.
4. Press the radio button in front of Master.

   Press ✓ button to save the changes.

   You have now successfully changed LOGO! from slave mode to master mode. LOGO! restarts automatically and then displays the home page.

Alternatively, you can change LOGO! from slave mode to master mode from LOGO!Soft Comfort. If you download a circuit program and configuration to a LOGO! in slave mode from LOGO!Soft Comfort, LOGO! will change to master mode and then restart automatically. For more information, refer to the *LOGO!Soft Comfort Online Help*.

Besides, you can also change LOGO! master or slave mode by loading the device configuration from the micro SD card.

3.7 Configuring LOGO! in STOP or RUN mode

Regardless of whether the LOGO! Basic is in RUN mode or STOP mode, you can set the following values:

- **Clock**: set the default values for time-of-day and date, time zone, NTP (Network Time Protocol), and summertime/wintertime conversion (Page 94)
- **Start Screen**: select the default setting for the start screen (Page 98) that displays on LOGO! when LOGO! transfers to RUN mode
- **Message Configuration**: set the message page display (Page 99) that apply to all LCD Message function blocks (Page 197)
- **LCD**: set the LCD brightness and screen saver (Page 100)
- **Touch Calibration**: calibrate the LOGO! Basic touch screen (Page 101)
- **Menu Language**: set the LOGO! display language (Page 101)

3.7.1 Setting clock

Setting the time of day and the date

To set LOGO! time, date or the timezone, follow these steps:

1. Press Setup in the home page.
2. Press Clock in the menu.

   Now you can see the current time, date and timezone information of the LOGO! Basic.
3. Press the value field to enter the editing page.
4. Use the touch keyboard to change the settings. Then press ✓ button to confirm the input.
5. You can press the button to enable batch clock setting. After it is enabled, all LOGO! BMs in the network will update to the configured date and time.

   Note: Accept batch clock setting is disabled by default. Enabling batch clock setting is unsecure as it allows unauthorized clock setting changes.
6. Press ✓ button to apply the setting.

Setting Network Time Protocol (NTP)

Network Time Protocol (NTP) function is used for network time synchronization. NTP function is disabled by default.

LOGO! can serve as both an NTP server and an NTP client as the same time.

- NTP Client

  To make LOGO! BM synchronize time from the NTP server, you need to set BM as NTP client and configure its NTP server IP first. Any standard NTP server can be used for LOGO! 8.FS4, such as the Windows/Linux NTP Server, standard time provider and LOGO! 9 itself.

  NOTE

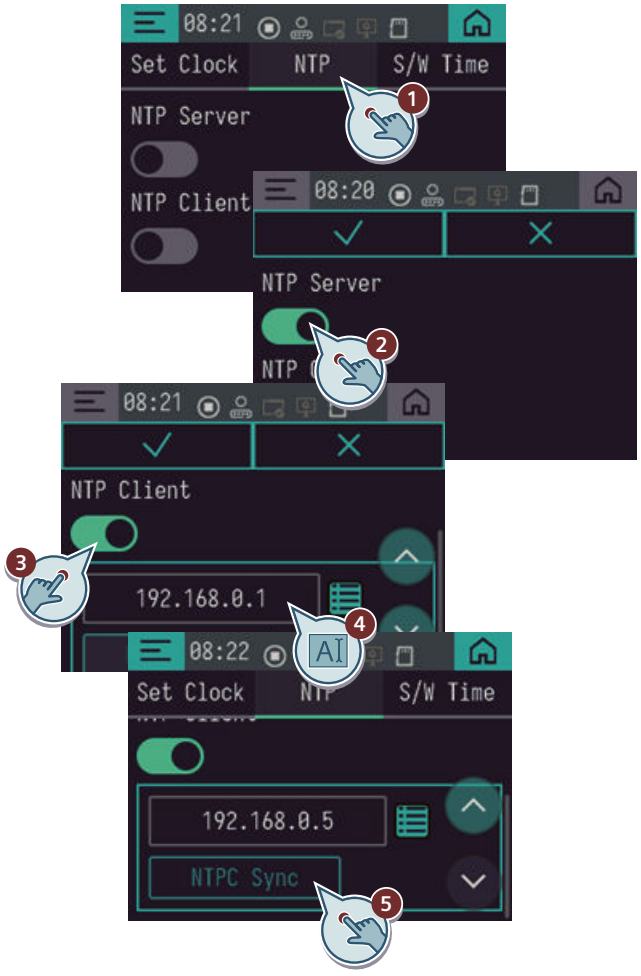
  Siemens strongly recommends that you use NTP function at firewalls within Secure Network.

  For detailed information about security functions on LOGO!, see Chapter Security (Page 256).

- NTP Server

  NTP Server is only a reactor server. It can only provide the time passively while the broadcast function is disabled. When you set LOGO! as the NTP server, LOGO! works as a time provider for all standard NTP client, including Windows/Linux NTP client, LOGO! devices and so on.

To configure the NTP function, follow these steps:



1. Press NTP tab.
2. To set LOGO! as the NTP Server, press the button to enable NTP Server. Then press ✓ button to apply the setting.
3. To set LOGO! as the NTP Client, press the button to enable NTP Client.
4. Press the IP value field to enter the editing page. Use the touch keyboard to enter the NTP server IP. Then press ✓ button to confirm the input.

   Or press ☰ to call the history NTP server list. Select one from the list, then press ✓ button to confirm the selection.

   Press ✓ button to apply the setting.

   Now LOGO! is configured to work as both an NTP server and an NTP client.
5. To synchronize the time from NTP server, press **NTPC Sync** button.

   If the synchronization is successful, a dialog appears showing the synchronization timestamp. Otherwise, the dialog shows "**Not Synchronized**".

NOTE

The NTP client can synchronize time from NTP server every 4096 seconds, but it can synchronize the time immediately in the following scenarios:

- Base Module Power on
- Base Module from Stop to Run
- NTP server IP is changed
- Manual synchronization operation in the NTP client setting

Setting automatics summertime/wintertime conversion

NOTE

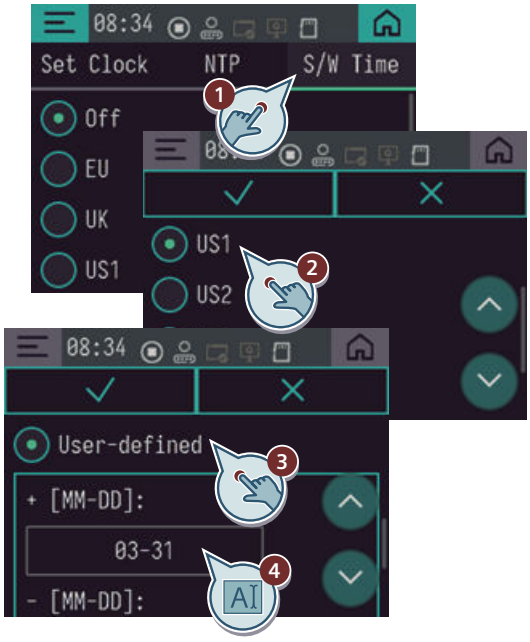
Summertime refers to "daylight saving time" and wintertime refers to "standard time" in the United States.

LOGO! Basic offers the following options of S/W time:

S/W time	Start of summertime	End of summertime	Time zone difference Δ
Off	/	/	/
EU	Last Sunday in March: 02:00→03:00	Last Sunday in October: 03:00→02:00	60 minutes
UK	Last Sunday in March: 01:00→02:00	Last Sunday in October: 02:00→01:00	60 minutes
US1	First Sunday in April: 02:00→03:00	Last Sunday in October: 02:00→01:00	60 minutes
US2	Second Sunday in March: 02:00→03:00	First Sunday in November: 02:00→01:00	60 minutes
AUS	Last Sunday in October: 02:00→03:00	First Sunday in April: 03:00→02:00	60 minutes
AUS-TAS	First Sunday in October: 02:00→03:00	First Sunday in April: 03:00→02:00	60 minutes
NZ	Last Sunday in September: 02:00→03:00	First Sunday in April: 03:00→02:00	60 minutes
User-defined	Customized month and day; 02:00→02:00 + Time zone difference	Customized month and day; Time zone difference: 03:00→03:00 - Time zone difference	User-defined (resolution in minutes)

The automatic summertime/wintertime conversion is disabled (off) by default.

To set the automatic summertime/wintertime conversion, follow these steps:



1. Press S/W Time tab.

   Now you can see the default setting.
2. Press the radio button to select the desired option.

   Press ✓ button to apply the setting.
3. To set the user-defined S/W time, press to select User-defined option.
4. Press the setting field to enter editing page, then change the values.

   Press ✓ button to confirm the input.

   Press ✓ button to apply the setting.

NOTE

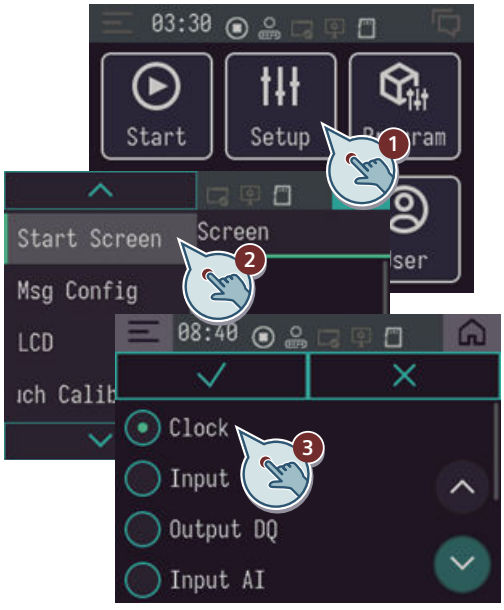
Summertime/wintertime conversion only functions when LOGO! is operating in RUN or STOP mode. It does not function when the internal real–time clock of LOGO! continues operation after a power failure (refer to Section "Backup of the real-time clock (Page 138)").

3.7.2 Setting the start screen

LOGO! Basic offers you the following options as the start screen that LOGO! displays in RUN mode:

- Clock
- Input DI
- Output DQ
- Input AI
- Output AQ
- M flags
- Cursor keys
- Menu

To set the start screen for LOGO! Basic, follow these steps:



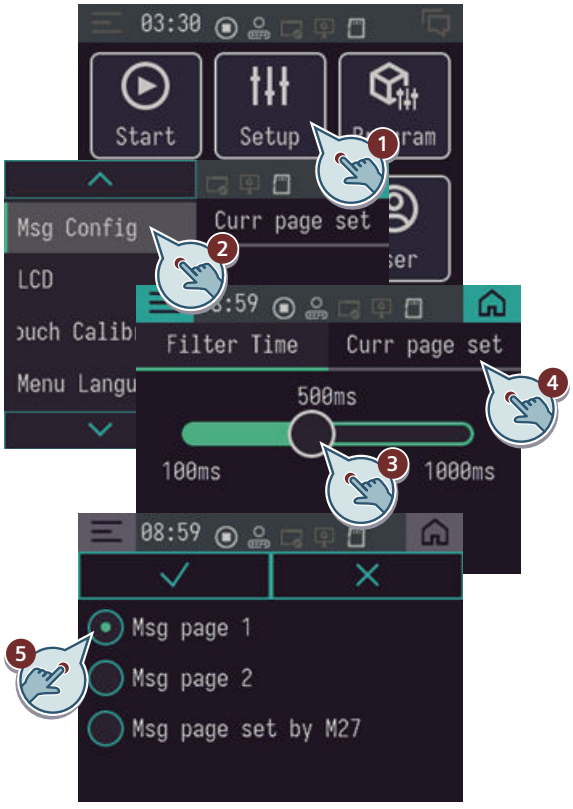
1. Press Setup in the home page.
2. Press Start Screen in the menu.
3. Press the radio button to select the desired page as the start screen. Then press ✓ button to confirm the selection.

3.7.3 Setting message pages

You can configure message page display through Setup -> Message Configuration menu on LOGO! onboard LCD.

- Filter time: the filter time determines the frequency at which the LOGO! BM refreshes the AI, AQ or variable values displayed by the integer/float number widgets in a message page. The setting value ranges from 100 ms to 1000 ms. The setting value represents the default filter time (Global Setting) of the Integer/Float number widgets.
- Current page setting
  - Message Page 1: only display message page 1 on LOGO! screen
  - Message Page 2: only display message page 2 on LOGO! screen
  - Use M27 to change the message page: this determines whether message page 1 or message page 2 is displayed. If M27 = 0 and you select this checkbox, LOGO! BM displays message page 1; if M27 = 1 and you select this checkbox, LOGO! BM displays message page 2.

Follow these steps to configure message pages on LOGO!:



1. Press Setup in the homepage.
2. Press Message Configuration in the navigation menu.
3. To set message filter time, press and drag the slider to set the filter time. The filter time increase or decrease by 100 ms. The value range is from 100 ms to 1000 ms.

   Press ✓ to confirm the setting. Or press X to cancel the setting.
4. To set the default display message page, press Current page set tab.
5. Press the radio button to select the message page you want to display.

   Press ✓ to confirm the setting. Or press X to cancel the setting.

LOGO! supports up to 50 message pages in one circuit diagram. LOGO! supports displaying all UTF8 characters.

3.7.4 Setting LCD brightness and screen saver

NOTE

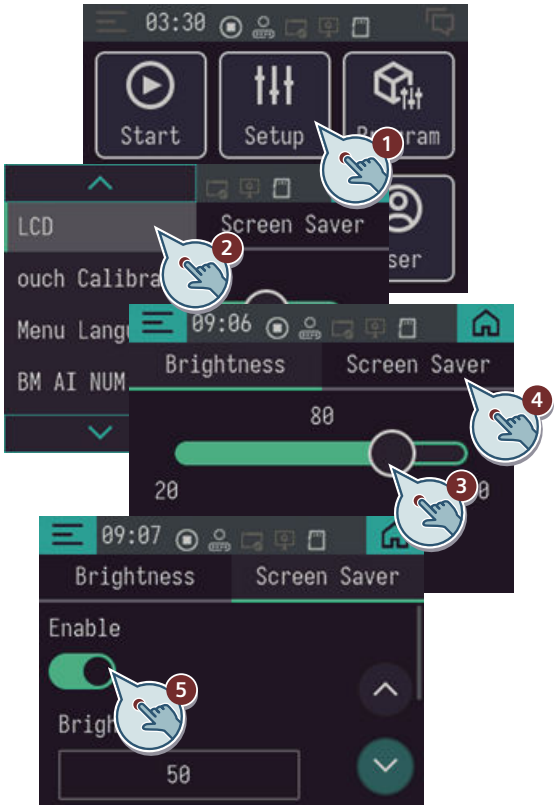
LCD lifetime

The LCD for LOGO! Basic and LOGO! TDE have limited lifetime. Long time enlightening and higher brightness result in shorter LCD lifetime.

To extend the LCD lifetime, it's highly recommended that you set lower LCD brightness and use screen saver.

To learn more about the LCD lifetime, refer to General technical data (Page 293).

Follow these steps to set the LCD brightness and screen saver:



1. Press Setup in the home page.
2. Press LCD in the menu.
3. To set LCD brightness, press and drag the slider left or right to decrease or increase the LCD brightness. Or just press any point one the bar to define the brightness.

   The value range is from 20 to 100, with the value higher, the LCD brighter.

   Then press ✓ button to make the setting take effect.
4. To set screen saver, press Screen Saver tab.

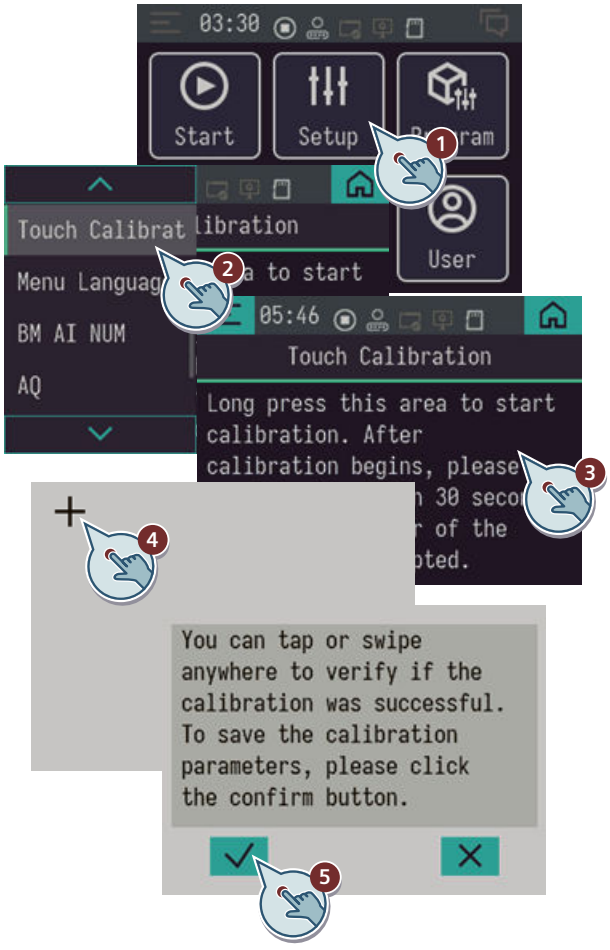
   Now you can see the default setting of the screen saver.

   You can choose to disable/enable the screen saver, or press the setting field to enter editing page to change the value.

   Press ✓ button to make your settings take effect.

3.7.5 Calibrating the touch screen

Follow these steps to calibrate the LOGO! touch screen:



1. Press Setup in the home page.
2. Press Touch Calibration in the menu.

   Read the calibration instructions carefully on the screen.
3. Long-press the screen to start the calibration.
4. Press the cross on the screen one after the other.
5. After pressing the five crosses, click the ✓ button to confirm the calibration result, or click the **X** button to cancel the calibration.

   Note: once the calibration is started, you have to finish it within 30 seconds. Otherwise, the calibration process will be terminated.

3.7.6 Setting the menu language

The language of the LOGO! menus can be one of ten predefined languages:

- German
- English
- French
- Spanish
- Italian
- Chinese
- Dutch
- Turkish
- Russian
- Japanese

Setting the menu language

To set the menu language, follow these steps:

1. Press Setup in the home page.
2. Press Menu Language in the menu.

   Now you can see the current menu display language.
3. Press the drop-down arrow to show all the supported language list, then press the desired one.

   The menu language setting takes effect immediately and LOGO! exits to the clock setting menu.

3.8 Configuring additional functions for LOGO!

You can configure the following additional functions for LOGO!:

- Diagnosing errors from LOGO! (Page 103)
- Viewing LOGO! certificates (Page 109)

UDF and Data Log

You can configure the UDF (User-Defined Functions) and Data Log functions only from LOGO!Soft Comfort.

Network digital and analog I/O

You can configure the following connectors representing network digital or analog inputs/outputs only from LOGO!Soft Comfort:

- Network digital inputs
- Network analog inputs
- Network float analog inputs
- Network digital outputs
- Network analog outputs
- Network float analog outputs

NOTE

If your circuit program in a LOGO! 9 device contains any network digital or analog inputs/outputs, you can edit the "**Par**" parameter of function blocks from LOGO!.

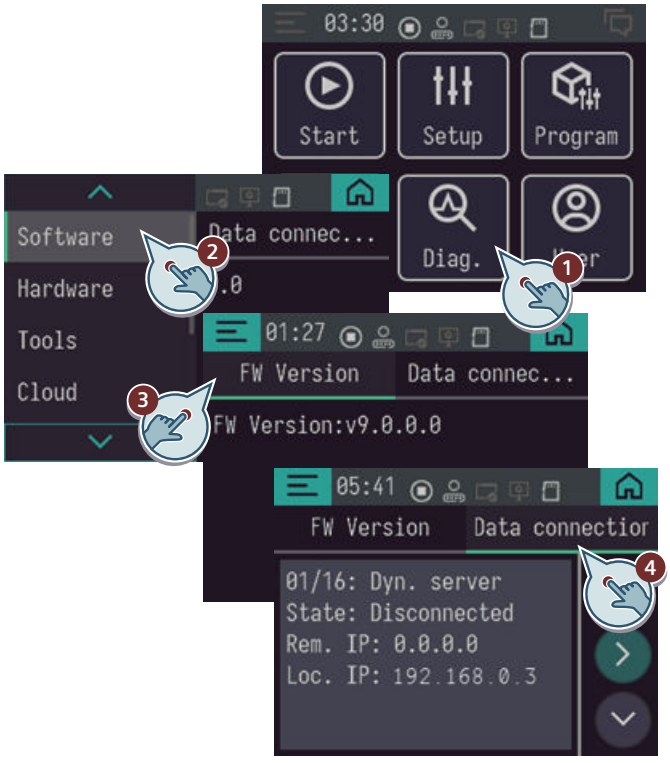
3.8.1 Diagnosing errors from LOGO!

LOGO! 9 supports error event diagnostics. You can perform the following actions from LOGO!'s diagnostics menu:

- View software status and errors:
  - Data connection error
  - Firmware version of LOGO!
- View hardware status and errors:
  - Ethernet connection error
  - Micro SD card error (for example, card read/write error, card is not inserted, or card is full)
  - EM (Expansion Module) status and error (for example, bus error and configuration update)
  - MAC address of LOGO!
- View and clear the event log, and check the availability of a specific IP address
- View Cloud connection status, errors and the log for Cloud synchronization
- View the configured SMTP information and logs of mail sending failure
- Toggle an error event alert

Viewing the software status and errors of LOGO!

To view the software status and errors, follow these steps:

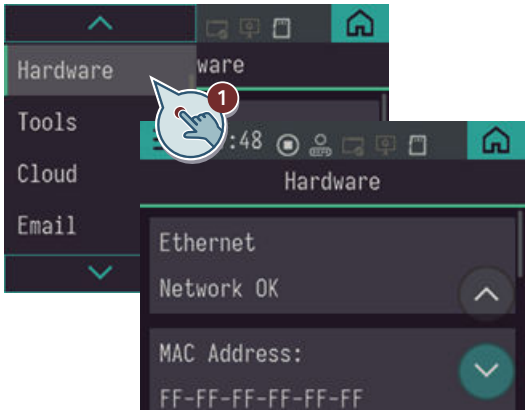


1. Press Diagnostics in the home page.
2. Press Software in the menu.
3. Press FW Version tab to view the firmware version of LOGO!.
4. Press Data connection tab to view the real-time status of the S7 connection, LOGO! Communication or Modbus connection.

   Press ◀ or ▶ to view the status of each data connection.

Viewing the hardware status and errors of LOGO!

To view the hardware status and errors, follow these steps:



Press Hardware in the menu.

Here you can check the status of Ethernet interface, micro SD card, the connected Expansion Modules, and the MAC address of LOGO!.

NOTE

BM crash caused by a damaged circuit diagram

If BM crashes by a damaged circuit diagram, BM will try to restart for four times at most. If BM still cannot work after these restarts, BM will:

- delete the error diagram in BM. If the diagram is loaded to BM by SD card, BM will also save the bin file in SD card as dmg file to avoid this error diagram being loaded to BM again.
- record this error in the event log

After BM deleted the error diagram, the screen of LOGO! Basic or the RUN/STOP LED for LOGO! Pure will flashes once every second in amber in next BM restarts. The flash stops when you do either of the following:

- Download a new diagram to BM.
- Switch off the power and then restart BM.

Tools

To view the errors detected, clear the event logs, or Ping certain IP address, follow these steps:

1. Press Tools in the menu.
2. To view the errors detected, press View Event Log tab.

   Press ◀ or ▶ to view the detailed information of each event log.
3. To clear all errors, press Clear Event Log tab. Press Apply button.

   Press Yes to confirm the operation.

   A message dialog will appear to inform you when the operation is complete.
4. To check the availability of a specific IP address, press Ping tab.

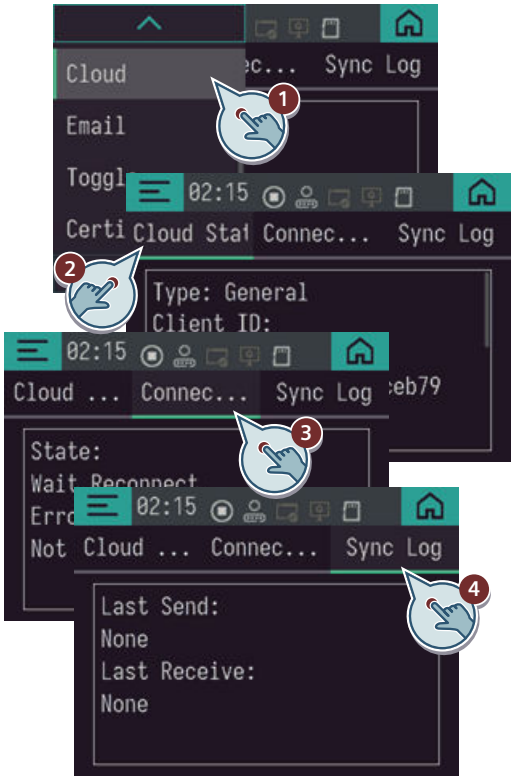
   Press the IP address field to enter the IP address you want to Ping.

   Press Start button.

   A message dialog will appear to inform you the diagnostics result after the Ping is complete.

Viewing Cloud status

To view the Cloud status, Cloud connection state and Cloud synchronization log, follow these steps:

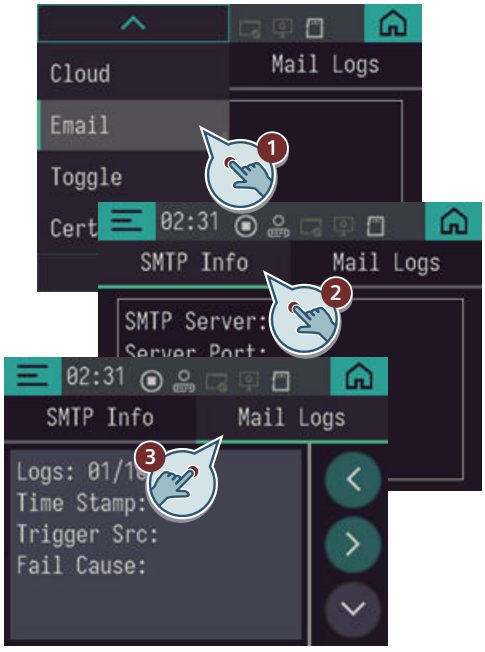


1. Press Cloud in the menu.
2. Press Cloud Status tab to view the real-time Cloud type.
3. Press Connection Status tab to view the Cloud connection state.

   If the connection state is **Error**, LOGO! displays specific error information. You can refer to Troubleshooting (Page 326) to try to fix the connection error.
4. Press Sync Log tab to view the Cloud synchronization log.

Viewing Email SMTP information and email sending failure logs

To view the configured Email SMTP information and email sending failure logs, follow these steps:



1. Press Email in the menu.
2. Press SMTP Info tab to view the configured Email SMTP information.
3. Press Mail Logs tab to view the logs of email sending failure.

   Press ‹ or › to view the detailed information of each log.

   LOGO! records the latest 16 logs. According to the failure cause displayed in the log, you can refer to Troubleshooting (Page 326) to try to fix email sending errors.

Toggling an error alert

You can enable/disable an error alert by following these steps:

1. Press Toggle Error in the menu.
2. Press the toggle event switch to enable or disable the error alert.

   Then press ✓ button to confirm the operation.

If you enable the error alert, when an error occurs, a notification window with brief information appears at the right bottom of the LCD. Press the window to view the detailed information of the notification. Or you can check the information through BM menu: Diagnostics -> Tools -> View Event Log.

Once the error is fixed, a notification windows appears at the right bottom of the LCD.

You can recognize the urgent level of the notification by the icons:

Info: this notification is for information purposes only. You don't need to take any action.

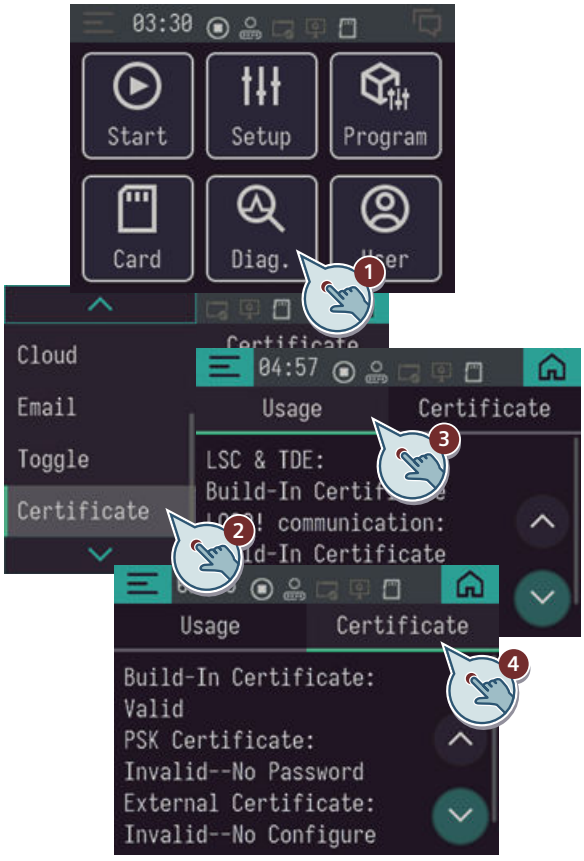
Warning: this notification is intended to inform you that a certain function is at risk.

Error: a server error occurs which causes the device to malfunction.

3.8.2 Viewing LOGO! certificates

LOGO! offers you certificate strategies for secure communication. To learn more information about LOGO! certificate strategies, refer to LOGO! certificate (Page 262).

To view the used certificate strategy and certificate status, following these steps:



1. Press Diagnostics in the home page.
2. Press Certificate in the menu.
3. To view the configured certificate strategies for different LOGO! connections, press Usage tab.

   To see all the information, swipe the LCD up/down, or press ^ or v button.
4. To view the current certificate status, press Certificate tab.

   To see all the information, swipe the LCD up/down, or press ^ or v button.

3.9 Memory space and circuit program size

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

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 can contain. You can determine the total number of bytes used by adding up the number of bytes used for the relevant function blocks.
- **Retentive memory (Rem)**:
  In this area, LOGO! stores values that are retentive; for example, the hours counter value. Blocks with optional retentivity use this memory area only if you have enabled the retentivity function.

Resources available in LOGO!

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

LOGO! device series	Bytes	Blocks	REM
LOGO! 9	12000	800	1024

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 in LOGO! 9:

Block	RAM (Bytes)	Rem * (Bytes)
AND	0	-
AND (Edge)	0	-
NAND	0	-
NAND (Edge)	0	-
OR	0	-
NOR	0	-
XOR	0	-
NOT	0	-
On delay	2	5
Off delay	2	5
On/off delay	4	5
Retentive on delay	2	5

Block	RAM (Bytes)	Rem * (Bytes)
Wiping relay	2	5
Edge-triggered wiping relay	5	6
Asynchronous pulse generator	4	5
Random generator	4	-
Stairway lighting switch	6	5
Multiple function switch	8	5
Weekly timer	16	-
Yearly timer	7	-
Astronomical clock	28	-
Stopwatch	1	17
Up/Down counter	12	5
Hours counter	11	17
Threshold trigger	6	-
Analog threshold trigger	• Integer: 9 • Float: 16	-
Analog differential trigger	• Integer: 11 • Float: 16	-
Analog comparator	• Integer: 9 • Float: 16	-
Analog watchdog	• Integer: 9 • Float: 16	• Integer: 3 • Float: 5
Analog amplifier	• Integer: 5 • Float: 8	-
Pulse width modulator (PWM)	• Integer: 13 • Float: 18	-
Analog multiplexer	• Integer: 9 • Float: 16	-
Analog ramp	• Integer: 15 • Float: 28	-
PI controller	• Integer: 18 • Float: 23	• Integer: 2 • Float: 4
Analog filter	• Integer: 2 • Float: 2	-
Max/Min	• Integer: 3 • Float: 2	• Integer: 7 • Float: 13
Average Value	• Integer: 4 • Float: 4	• Integer: 24 • Float: 30
Mathematic instruction	13	-
Float mathematics instruction	84	-
Mathematic instruction error detection	5	1
Latching relay	0	1

Block	RAM (Bytes)	Rem * (Bytes)
Pulse relay	1	2
LCD Message	9	-
Softkey	2	1
Shift register	2	2
Float/Integer converter	10	-
Integer/Float converter	12	-

*: Bytes in the Rem memory area if you have enabled retentivity

NOTE

Since a UDF block is a preconfigured circuit program that you create from LOGO!Soft Comfort for your LOGO! device, the memory size (program memory and Rem memory) of a UDF block depends upon the size of the function blocks contained in the UDF.

Utilization of memory areas

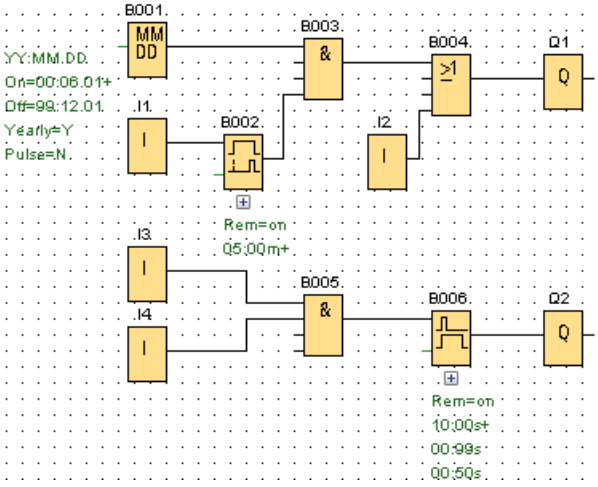
LOGO! indicates that there is insufficient memory space by not allowing you to add a block to your circuit program. LOGO! offers you only the blocks for which it can provide sufficient memory space. If LOGO! memory space is insufficient to hold any additional blocks, the system denies access to the block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

If memory space is full, optimize your circuit program or install another LOGO!.

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:

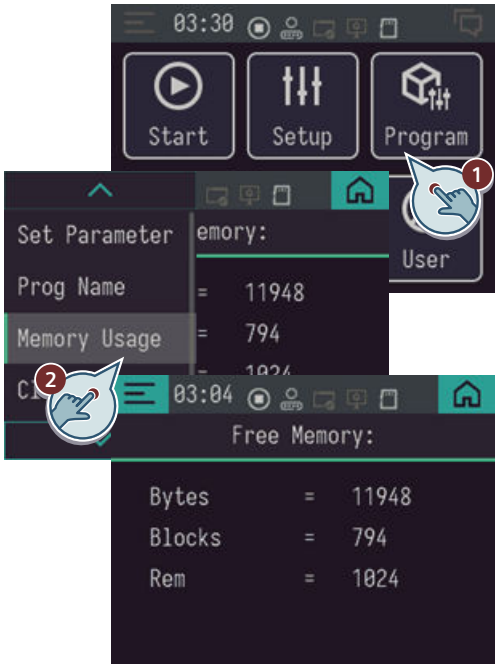
Block no.	Function	Memory area		
		Bytes	Blocks	REM
B001	Yearly timer	7	1	-
B002	On-delay*	2	1	5
B003	AND	0	1	-
B004	OR	0	1	-
B005	AND	0	1	-
B006	Stairway lighting switch*	6	1	5
	Resources used by the circuit program	15	6	10
	Memory space limits in LOGO!	12000	800	1024
	Still available in LOGO!	11985	794	1014

*: Configured with retentivity.

This means that this circuit program fits in LOGO!.

Indication of available memory space

You can view the free memory space in LOGO! in STOP mode. Follow these steps:



1. Press Program menu in the home page.
2. Press Memory Usage in the menu.
   Now you can view the free memory of the BM.

Using memory cards

4

For program storage, LOGO! supports micro SD cards that support FAT32 and exFAT file system format.

You can store and copy-protect a circuit program, with or without the data log of process data, from a LOGO! device to a micro SD card, or copy a circuit program (with or without device configuration) from the card to a LOGO! device.

LOGO! allows you to store only one circuit program (with or without device configuration) in its memory. If you want to modify the circuit program, you must archive it somewhere beforehand.

LOGO! 9 supports using the micro SD card to factory reset LOGO! (Page 284) and upgrade LOGO! firmware (Page 120).

For detailed information about how to format micro SD cards, see Section "Formatting micro SD cards by PC (Page 122)".

For detailed information about the copy protection function, see Section "Program copy protection (Page 260)".

For detailed information about the data log, see Chapter "Data log (Page 235)".

NOTE

Having too many files on the micro SD card may result in poor performance of micro SD card-related functions.

Upward compatibility of circuit programs

You can transfer circuit diagrams written for the previous versions 0BA0...0BA8 to LOGO! 9 devices from LOGO!Soft Comfort.

NOTE

Uploading a circuit diagrams written for previous versions of LOGO! precious versions from the micro SD card is not allowed. You must use LOGO!Soft Comfort to reconfigure the diagram before downloading it to LOGO! 9.

4.1 Inserting and removing the card from LOGO!

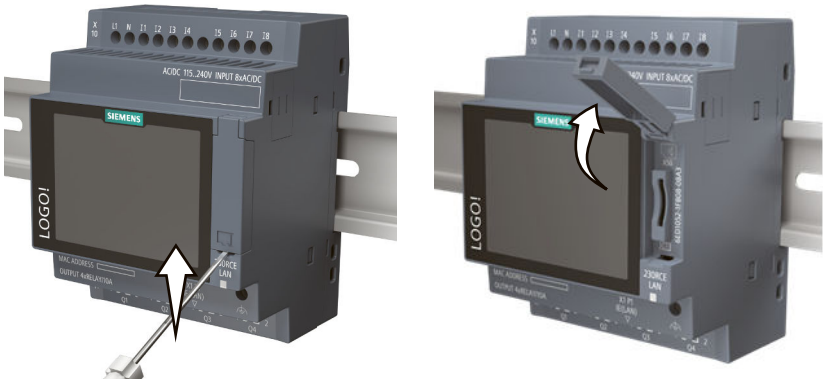
When you remove a micro SD card that contains a circuit program with copy protection attributes, note the following: LOGO! can only execute the circuit program stored on the card if the card remains inserted during system runtime.

A removal of the card during RUN mode can lead to impermissible operating states.

⚠ WARNING
Fire hazard
Insert/remove under hazardous location may trigger a fire in the machine or plant.
Death or serious injury could occur.
Do not insert/remove the memory card in hazardous locations.

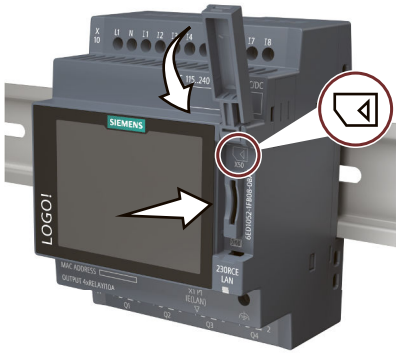
Removing the micro SD card

To remove the micro SD card, carefully insert a screwdriver with a 3-mm blade into the groove on the micro SD card slot cover, and lever the socket upward to open the cover. Pull the cover to the position as the following figure shows. To remove the micro SD card, gently press it until it is ejected from the slot.



Inserting the micro SD card

To insert the micro SD card in the right direction, observe the figure at the top of the card slot. Insert the card into the slot and push it in until it clicks into place.



4.2 Copying data from LOGO! to the card

Copying data from LOGO! to the card manually

You can only copy data from LOGO! BM to the micro SD card when the LOGO! is in STOP mode. To manually copy the circuit program (with or without the device configuration) to the micro SD card, follow the steps:

1. Press Card in the home page.
2. In the Save to card tab window, press the radio button to save the diagram or save the diagram and device configuration.

   Here you can also configure the card copy protection. Refer to Program copy protection (Page 260) for more information.
3. Press Apply button.

   A dialog will appear to remind you when the copy process completes.

If power fails while LOGO! is copying the data, repeat the process after power-on.

NOTE

- If the program is empty, a message will display on the screen to remind you the program in LOGO! is empty.
- The password of a protected circuit program in LOGO! also applies to the copied program version on your card.

Copying data from LOGO! to the card automatically

LOGO!Soft Comfort provides an option for automatically copying the circuit program to the micro SD card when transferring the circuit program to LOGO!. This option is available in the dialog for PC -> LOGO! transfer. If you select this option, LOGO!Soft Comfort transfers the circuit program (with or without the device configuration) to LOGO! and to the micro SD card.

NOTE

To successfully copy the data from LOGO! to the micro SD card, make sure that the free memory space available on the micro SD card is at least 1 M bytes.

Function block parameters can be saved automatically

To automatically save the function block parameters changes to the inserted micro SD card, you have the following options:

- Select Copy to SD card in LOGO!Soft Comfort when downloading a diagram to LOGO!. Refer to *LOGO!Soft Comfort Online Help* for detailed information.
- Implement Save to card following above instructions.
- Implement Load from card (Page 117).

Generating the data log on the micro SD card

If your circuit program in LOGO! includes a Data Log function block configured from LOGO!Soft Comfort, you can save the data log in your LOGO! or on the micro SD card. If there is a micro SD card inserted into the slot of your LOGO!, then when LOGO! switches from STOP to RUN, it attempts to copy the data log to the micro SD card; otherwise, LOGO! saves the data log in memory. At every STOP to RUN transition, LOGO! determines the destination of the data log storage.

If LOGO! copies the data log to the micro SD card, it saves the data log by default as .CSV file format, which you can then open from a PC. Each line in the .CSV file includes a time stamp, the function block number and the actual values recorded. For more information about the data log, refer to chapter "Data log (Page 235)".

NOTE

You can upload at most 50 recent log files on the micro SD card to LOGO!Soft Comfort no matter when LOGO! is in STOP or RUN mode.

To learn more about uploading data log from the micro SD card in the LOGO! BM to LOGO!Soft Comfort, refer to the section Tools -> Transfer -> Upload Data Log in *LOGO!Soft Comfort Online Help*.

4.3 Copying data from the card to LOGO!

You can copy a circuit program with the device configuration from a micro SD card to LOGO! in one of the following ways:

- Automatically during the startup of LOGO! (POWER ON)
- By LOGO! menu command

NOTE

If the program on the card is protected with a password, the copied program in LOGO! is also protected with the same password. For more information about the Card menu, refer to Section "LOGO! menus overview (Page 60)".

NOTE

.bin file in the micro SD card

You can only copy LOGO! 9(or later versions) .bin file from the micro SD card to LOGO!. Otherwise, you need to change the hardware type to LOGO! 9 using LOGO!Soft Comfort.

Automatic copying during the startup of LOGO!

To automatically copy the circuit program (with the device configuration if exists) to LOGO!, follow these steps:

1. Switch off the power supply to LOGO!.
2. Insert the card into the micro SD card slot on the BM.
3. Switch on the power supply to LOGO!.

   LOGO! copies the program from the micro SD card to LOGO!. When LOGO! finishes copying,

   – for LOGO! Basic (with onboard display), BM is in STOP mode. LOGO! displays the home page.

   – for LOGO! Pure (without onboard display), BM is in RUN mode.

NOTE

Loading UMAC configuration

LOGO! loading the UMAC configuration from the micro SD card varies to different cases:

– When LOGO! is powered-on for the first time or after factory reset, LOGO! will automatically load the UMAC configuration from the micro SD card.

– When LOGO! runs with the UMAC being disabled, and the micro SD card contains the device configuration of UMAC being enabled, LOGO! will automatically load the UMAC configuration from the micro SD card.

– When LOGO! runs with UMAC being enabled, LOGO! will not load the UMAC configuration from the micro SD card.

Refer to *LOGO!Soft Comfort Online Help* for detailed information of UMAC settings.

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.

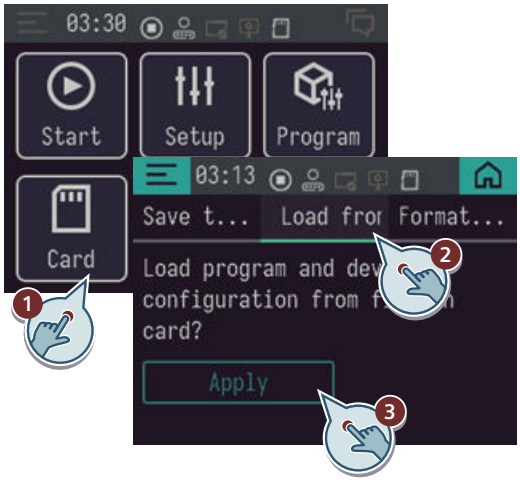
Copying by LOGO! menu command

For more information about the replacement of a micro SD card, refer to Section "Inserting and removing the card from LOGO! (Page 115)".
To copy a program from the card to LOGO! in STOP mode, insert the card then follow these steps:

NOTE

Only Admin and Maintainer have the access to Card menu.

Refer to Menu access security (Page 279) to learn more about LOGO! user management and access.



1. Press Card in the home page.
2. Press Load from card tab.
3. Read the notification message in the window. Then press Apply button.

LOGO! copies the circuit program (and the device configuration) from the card to LOGO!. When LOGO! finishes copying, LOGO! displays the home page and stays in STOP mode.

NOTE

Copying UMAC configuration

The UMAC configuration in LOGO! will be overwritten by the UMAC configuration in the micro SD card.

4.4 Upgrading LOGO! firmware using micro SD card

To upgrade LOGO! firmware using the micro SD card, follow these steps:

1. Download the LOGO!_device_upgrade_package.duf file from the SiePortal (https://sieportal.siemens.com/en-ww/home) or through LOGO! ID Link (Page 24), and save the file to the micro SD card.
2. Insert the micro SD card into LOGO! BM.
3. Power on the LOGO! BM to execute the firmware upgrade.

   For LOGO! Basic, it displays the upgrade process on the LCD; for LOGO! Pure, the amber LED on the device will flash rapidly. When the upgrade completes, LOGO! will restart automatically.

NOTICE
Do not power off or disconnect the device during the upgrade process. Otherwise, this could result in data loss or system damage.

NOTE

LOGO! checks whether the firmware version in the upgrade file is higher than the device current firmware version. If not, the firmware upgrade will not be carried out.

To learn how to check LOGO! firmware version, refer to Diagnosing errors from LOGO! (Page 103).

You can also upgrade LOGO! firmware through LOGO!Soft Comfort. Refer to *LOGO!Soft Comfort Online Help* for more information.

4.5 Resetting LOGO! using micro SD card

Factory reset using micro SD card

1. Copy __reset.bm file from the LOGO! USB Stick into the root directory of a micro SD card.
2. Insert the micro SD card into the LOGO! BM.
3. Power on the LOGO! BM to execute factory reset. After the BM is reset to factory settings, __reset.bm file in the SD card is deleted automatically.

NOTE

The __reset.bm file can only be used to reset factory settings for LOGO! BM 8.3 and later versions.

NOTE

If you have forgotten the Admin password, using the reset file is the only way to reset your LOGO! to factory settings and reset the Admin password.

For other factory reset options, refer to section Securely removing data (Page 284).

NOTE

Retain IP setting

If you reset LOGO! through LOGO!Soft Comfort or the BM menu command, you have the option to retain the IP setting. However, using the __reset.bm file resets all settings including the IP setting.

4.6 Formatting micro SD cards

You can format your micro SD cards in the following ways:

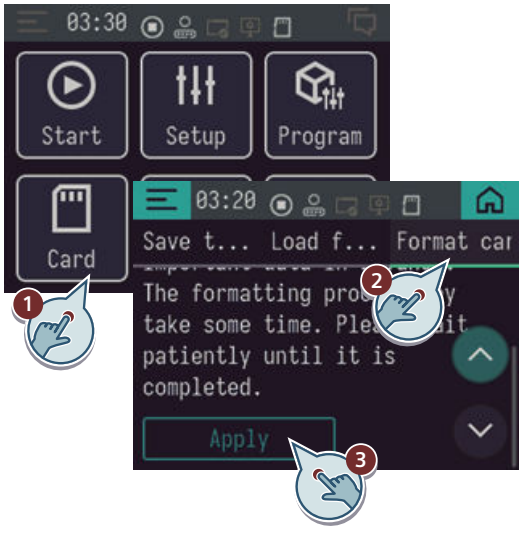
- Formatting micro SD cards by BM
- Formatting micro SD cards by PC (under operating systems Windows, Linux and Mac OS)
- Formatting micro SD cards by LOGO!Soft Comfort. Refer to *LOGO!Soft Comfort Online Help* for detailed information.

4.6.1 Formatting micro SD cards by BM

Before formatting the micro SD card, make sure it is inserted into the LOGO! BM. The micro SD card icon in the status bar (Page 62)will light up once the BM recognizes the inserted micro SD card.

Make sure the BM is in STOP mode.

Follow these steps to format the micro SD card in BM:



1. Press Card menu in the homepage.
2. Press Format Card tab.

   Read the important notices before formatting.
3. Press Apply button to start formatting.

   During the formatting process, the micro SD card icon in the status bar is grayed out. When the formatting is complete, a message dialog appears to notify you. The micro SD card icon in the status bar will lighten again.

NOTE

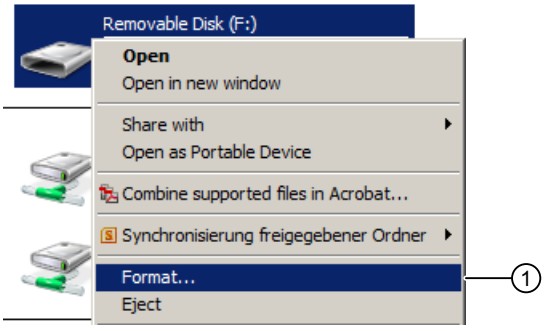
Power failure of the BM during micro SD card formatting may damage the file system of the micro SD card, and cause the BM to not recognize the micro SD card after power-on. To recover the micro SD card, you can start the formatting again.

4.6.2 Formatting micro SD cards by PC

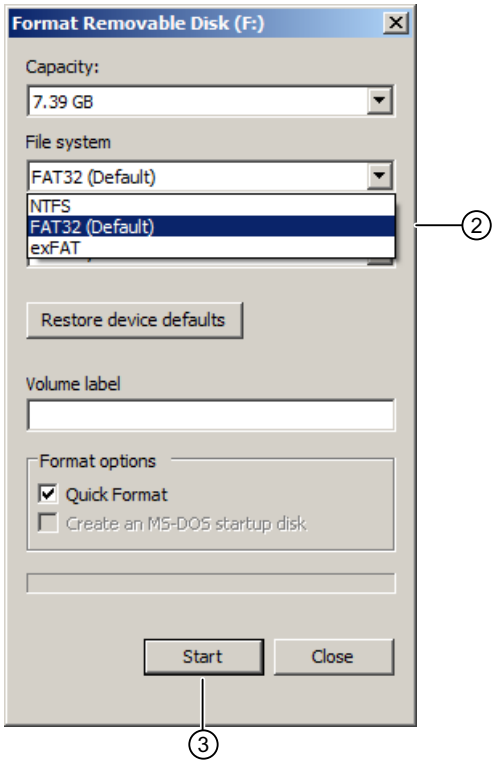
Formatting under Windows OS

Follow the steps below to format the micro SD card under Windows OS:

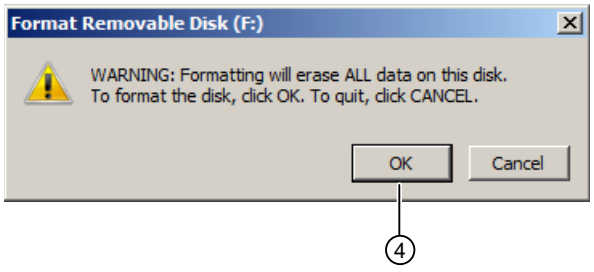
1.



2.


Format Removable Disk (F:)
Capacity:
7.39 GB
File system
FAT32 (Default)
NTFS
FAT32 (Default)
exFAT
Restore device defaults
Volume label
Format options
Quick Format
Create an MS-DOS startup disk
Start
Close
2
3

3.


Format Removable Disk (F:)
WARNING: Formatting will erase ALL data on this disk.
To format the disk, click OK. To quit, click CANCEL.
OK
Cancel
4

4.


Formatting Removable Disk (F:)
Format Complete.
OK
5

Formatting under Linux OS

1. Open the following terminal in the application browser to enter commands:

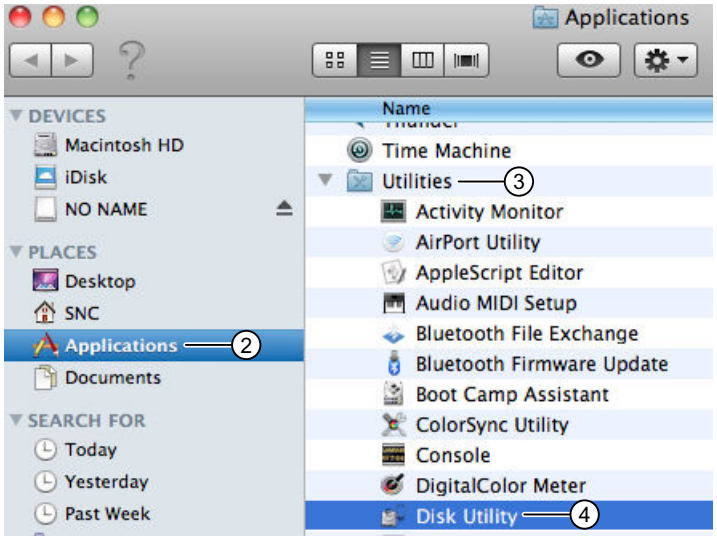
2. Enter the first command "fdisk -1" in the terminal to search for the removable device block name and "/dev/sdc1" is found.
3. Enter "sudo umount /dev/sdc1" to uninstall device.
4. Enter "sudo mkfs.vfat -f 32 /dev/sdc1" and formatting is completed.

Formatting under Mac OS

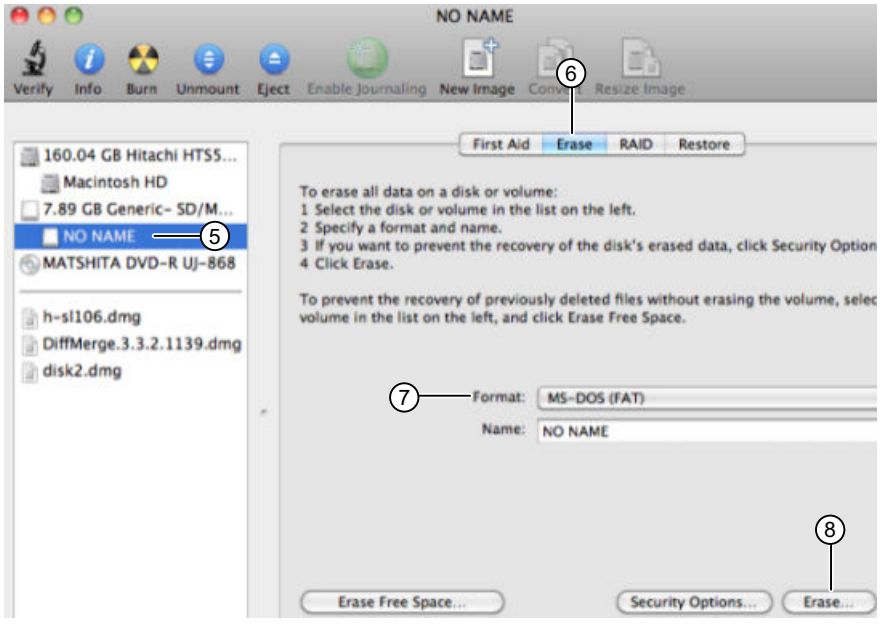
Follow the steps below to format the micro SD card under MAC OS:

1. 

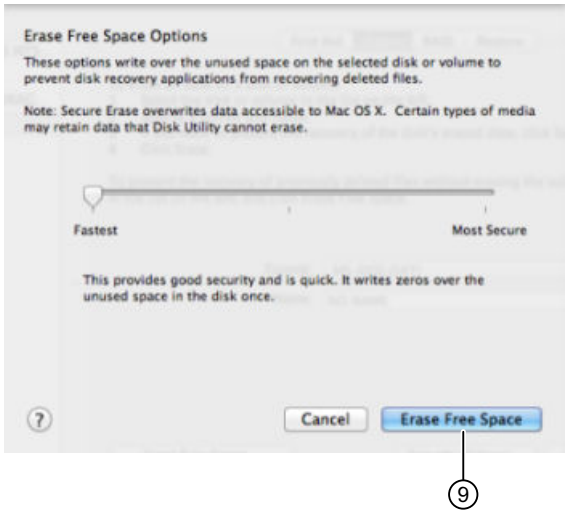
2.


Applications
DEVICES
Macintosh HD
iDisk
NO NAME
PLACES
Desktop
SNC
Applications
2
Documents
SEARCH FOR
Today
Yesterday
Past Week
Name
Time Machine
Utilities
3
Activity Monitor
AirPort Utility
AppleScript Editor
Audio MIDI Setup
Bluetooth File Exchange
Bluetooth Firmware Update
Boot Camp Assistant
ColorSync Utility
Console
DigitalColor Meter
Disk Utility
4

3.


NO NAME
Verify
Info
Burn
Unmount
Eject
Enable Journaling
New Image
Convert
Resize Image
6
First Aid
Erase
RAID
Restore
160.04 GB Hitachi HTS5...
Macintosh HD
7.89 GB Generic- SD/M...
NO NAME
5
MATSHITA DVD-R UJ-868
h-sl106.dmg
DiffMerge.3.3.2.1139.dmg
disk2.dmg
To erase all data on a disk or volume:
1 Select the disk or volume in the list on the left.
2 Specify a format and name.
3 If you want to prevent the recovery of the disk's erased data, click Security Option
4 Click Erase.
To prevent the recovery of previously deleted files without erasing the volume, selec
volume in the list on the left, and click Erase Free Space.
7
Format:
MS-DOS (FAT)
Name:
NO NAME
8
Erase Free Space...
Security Options...
Erase...

4.


Erase Free Space Options
These options write over the unused space on the selected disk or volume to prevent disk recovery applications from recovering deleted files.
Note: Secure Erase overwrites data accessible to Mac OS X. Certain types of media may retain data that Disk Utility cannot erase.
Fastest
Most Secure
This provides good security and is quick. It writes zeros over the unused space in the disk once.
Cancel
Erase Free Space
9

LOGO! functions

5

LOGO! provides you with the following function blocks for programming in LOGO!Soft Comfort:

- Connectors (Page 126)
- GF: basic functions AND, OR, ... (Page 131)
- SF: special functions (Page 144)
- Reusable blocks configured in the circuit program

Besides these function blocks, LOGO! additionally provides you with the following elements for programming in LOGO!Soft Comfort:

- UDF: List of user-defined function blocks configured in the circuit program
- L: A Data Log function block configured in the circuit program

LOGO! 9 BM (and later versions) doesn't support creating or editing a circuit diagram on the BM screen. LOGO! 9 BM (and later versions) supports setting parameters of the circuit diagram in STOP or RUN mode.

5.1 Constants and connectors

Constants and connectors represent inputs, outputs, flags, constants, and network digital and analog inputs/outputs.

Inputs

- **Digital inputs**

  Digital inputs begin with the letter **I.** The number of the digital inputs (I1, I2, ...) corresponds to the number of the input connectors of the LOGO! Base Module and of the connected digital modules, in the order of their installation. You can use the fast digital inputs I3, I4, I5, and I6 of the LOGO! versions LOGO! 12/24 RCE, LOGO! 12/24 RCEo, LOGO! 24 CE and LOGO! 24 CEo as fast counters.

  NOTE

  To avoid that the LOGO! Base Module fails to read input signals because its built-in MCU (Microcontroller Unit) is too sensitive and runs much faster than those in previous LOGO! devices, an on-/off-delay function is designed for LOGO!:

  – For LOGO! 230RCE and LOGO! 230RCEo, a 25 ms on-delay time and a 20 ms off-delay time are defined for digital inputs I1 to I8.
  – For all the other LOGO! versions, a 5 ms on-delay time and a 5 ms off-delay time are defined for all the digital inputs.

  Besides, when the LOGO! Base Module is in slave mode, a 5 ms on-delay time and a 100 ms signal-retentive-time are defined for all the digital inputs.

- **Analog inputs**

  The LOGO! versions LOGO! 24 CE, LOGO! 24 CEo, LOGO! 12/24 RCE and LOGO 12/24 RCEo have the inputs I1, I2, I7 and I8, which you can also program for use as **AI3, AI4, AI1** and **AI2** inputs. As described in topic "Setting the number of AIs in LOGO! (Page 86)", you can configure these modules to use either two analog inputs (AI1 and AI2), or all four. LOGO! interprets signals at the I1, I2, I7 and I8 inputs as digital values, and those at the AI3, AI4, AI1 and AI2 inputs 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. LOGO! numbers the inputs of a connected analog module according to the already existing analog inputs. See topic "Setup with Expansion Modules (Page 34)" for example setups.

Outputs

- **Digital outputs**

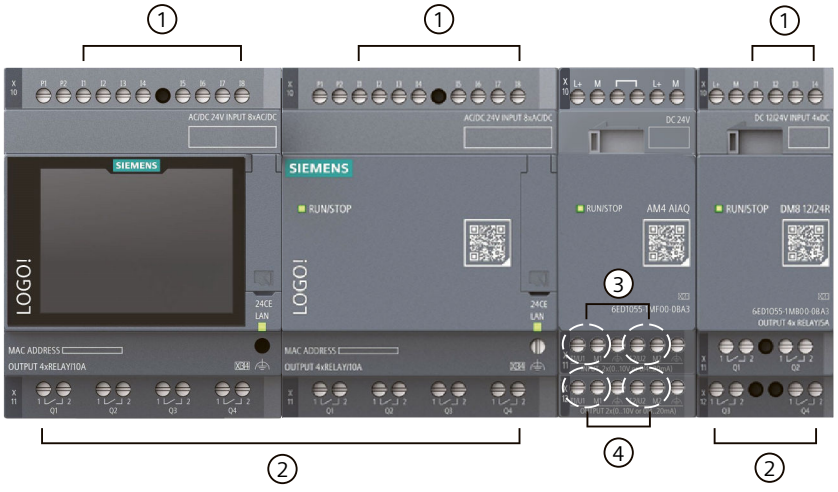
  Digital outputs begin with the letter **Q**. The output numbers (Q1, Q2, ...) correspond with the numbers of the output connectors at the LOGO! Base Module and with those of the Expansion Modules, in their order of installation.

  LOGO! 9 also provides 128 blank outputs and identifies them with the letter **x**. You cannot reuse the blank outputs in a circuit program. The blank outputs differ from flags, for example, which you can reuse. A blank output, for example, is useful for the special function "LCD Message" (Page 197).

- **Analog outputs**

  Analog outputs begin with the letters **AQ**. Eight analog outputs are available, namely AQ1, AQ2, ... You can only connect an analog output with the analog input of a function, an analog flag AM, a float analog flag FAM 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.



① Digital inputs
② Digital outputs
③ Analog inputs
④ Analog outputs

NOTE

LOGO! 9 supports the graphical display of the analog value changes in the form of a trend curve on the onboard display. You can easily monitor each analog I/O in use by means of the trend curves when LOGO! is in RUN mode. For more information on how to view the trend curve, refer to "Viewing the analog changes (Page 74)".

Flag blocks

The letters **M**, **AM** or **FAM** identify flag blocks. These are virtual outputs, which output the value of their inputs. LOGO! 9 provides 128 digital flags M1 to M128, 128 analog flags AM1 to AM128, and 32 float analog flags FAM1 to FAM32.

Startup flag M8

LOGO! sets flag M8 in the first cycle of the circuit program. You can thus use it as a startup flag in your circuit program. LOGO! resets M8 at the end of the first cycle.

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

Backlight flags M28 to M31

The following flags control the backlight colors of the LOGO! LCD display or the LOGO! TDE LCD display:

- M28: LOGO! BM displays amber backlight on the LCD status bar
- M29: LOGO! BM displays red backlight on the LCD status bar
- M30: LOGO! TDE displays amber backlight on the LCD status bar
- M31: LOGO! TDE displays red backlight on the LCD status bar

Message text character set flag M27

The M27 flag selects between the two message pages that LOGO! uses to display message texts. State 0 corresponds to Message Page 1, and state 1 corresponds to Message Page 2. If M27=0 (low), LOGO! only displays message texts configured for Message Page 1; If M27=1 (high), LOGO! only displays message texts configured for Message Page 2. If you do not include M27 in the circuit program, message texts display in the message page that you selected from either LOGO!Soft Comfort or a LOGO! device.

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.
- You can read or write flags from the network. If you have not added any special flags in the diagram, but written them from the network, they can still work except M27. So if you want to control message pages display by M27, you must add it in the diagram first, and you can connect M27 to NI blocks to control it from the network.

Shift register bits

LOGO! provides read-only shift register bits S1.1 to S4.8. Only the "Shift register" (Page 203) special function can modify shift register bit values.

Cursor keys

Up to four Cursor keys are available to you, namely C1 ▲, C2 ▼, C3 ◀ and C4 ▶ ("C" = "Cursor"). Cursor keys are programmed for the circuit program in the same way as other inputs. You can program Cursor keys in the corresponding display while the system is in RUN (Page 74) , and in an active message page (press ⌃⌃ in the toolbar of LOGO! LCD to access the Cursor key menu). Cursor keys can save switches and inputs, and allow operator control of the circuit program. Cursor key inputs from the LOGO! TDE are identical to Cursor key inputs from the LOGO! Base Module.

LOGO! TDE Function keys

The LOGO! TDE has four Function keys, F1, F2, F3, and F4, which 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 virtual keys (press ⌃⌃ in the toolbar of LOGO! TDE LCD to access the Cursor key and Function key menu). when LOGO! is in RUN mode to affect the behavior of the circuit program, and to save switches and inputs.

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

LOGO! uses the letter **x** to indicate unused block connectors. LOGO! 9 provides you with 128 open connectors.

Network inputs/outputs (available only if configured from LOGO!Soft Comfort)

You can configure the following network inputs/outputs only from LOGO!Soft Comfort. If the circuit program in LOGO! contains a network digital/analog I/O, you can not edit any of the rest of the circuit program except for the Par parameter. To edit the rest of the program, you must upload the program to LOGO!Soft Comfort and then edit from LOGO!Soft Comfort.

1) Network digital inputs

The letters **NI** identify a network digital input. There are 512 network digital inputs NI1 to NI512 available for configuration in the circuit program from LOGO!Soft Comfort.

2) Network analog inputs

The letters **NAI** identify a network analog input. There are 128 network analog inputs NAI1 to NAI128 available for configuration in the circuit program from LOGO!Soft Comfort.

3) Network float analog inputs

The letters **NFAI** identify a network float analog input. There are 16 network float analog inputs NFAI1 to NFAI16 available for configuration in the circuit program from LOGO!Soft Comfort.

4) Network digital outputs

The letters **NQ** identify a network digital output . There are 480 network digital outputs NQ1 to NQ480 available for configuration in the circuit program from LOGO!Soft Comfort.

5) Network analog outputs

The letters **NAQ** identify a network analog output. There are 128 network analog outputs NAQ1 to NAQ128 available for configuration in the circuit program from LOGO!Soft Comfort.

6) Network float analog outputs

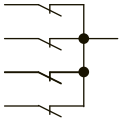
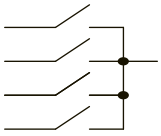
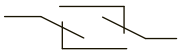
The letters **NFAQ** identify a network float analog output. There are 16 network float analog outputs NFAQ1 to NFAQ16 available for configuration in the circuit program from LOGO!Soft Comfort.

5.2 Basic functions

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 the value at the input, the program sets a logical "1".

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

View in the circuit diagram	Name of the basic function
 Series circuit make contact	AND (Page 132)
	AND with edge evaluation (Page 132)
 Parallel circuit with break contacts	NAND (Page 133) (not AND)
	NAND with edge evaluation (Page 133)
 Parallel circuit with make contacts	OR (Page 134)
 Series circuit with break contacts	NOR (Page 134) (not OR)
 Double changeover contact	XOR (Page 135) (exclusive OR)
 Break contact	NOT (Page 135) (negation, inverter)

5.2.1 AND

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

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

AND function logic table

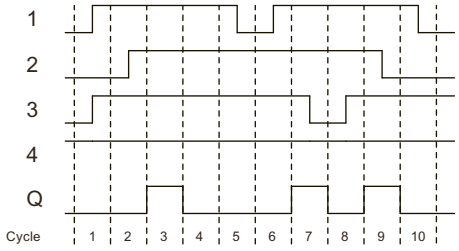
1	2	3	4	Q
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

5.2.2 AND with edge evaluation

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



5.2.3 NAND

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

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

NAND function logic table

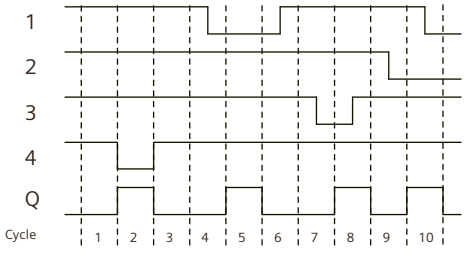
1	2	3	4	Q
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

5.2.4 NAND with edge evaluation

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



5.2.5 OR

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

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

OR function logic table

1	2	3	4	Q
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

5.2.6 NOR

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

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

NOR function logic table

1	2	3	4	Q
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0

1	2	3	4	Q
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

5.2.7 XOR (exclusive OR)

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

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

5.2.8 NOT (Negation, Inverter)

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

An advantage of the NOT block, for example, is that you do not have to use break contacts. You simply use a make contact and the NOT block to convert these into a break contact.

NOT function logic table

1	Q
0	1
1	0

5.3 Special functions overview

Because of their different input designation, you can see right away that there is a difference between the special functions and basic functions. Special 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 (Page 144).

5.3.1 Designation of the inputs

Logical inputs

The following connectors enable you 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 triggers the start of a function.
- **Cnt (Count):**
  This input counts pulses.
- **Fre (Frequency):**
  LOGO! applies frequency signals to be evaluated to this input.
- **Dir (Direction):**
  This input determines the direction, + or -.
- **En (Enable):**
  This input enables a block function. When this input is "0", the block ignores all other signals.
- **Inv (Invert):**
  A signal at this input inverts the output signal of the block.
- **Ral (Reset all):**
  A signal at this input resets all internal values.
- **Lap** (for the stopwatch function)

  A signal at this input pauses the stopwatch.

NOTE

Unused logical inputs of special functions default to logical "0".

Connector X at SF inputs

The connector "x" input for any SF input is low. That is, the input carries 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):**
  You do no connect the Par parameter. Instead, you set the relevant block parameters (times, on/off thresholds etc.).
- **Priority:**
  This is an open input. Here, you define priorities and specify whether a message is to be acknowledged in RUN.

5.3.2 Time response

Parameter T

You can configure a time value T for some of the SF blocks. When you preset this time, note that your input values are based on the timebase set:

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

This is an example of setting a time T of 250 minutes (unit in hours h).

The Stopwatch (Page 173) function block provides an additional timebase: 10 milliseconds.

Accuracy of T

Because of slight tolerances in the characteristics of electronic components, the set time T can deviate. You can find a detailed description of such deviations in the "On-delay" topic (Page 145).

Accuracy of the timer (weekly/yearly timer)

To prevent timing inaccuracy of the real-time clock in C versions (LOGO! devices with an integrated real-time clock) caused by this deviation, LOGO! continuously compares the timer value to a high-precision timebase and makes continual corrections. The resultant maximum timing inaccuracy is ±2 s/day.

5.3.3 Backup of the real-time clock

The supercapacitor in LOGO! backs up the internal real-time clock, making the real-time clock continue operation after a power failure. The surrounding temperature influences the backup time. At a surrounding temperature of 25°C, the typical backup time of a LOGO! 0BA8 is 20 days. It takes 30 minutes to get the supercapacitor fully charged after the LOGO! is powered up, and the fully charged supercapacitor can support typical 20-day backup time.

If there is a power outage of a LOGO! for more than 20 days, on restarting, the internal clock is back in the status that it was in before the power outage.

5.3.4 Retentivity

You can set the switching states, counter and time values of many SF blocks (Page 144) to be retentive. This means that LOGO! retains current data values 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.

To enable this response, however, the relevant functions must be set retentive. Two options are available when LOGO! is in STOP mode:

	The data is retentive
	Current data is not retentive (default)

To learn how to enable or disable retentivity, refer to Switching LOGO! to STOP mode (Page 79).

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

5.3.5 Parameter protection

In the parameter protection settings, you can determine whether or not you display and edit the parameters when LOGO! is in STOP mode. Two options are available when LOGO! is in STOP mode:

	Parameter protection mode off. The parameter attribute permits read/write access when LOGO! is in RUN mode (default).
	Parameter protection mode on. The parameter settings are read–/write–protected when LOGO! is in RUN mode, and you can only edit them in STOP mode.

To learn how to enable or disable parameter protection, refer to Switching LOGO! to STOP mode (Page 79).

NOTE

Parameter protection covers only the "Set Parameter" window. If you embed variables of protected special functions in a message page, the variables are still editable from the message page. To protect these variables, you must also activate the protection of the message page.

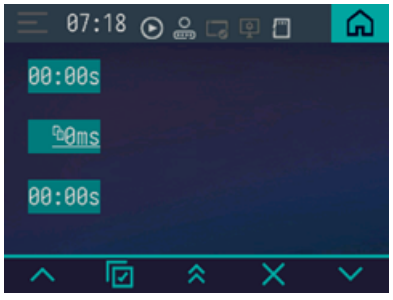
5.3.6 Reference parameter

If the parameter is a reference value from another configured function block parameter, the icon displays before the reference value.

The following are examples of parameter T as a reference value:

Reference value in Set Parameter menu

Reference value in message page



In these examples, you are only allowed to change the timebase rather than the value. Long-pressing the underlined T value to enter the edition page, then selecting the timebase.

5.3.7 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.

Depending on the configured I/O analog resolution, LOGO! always converts the electrical signals at the analog input into digital values from 0 to 1000/4095/10000. LOGO! internally transforms a voltage of 0 V to 10 V at input AI to a range of values from 0 to 1000/4095/10000. LOGO! interprets an input voltage exceeding 10 V as internal value 1000/4095/10000.

To learn the detailed information about I/O analog resolution configuration, refer to *LOGO!Soft Comfort Online Help*.

Because you cannot always process the range of values from 0 to 1000/4095/10000 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! onboard display that is proportional to the actual process variable.

Analog resolution	Input voltage (in V)	Internal value	Gain	Offset
0-1000	• Min: 0 • Max: ≥ 10	• Min: 0 • Max: 1000	• Min: -10.00 • Max: +10.00	• Min: -10000 • Max: +10000
0-4095	• Min: 0 • Max: ≥ 10	• Min: 0 • Max: 4095	• Min: -10.00 • Max: +10.00	• Min: -32768 • Max: +32767
0-10000	• Min: 0 • Max: ≥ 10	• Min: 0 • Max: 10000	• Min: -10.00 • Max: +10.00	• Min: -32768 • Max: +32767

Mathematical rule

Actual value **Ax** =
(internal value at input Ax • gain) + offset

Gain and offset calculation

LOGO! calculates the gain and offset based on the relevant high and low values of the function. In the following examples, the I/O analog resolution is set as 0-1000.

Example 1:

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

Actual value = (internal value • gain) + offset, thus

-30 = (0 • A) + B, that is, offset B = -30

+70 = (1000 • A) -30, that is, 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 = (internal value • gain) + offset, thus

1000 = (0 • A) + B, that is, offset B = 1000

5000 = (1000 • A) +1000, that is, gain A = 4

Example of analog values

In the following example, the I/O analog resolution is set as 0-1000.

Process variable	Voltage (V)	Internal value	Gain	Offset	Value shown (Ax)
-30 °C 0 °C +70 °C	0 3 10	0 300 1000	0.1 0.1 0.1	-30 -30 -30	-30 0 70
1000 mbar 3700 mbar 5000 mbar	0 6.75 10	0 675 1000	4 4 4	1000 1000 1000	1000 3700 5000
	0 5 10	0 500 1000	0.01 0.01 0.01	0 0 0	0 5 10
	0 5 10	0 500 1000	1 1 1	0 0 0	0 500 1000
	0 5 10	0 500 1000	10 10 10	0 0 0	0 5000 10000
	0 5 10	0 500 1000	0.01 0.01 0.01	5 5 5	5 10 15
	0 5 10	0 500 1000	1 1 1	500 500 500	500 1000 1500
	0 5 10	0 500 1000	1 1 1	-200 -200 -200	-200 300 800
	0 10	0 1000	10 10	-10000 -10000	-10000 0
	0.02 0.02 0.02 0.02	2 2 2 2	0.01 0.1 1 10	0 0 0 0	0 0 2 20

For further information on a sample application, refer to the "Analog comparator (Page 187)" topic.

For further information on analog inputs, refer to the Constants and connectors (Page 126) topic.

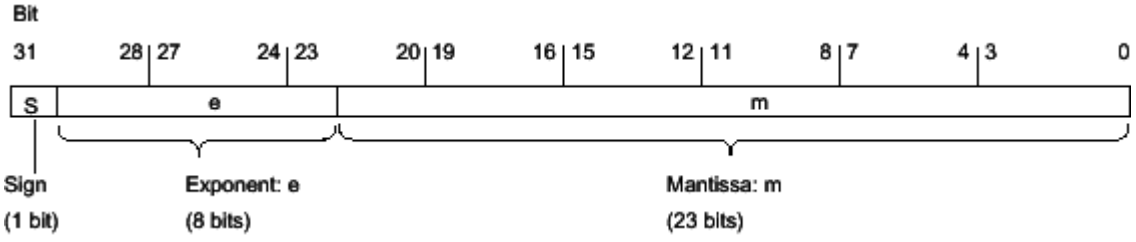
5.3.8 Floating-point numbers

Floating-point numbers description

Floating-point numbers have a length of 32 bits, and consist of the following three components:

- Sign: determined by the signal state of bit 31. The bit 31 assume the value "0" (positive) or "1" (negative).
- 8-bit exponents to basis 2: the exponent is increased by a constant (base, +127), so that it has a value range of 0 to 255.
- 23-bit mantissa: only the fraction part of the mantissa is shown. The integer part of the mantissa is always 1 with normalized floating-point numbers and is not stored.

The following figure shows the structure of floating-point numbers:



NOTE

With floating-point numbers, only the precision defined by the IEEE754 standard is stored. Additionally specified decimals are rounded off according to IEEE754.

The number of decimal places may decrease for frequently nested arithmetic calculations.

If more decimal places are specified than can be stored by the data type, the number is rounded to the value corresponding to the precision allowed by this value range.

The following table shows the properties of floating-point numbers:

Length (bit)	Format	Value range	Examples of value input
32	Floating-point numbers according to IEEE754	-3.402823e+38 to -1.175495e-38 ±0.0 +1.175495e-38 to +3.402823e+38	1.0e-5
	Floating-point numbers		1.0

NOTE

LOGO! 0BA8 and earlier versions only provide integer analog function blocks. You can use Float/Integer convertor (Page 226) FB or Integer/Float convertor (Page 228) FB to convert the integer and float data. These two blocks can only be used with the integer function blocks, and support single-precision floating-point number and double-precision floating-point number.

LOGO! 9 and later versions provide float analog function blocks. Float analog blocks only support single-precision floating-point number.

Floating-point numbers display

LOGO! supports the processing of floating-point numbers that comply with the IEEE754 standard.

This following table lists the display rules for floating-point numbers in LOGO!.

Value	Display
Invalid value	NaN
Positive infinity	+INF
Negative infinity	-INF
Valid value	• Display with seven significant digits (including both integer and decimal parts). • The display format supports scientific notation.

To learn more about the floating-point numbers format and display, refer to the IEEE754 standard.

NOTE

Float analog function blocks

The output value of the float analog function blocks are floating-point numbers as shown in above table. When errors occur in the float blocks, the output value (usually AQ) will be kept as the value from the last cycle, and the float block parameters are unreliable.

5.4 Special functions

When you create your circuit program in LOGO!Soft Comfort, you find the following special function blocks.

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".

The table also specifies whether the relevant function can be set retentive (Rem).

Name of the special function	Rem
Timers	
On-delay (Page 145)	REM
Off-delay (Page 148)	REM
On-/off-delay (Page 150)	REM
Retentive on-delay (Page 152)	REM
Wiping relay (pulse output) (Page 153)	REM
Edge-triggered wiping relay (Page 155)	REM
Asynchronous pulse generator (Page 158)	REM
Random generator (Page 159)	
Stairway lighting switch (Page 161)	REM
Multiple function switch (Page 164)	REM
Weekly timer (Page 166)	
Yearly timer (Page 168)	
Astronomical clock (Page 171)	
Stopwatch (Page 173)	
Counter	
Up/down counter (Page 175)	REM
Hours counter (Page 177)	REM
Threshold trigger (Page 180)	
Analog	
Analog threshold trigger (Page 183)	
Analog differential trigger (Page 185)	
Analog comparator (Page 187)	
Analog watchdog (Page 191)	REM
Analog amplifier (Page 193)	
Analog multiplexer (Page 204)	
Pulse width modulator (PWM) (Page 213)	
Mathematic instruction (Page 217)	
Analog ramp (Page 206)	
PI controller (Page 209)	REM
Analog filter (Page 221)	
Max/Min (Page 222)	REM

Name of the special function	Rem
Average value (Page 225)	REM
Float mathematics instruction (Page 230)	
Miscellaneous	
Latching relay (Page 195)	REM
Pulse relay (Page 196)	REM
LCD Message (Page 197)	
Softkey (Page 202)	REM
Shift register (Page 203)	REM
Mathematic instruction error detection (Page 219)	
Float/Integer Converter (Page 226)	
Integer/Float Converter (Page 228)	

5.4.1 On-delay

Short description

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

Connection	Description
Input Trg	A signal at input Trg (Trigger) triggers the on-delay timer.
Parameter	T represents the time after which the output is on (0 to 1 transition of the output signal). Retentivity: / = no retentivity R = the status is retentive.
Output Q	Q is on when the set time T expires, provided Trg is still set.

Parameter T

Note the defaults for parameter T in topic Time response (Page 137).

The actual value of another already-configured functions can provide the time for parameter T. You can use the actual values of the following functions for the value of T:

- Analog comparator (Page 187)(actual value Ax - Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 193)(actual value Ax)
- Analog multiplexer (Page 204)(actual value Aq)
- Analog ramp (Page 206)(actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209)(actual value Aq)
- Up/down counter (Page 175)(actual value Cnt)

- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (current time Ta)
- Off-delay (Page 148)(current time Ta)
- On-/off-delay (Page 150)(current time Ta)
- Retentive on-delay (Page 152)(current time Ta)
- Wiping relay (pulse output) (Page 153)(current time Ta)
- Edge-triggered wiping relay (Page 155)(current time Ta)
- Asynchronous pulse generator (Page 158)(current time Ta)
- Stairway lighting switch (Page 161)(current time Ta)
- Multiple function switch (Page 164)(current time Ta)
- Stopwatch (Page 173)(actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

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

Valid ranges of the timebase, if T = parameter

Note the following characteristics of timebase values.

Timebase	max. value	min. resolution	Accuracy
s (seconds)	99:99	10 ms	+ 10 ms
m (minutes)	99:59	1s	+ 1 s
h (hours)	99:59	1 min	+ 1 min

The parameter T initially appears as follows in STOP mode, for example:

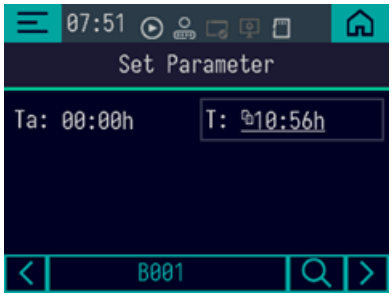
Valid ranges of the timebase, if T = reference value

If the value of T is the reference value from another configured function block parameter, the valid ranges of the timebase are as follows:

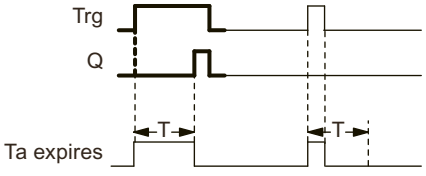
Timebase	max. value	Meaning	Accuracy
ms	32767	Number of ms	+ 10 ms
10 ms	99:99	Number of s	+
s	99:59	Number of min	+ 1 s
m	99:59	Number of h	+ 1 min

The icon displays before the reference value.

You are only allowed to change the timebase rather than the value. Long-pressing the underlined T value to enter the edition page, then selecting the timebase. The following is an example of parameter T as a reference value:



Timing diagram



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

Functional description

A 0 to 1 transition triggers the time T_a at input Trg (T_a is the current LOGO! time).

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

LOGO! resets the time when the status at input Trg returns to 0 before the time T expires.

LOGO! resets the output to 0 when the signal at input Trg is 0.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.2 Off-delay

Short description

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

Connection	Description
Input Trg	The off-delay timer starts with a negative edge (1 to 0 transition) at input Trg (Trigger)
Input R	A signal at input R resets the on-delay time and the output.
Parameter	The output switches off (transitions from1 to 0) when the delay time T expires. Retentivity: / = No retentivity R = The status is retentive.
Output Q	A signal at input Trg sets Q. Q holds this state until T expires.

Parameter T

Note the parameter T defaults specified in topic Time response (Page 137).

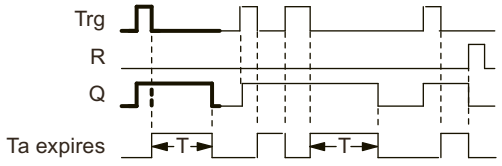
The actual value of another already-configured functions can provide the time for parameter T. You can use the actual value of the following functions:

- Analog comparator (Page 187) (actual value Ax - Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)

- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid timebase ranges and parameter preset, refer to Section "On-delay (Page 145)".

Timing diagram



The bold section of the timing diagram also appears in the off-delay symbol.

Functional description

LOGO! sets Output Q to 1 immediately when the input Trg transitions from 0 to 1.

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

LOGO! retriggers he time T_a 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 expires.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.3 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.

Connection	Description
Input Trg	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.
Parameter	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.
Output Q	LOGO! sets Q when the configured time T_H expires and Trg is still set. LOGO! resets Q when T_L expires, if the trigger Trg has not been set.

Parameters T_H and T_L

Note the preset values for the parameters T_H and T_L in topic Time response (Page 137).

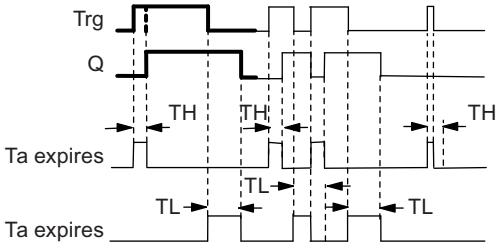
The actual value of another, already-configured function can provide the on-delay and off-delay times for parameters T_H and T_L . You can use the actual values of the following functions:

- Analog comparator (Page 187)(actual value Ax - Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 193)(actual value Ax)
- Analog multiplexer (Page 204)(actual value Aq)
- Analog ramp (Page 206)(actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209)(actual value Aq)
- Up/down counter (Page 175)(actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145)(current time Ta)
- Off-delay (Page 148)(current time Ta)
- On-/off-delay (current time Ta)
- Retentive on-delay (Page 152)(current time Ta)

- Wiping relay (pulse output) (Page 153)(current time Ta)
- Edge-triggered wiping relay (Page 155)(current time Ta)
- Asynchronous pulse generator (Page 158)(current time Ta)
- Stairway lighting switch (Page 161)(current time Ta)
- Multiple function switch (Page 164)(current time Ta)
- Stopwatch (Page 173)(actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid timebase ranges and parameter preset, refer to Section "On-delay (Page 145)".

Timing diagram



The bold section of the timing diagram also appears 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, LOGO! sets the output to 1 on expiration of the time T_H (the output follows the input with on-delay).

LOGO! resets the time when LOGO! resets the signal at input Trg to 0 before the time T_H expires.

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, LOGO! sets the output to 0 on expiration of the time T_L (the output follows the input with off-delay).

LOGO! resets the time when the signal at input Trg changes to 1 again before the time T_L expires.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.4 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.

Connection	Description
Input Trg	A signal at input Trg (Trigger) triggers the on-delay timer.
Input R	A signal at input R resets the on-delay time and the output.
Parameter	T represents the on-delay time for the output (output status transition 0 to 1). Retentivity: / = no retentivity R = The status is retentive.
Output Q	LOGO! sets output Q after the time T expires.

Parameter T

Note the defaults specified in topic Time response (Page 137).

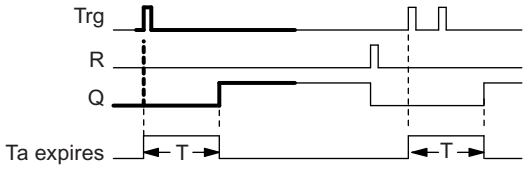
The actual value of another already-programmed function can provide the time for parameter T. You can use the actual values of the following functions:

- Analog comparator (Page 187)(actual value Ax – Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 193)(actual value Ax)
- Analog multiplexer (Page 204)(actual value Aq)
- Analog ramp (Page 206)(actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209)(actual value Aq)
- Up/down counter (Page 175)(actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145)(current time Ta)
- Off-delay (Page 148)(current time Ta)
- On-/off-delay (Page 150)(current time Ta)
- Retentive on-delay (current time Ta)
- Wiping relay (pulse output) (Page 153)(current time Ta)
- Edge-triggered wiping relay (Page 155)(current time Ta)
- Asynchronous pulse generator (Page 158)(current time Ta)
- Stairway lighting switch (Page 161)(current time Ta)

- Multiple function switch (Page 164)(current time Ta)
- Stopwatch (Page 173)(actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Section "On-delay (Page 145)".

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. LOGO! sets output Q when $T_a = T$. A further signal at input Trg does not influence the time T_a.

LOGO! resets the output and the time T_a with the next 1 signal at input R.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.5 Wiping relay (pulse output)

Short description

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

Connection	Description
Input Trg	A signal at input Trg (Trigger) triggers the time for the wiping relay function.
Parameter	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.
Output Q	A signal at input Trg sets Q. If the input signal = 1, output Q remains set for the time Ta.

Parameter T

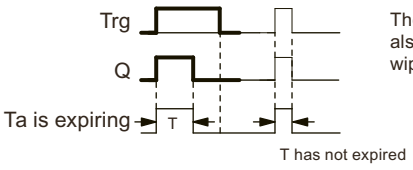
Note the information on parameter T in topic Time response (Page 137).

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

- Analog comparator (Page 187)(actual value Ax – Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 193)(actual value Ax)
- Analog multiplexer (Page 204)(actual value Aq)
- Analog ramp (Page 206)(actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209)(actual value Aq)
- Up/down counter (Page 175)(actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145)(current time Ta)
- Off-delay (Page 148)(current time Ta)
- On-/off-delay (Page 150)(current time Ta)
- Retentive on-delay (Page 152)(current time Ta)
- Wiping relay (pulse output) (current time Ta)
- Edge-triggered wiping relay (Page 155)(current time Ta)
- Asynchronous pulse generator (Page 158)(current time Ta)
- Stairway lighting switch (Page 161)(current time Ta)
- Multiple function switch (Page 164)(current time Ta)
- Stopwatch (Page 173)(actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to Section "On-delay (Page 145)".

Timing diagram



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.

LOGO! resets output Q to lo (pulse output) when T_a reaches the value preset at T (T_a = T).

LOGO! sets the output immediately if there is a 1 to 0 transition at input Trg before the specified time expires.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.6 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.

Connection	Description
Input Trg	A signal at input Trg (Trigger) triggers the times for the edge triggered wiping relay.
Input R	A signal at input R resets the current time (T_a) and the output.
Parameter	The interpulse width T_L and the pulse width T_H are configurable. N determines the number of pulse/pause cycles TL/TH: Range of values: 1...9 Retentivity: / = No retentivity R = The status is retentive.
Output Q	Q is set after TL expires, and reset after TH expires.

Parameters TH and TL

Note the information on parameter T in topic Time response (Page 137).

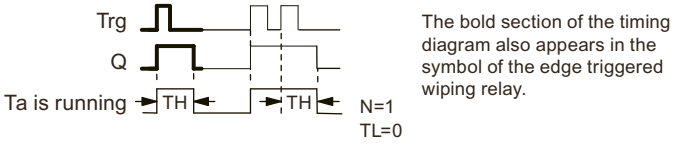
The actual value of another already-programmed function can provide the pulse width TH and the interpulse width TL. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)

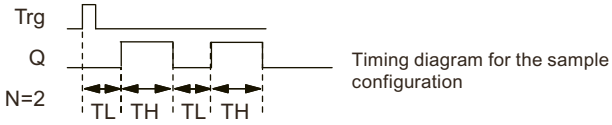
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

Timing diagram A



Timing diagram B



Functional description

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

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

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

Setting the Par parameter

View in STOP mode (example):

View in RUN mode (example):

① Interpulse width

② Pulse width

③ Number of pulse/pause cycles (example)

④ Protection mode and retentivity

⑤ Current pulse width T_L or T_H

To change the parameter, long-press the underlined value to enter the edition page.

5.4.7 Asynchronous pulse generator

Short description

You can asynchronously output pulses with this function.

Connection	Description
Input En	You can use input EN to set and reset the asynchronous pulse generator.
Input Inv	You can use input Inv to invert the output signal of the active asynchronous pulse generator.
Parameter	You can configure the pulse width T_H and the interpulse width T_L. Retentivity: / = No retentivity R = The status is retentive.
Output Q	The pulse and pause values cyclically set and reset Q.

Parameters TH and TL

Note the information on parameter T in topic Time response (Page 137)

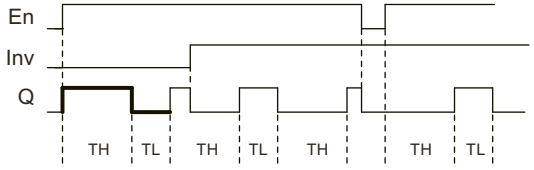
The actual value of another already-programmed function can provide the pulse width TH and the interpulse width TL. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (current time Ta)
- Stairway light switch (Page 161) (current time Ta)

- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

Timing diagram



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 the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.8 Random generator

Short description

The random generator function sets an output randomly within a configured time.

Connection	Description
Input En	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.
Parameter	LOGO! sets the on-delay at random to a value between 0 s and T_H. The off-delay is set at random to a value between 0 s and T_L.
Output Q	LOGO! sets output Q when the on-delay expires and if En is still set. LOGO! resets Q when the off-delay expires, provided LOGO! has not set En again meanwhile.

Parameter T_H and T_L

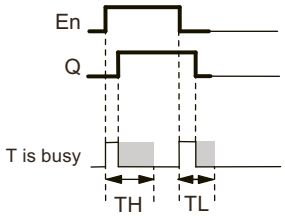
Note the defaults of the T_H and T_L parameters listed in topic Time response (Page 137).

The actual value of another already-programmed function can provide the on-delay time TH and the off-delay time TL. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

Timing diagram



The bold section of the timing diagram also appears in the symbol of the random generator.

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 expires 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.

LOGO! resets the output after the off-delay time expires, provided input En remains lo at least for the duration of this time.

LOGO! resets the time if the signal at input En changes to 1 again before the off-delay time expires.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

5.4.9 Stairway lighting switch

Short description

An input edge triggers a configurable and retriggerable time. LOGO! resets the output after this time expires. LOGO! can optionally output a warning signal to warn of the impending time expiration.

Connection	Description
Input Trg	A signal at input Trg (Trigger) triggers the off-delay time for the stairway lighting switch.
Parameter	T represents the off-delay time of the output (output signal transition 1 to 0). T_I determines the triggering time for the pre-warning. T_{IL} determines the length of the pre-warning signal. Retentivity: / = No retentivity R = The status is retentive.
Output Q	LOGO! resets Q after the time T expires. LOGO! outputs a warning signal before this time expires.

Parameter T, $T_!$ and $T_{!L}$

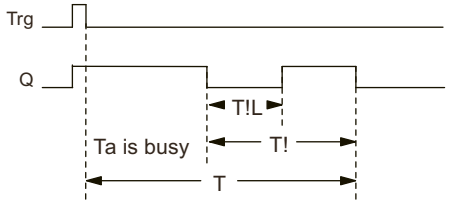
Note the defaults of the T parameters listed in topic Time response (Page 137).

The actual value of another already-programmed function can provide the off-delay time T, the pre-warning time $T_!$ and the pre-warning period $T_{!L}$. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lightswitch (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

Timing diagram



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 T_a, and output Q remains set.

LOGO! resets output Q when $T_a = T$. You can output a warning signal before the off-delay time ($T - T_!$) expires to reset Q for the time of the pre-warning period $T_{!L}$.

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

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

Setting the Par parameter

Note the defaults specified in topic Time response (Page 137).

NOTE

All times must have the same timebase.

View in STOP mode (example)

View in RUN mode (example)

① Off-delay time

② Off-warning time

③ Protection mode and retentivity

④ Start of the off-warning period ($T - T_!$)

⑤ Current value of T

To change the parameter, long-press the underlined value to enter the edition page.

5.4.10 Multiple function switch

Short description

The multiple function switch provides two different functions:

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

Connection	Description
Input Trg	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.
Input R	A signal at input R resets the current time T_a and resets the output.
Parameter	T represents the off-delay time. LOGO! resets the output (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. $T_!$ represents the on-delay for the prewarning time. $T_{!L}$ represents the length of the prewarning time period. Retentivity: / = No retentivity R = The status is retentive.
Output Q	A signal at Trg switches on output Q. Depending on the length of the input at Trg, the output is off again or on permanently, or it is reset with a further signal at Trg.

Parameters T, T_L,$T_!$ and $T_{!L}$

Note the defaults of the T parameters listed in topic Time response (Page 137).

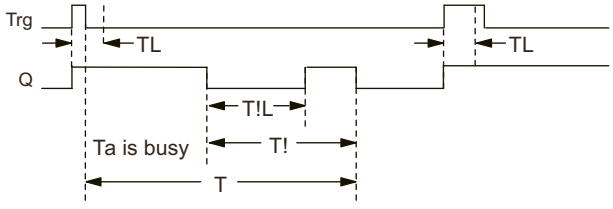
The actual value of another already-programmed function can provide the off-delay time T, the permanent light time T_L, the on-delay prewarning time $T_!$ and the prewarning time period $T_{!L}$. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)

- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)
- Multiple function switch (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

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 T_L, LOGO! enables the permanent lighting function and sets output Q accordingly.

LOGO! triggers the off-delay T when input Trg returns to 0 before T_L has expired.

Output Q is reset when $T_a = T$.

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 $T_{!L}$. A subsequent signal at Trg always resets T and the output Q.

If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

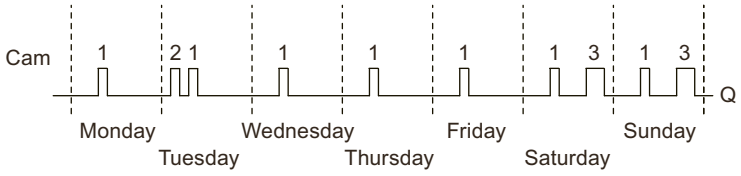
5.4.11 Weekly timer

Short description

The weekly timer controls an output 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.

Connection	Description
Cam parameters 1, 2 and 3	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. You can also specify whether the timer pulses on for one cycle when activated and then reset. The pulse setting applies to all three cams.
Output Q	LOGO! sets Q when actuating the configured cam.

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 for you 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 you have not set it, the weekly timer resets the output at a certain off-time if you configure an off-time, or at the end of the cycle if you specify a pulse output.

You will cause a conflict if you set overlapping on- and off-times; the earliest on- and off-times take priority. Here is an example:

Cam	On-time	Off-time
1	1:00h	2:00h
2	1:10h	1:50h
3	1:20h	1:40h

In this example, the work time is 1:00h to 1:40h.

The status of all three cams determines the switching state of the weekly timer.

Parameter setting screen form

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

① (Cam 1) weekdays (daily)
② (Cam 1) On-time
③ (Cam 1) Off-time
④ Pulse setting
⑤ Protection mode

Days of the week

The prefix "D=" (Day) has the following meaning:

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

Uppercase letters indicate a specific day of the week. A "-" indicates no selection for the day of the week.

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.

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.

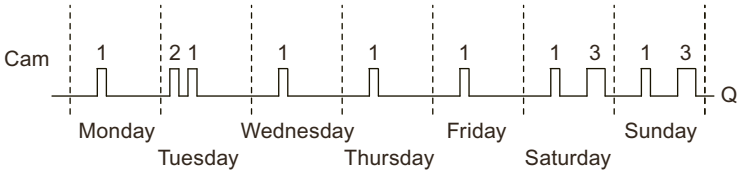
This requires three cams.

Here are the parameter setting screen forms of the cams No 1, 2 and 3, based on the timing diagram shown earlier.

- Cam No1 must set the output of the weekly timer daily from 06:30 h to 08:00 h.
- Cam No2 must set the output of the weekly timer every Tuesday from 03:10 h to 04:15 h.
- Cam No3 must set the output of the weekly timer switch every Saturday and Sunday from 16:30 h to 23:10 h.

Views in LOGO!:

Result



5.4.12 Yearly timer

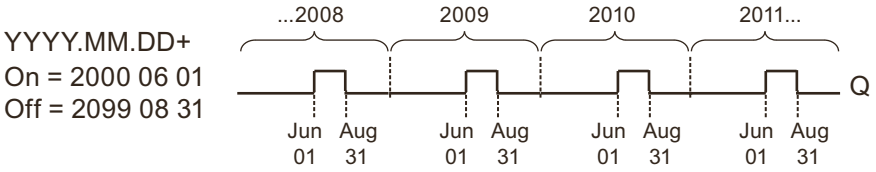
Short description

The output is controlled by means of a configurable on/off date. You can configure the timer to activate on a yearly, monthly, or user-defined time basis. With any mode, you can also configure the timer to pulse the output during the defined time period. The time period is configurable within the date range of January 1, 2000 to December 31, 2099.

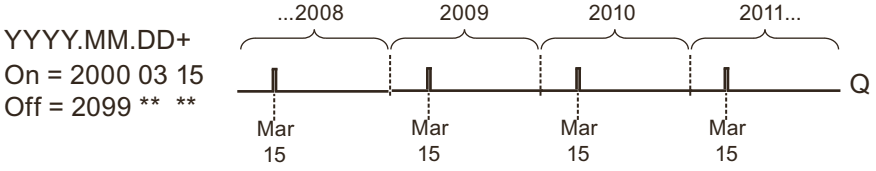
Connection	Description
Cam parameter	At the Cam parameter, you configure the timer mode, the on-/off-times for the timer, and whether the output is a pulse output.
Output Q	LOGO! sets Q when the configured cam is on.

Timing diagrams

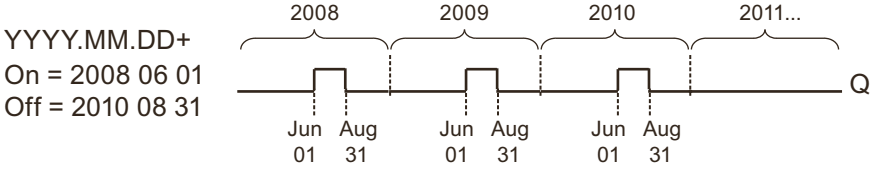
Example 1: Yearly mode on, Monthly mode off, Pulse Off, On Time = 2000-06-01, Off Time = 2099-08-31: every year on June 1 the timer output switches on and remains on until August 31.



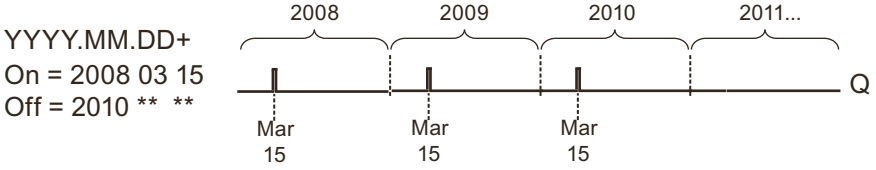
Example 2: Yearly mode on, Monthly mode off, Pulse on, On Time = 2000-03-15, Off Time = 2099-**-**: every year on March 15, the timer switches on for one cycle.



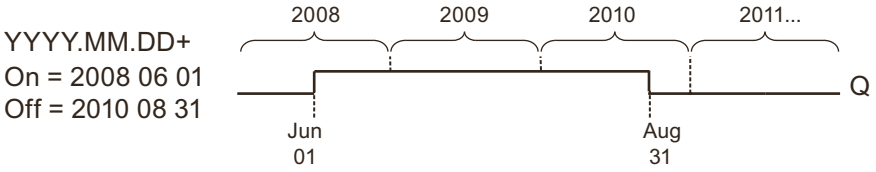
Example 3: Yearly mode on, Monthly mode off, Pulse off, On Time = 2008-06-01, Off Time = 2010-08-31: on June 1 of 2008, 2009, and 2010 the timer output switches on and remains on until August 31.



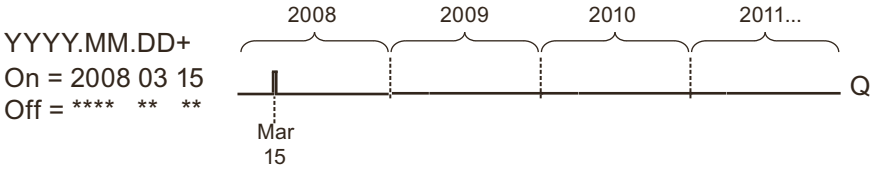
Example 4: Yearly mode on, Monthly mode off, Pulse on, On Time = 2008-03-15, Off Time = 2010-**-**: on March 15 of 2008, 2009, and 2010, the timer output switches on for one cycle.



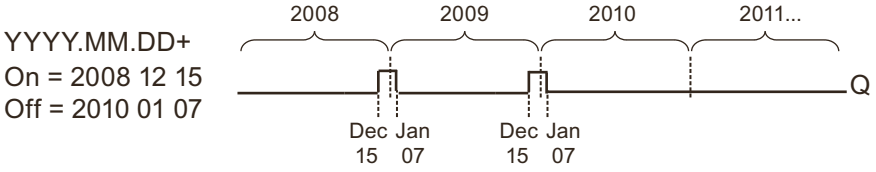
Example 5: Yearly mode off, Monthly mode off, Pulse off, On Time = 2008-06-01, Off Time = 2010-08-31: on June 1, 2008 the timer output switches on and remains on until August 31, 2010.



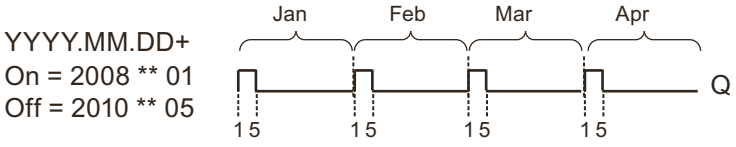
Example 6: Yearly mode off, Monthly mode off, Pulse selected, On Time = 2008-03-15, Off Time = ****-**-**: on March 15, 2008 the timer output switches on for one cycle. Because the timer does not have a monthly action or yearly action, the timer output pulses only one time at the specified On Time.



Example 7: Yearly mode on, Monthly mode off, Pulse off, On Time = 2008-12-15, Off Time = 2010-01-07: on December 15 of 2008 and 2009, the timer output switches on and remains on until January 7 of the following year. When the timer output turns off on January 7, 2010 it does NOT turn on again the following December 15.



Example 8: Yearly mode on, Monthly mode on, 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.



Functional description

The yearly timer sets and resets the output at specific on and off dates. Sets and resets are executed at 00:00. If your application requires a different time, use a weekly timer together with a yearly timer in your circuit program.

The on time specifies when the timer is activated. The off time specifies when the output is reset again. 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.

If 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. The on time specifies the initial year in which the timer is activated. The off time defines the last year in which the timer turns off. The maximum year is 2099.

If 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 time specifies the initial year in which the timer is activated. The off time defines the last year in which the timer turns off. The maximum year is 2099.

If you set Pulse output, the timer output switches on at the specified on time for one cycle and then the timer output is reset. You can choose to pulse a timer on a monthly or yearly basis, or just a single time.

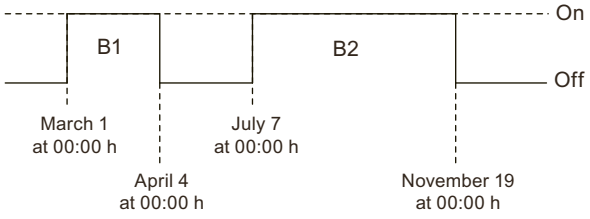
If you set none of the Monthly, Yearly, or Pulse modes on, you can define a specific time period with the on time and off time. It can span any time period that you choose.

For a process action that is to be switched on and off at multiple but irregular times during the year, you can define multiple yearly timers with the outputs connected by an OR function block.

Backup of the real-time clock

The internal real-time clock of LOGO! is buffered against power failure. The buffering time is influenced by the surrounding temperature, and is typically 20 days at a surrounding temperature of 25°C.

Result



5.4.13 Astronomical clock

Short description

The astronomical clock function is used to set an output high when the current time of your LOGO! Base Module is between the time of sunrise (TR) and the time of sunset (TS). LOGO! automatically calculates these times based on the geographical location, the settings for automatic summertime/wintertime conversion, and the current time of the module.

Connection	Description
Parameter	You specify the longitude, latitude, time zone, sunrise time offset and sunset time offset: **Longitude:** Direction settings: EAST or WEST Range of values: 0 ° to 180 ° (degrees) 0 ' to 59 ' (minutes) 0 " to 59 " (seconds) **Latitude**: Direction settings: NORTH or SOUTH Range of values: 0 ° to 90 ° (degrees) 0 ' to 59 ' (minutes) 0 " to 59 "(seconds) **Zone**:

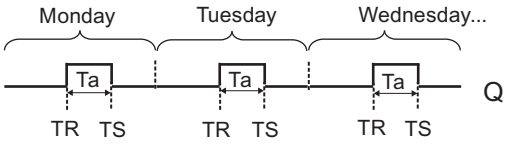
Connection	Description
	Range of values: -11 to 12 **TR Offset** (sunrise time offset): Range of values: -59 minutes to 59 minutes **TS Offset** (sunset time offset): Range of values: -59 minutes to 59 minutes
Output Q	LOGO! sets Q to "1" when the current time of your LOGO! Base Module is between the sunrise time (TR) and the sunset time (TS).

NOTE

From LOGO!Soft Comfort V8.1, you can choose from several pre-defined time zone locations. If you select one of these locations, LOGO!Soft Comfort uses the latitude, longitude, and the time zone of your selection. This location pre-configuration capability is only possible from LOGO!Soft Comfort.

Timing diagram

The following illustration is an example of the timing diagram where Ta refers to the current time of the LOGO! Base Module:



Functional description

The function calculates the TR and TS values at the input and sets Q when Ta (Ta is the current LOGO! Time) is between TR and TS; otherwise, the function resets Q.

If automatic summertime/wintertime conversion (see the topic Setting clock (Page 94) for details) is enabled, the function takes the configured time difference into consideration when calculating the TR and TS values.

5.4.14 Stopwatch

Short description

The stopwatch function counts the elapsed time between a start stopwatch signal and a stop stopwatch signal.

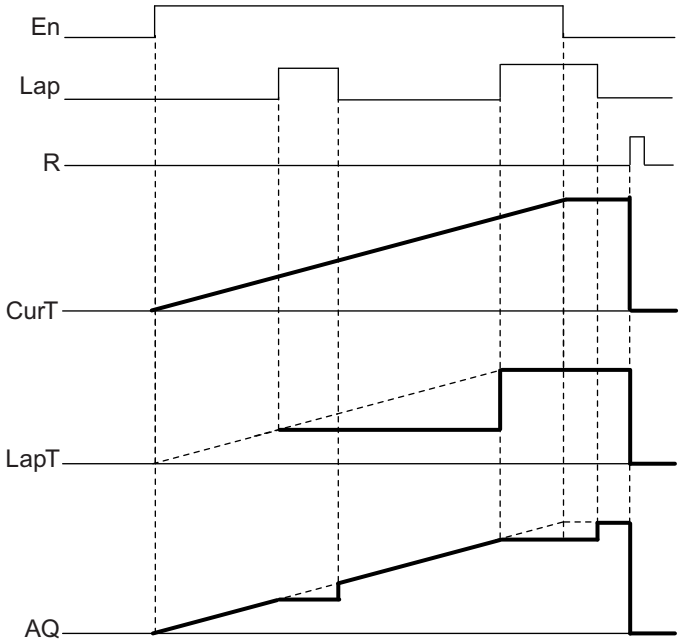
Connection	Description
En	A signal at input En begins counting elapsed time at analog output AQ.
Lap	A positive edge (0 to 1 transition) at input Lap pauses the stopwatch. A negative edge (1 to 0 transition) at input Lap resumes the stopwatch.
R	A signal at input R resets the elapsed time.
Parameter	You can set a timebase **TB** for the stopwatch. **Possible timebase settings**: 10 ms, s, m, and h Retentivity: / = No retentivity R = The status is retentive
Output AQ	A signal at input Lap holds the value of AQ until Lap is reset to 0. A signal at input R resets the value of AQ to 0.

Parameters TB

You can set a timebase from the following timebase set:

- 10 ms (10 milliseconds)
- s (seconds)
- m (minutes)
- h (hours)

Timing diagram



Functional description

En = 1 and Lap = 0: Using the selected timebase, the stopwatch outputs the current time (CurT) to AQ.

En = 1 and Lap = 1: The stopwatch leaves AQ at its last value when Lap = 0. This value is recorded as LapT for stopwatch pause time.

En = 0 and Lap = 1: The stopwatch pauses counting time. It outputs LapT to AQ.

En = 0 and Lap = 0: The stopwatch outputs the current time (CurT) to AQ.

A signal at R sets the AQ value to 0.

5.4.15 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.

Connection	Description
Input R	A signal at input R resets the internal count value to zero.
Input Cnt	The function counts the 0 to 1 transitions at input Cnt. 1 to 0 transitions are not counted. You can use the following as the input: • inputs I3, I4, I5, and I6 for fast counting (only LOGO! 12/24RCE/RCEo and LOGO! 24CE/24CEo): max. 5 kHz, if the fast input is directly connected to the up/down counter function block • any other input or circuit component for counting low frequency signals (typically 4 Hz)
Input Dir	You set the direction of count at input Dir: Dir = 0: Count up Dir = 1: Count down
Parameter	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.
Output Q	Q is set or reset, depending on the current value at Cnt and the set thresholds.

Parameters On and Off

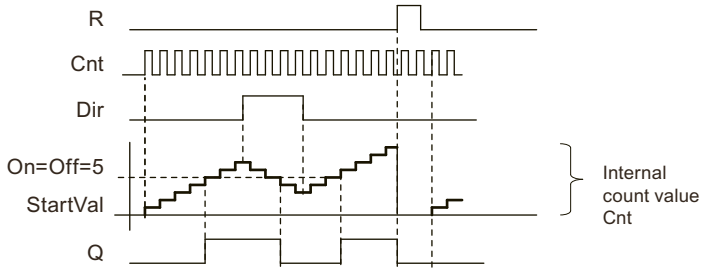
The actual value of another already-programmed function can provide the on threshold On and the off threshold Off. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)

- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Timing diagram



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.

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).

If the referenced block returns a value that lies out of the valid range, the value is rounded to the next valid value.

5.4.16 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.

Connection	Description
Input R	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).
Input En	En is the monitoring input. LOGO! scans the on-time of this input.
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 • Time-to-go of the maintenance interval MN = MI.
Parameter	MI: Maintenance interval to be preset in units of hours and minutes Range of values: 0000 h to 9999 h, 0 m to 59 m OT: the accumulated total operating time (you can specify an offset in hours and minute) Range of values: 00000 h to 99999 h, 0 m to 59 m

Connection	Description
	Q → 0 occurs depending on the following conditions: • 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.
Output Q	The output is set when the time-to-go MN = 0 (see timing diagram). The output is reset under the following conditions: • When "Q→0:R+En", if R = 1 or Ral = 1 or En = 0 • When "Q→0:R", if R = 1 or Ral = 1.

NOTE

MI, MN and OT are always retentive.

Parameter MI

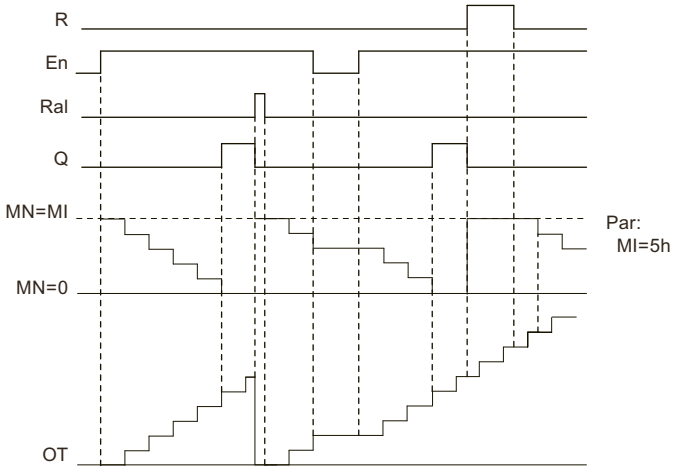
The maintenance interval MI can be provided by the actual value of another already-programmed function. The timebase of the referenced value is "h" (for hours) only. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)

- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (current time Ta)
- Threshhold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

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 RUN 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: You can view the actual values of MI, MN and OT when LOGO! is in RUN mode .
- LOGO! Pure: In LOGO!Soft Comfort, you can use the Online Test to read these values. For further information, see chapter "LOGO! software (Page 287)".
- In LOGO!Soft Comfort you can get the hours counter via the "Tools -> Transfer: Hours counter" menu command.

Limit value of OT

The value of the operating hours in OT is retained when you reset the hours counter with a signal at input R. The hours counter OT will be reset to zero with a transition from 0 to 1 at Ral. It 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. MN is calculated according to the following formula when reset input R is never enabled: MN = MI - (OT % MI). The % operator provides an integer division remainder.

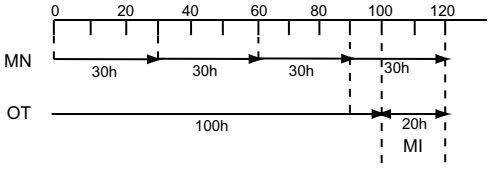
Example:

MI = 30h, OT = 100h

MN = 30 - (100 % 30)

MN = 30 -10

MN = 20h



In runtime mode, the value OT can not be preset. If the value for MI is changed, there would be no calculation for the MN. MN would take on the value of MI.

5.4.17 Threshold trigger

Short description

The output is set and reset with two configurable threshold triggers.

Connection	Description
Input Fre	The function counts the 0 to 1 transitions at input Fre. 1 to 0 transitions are not counted. Use the following as the input: • inputs I3, I4, I5, I6 for fast counting (only LOGO! 12/24RCE/RCEo and LOGO! 24CE/24CEo): if the fast input is directly connected to the threshold trigger function block, max. 5 kHz • any other input or circuit component for counting low frequency signals (typically 4 Hz)

Connection	Description
Parameter	On: on threshold Range of values: 0000...9999 Off: off threshold Range of values: 0000...9999 G_T: time interval or gate time during which the input pulses are measured Range of values: 00:00 s...99:99 s
Output Q	Q is set and reset at the thresholds.

Parameter G_T

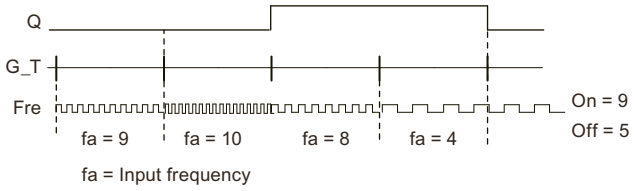
The gate time G_T can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay(pulse output) (Page 153) (current time Ta)
- Edge triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway light switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)

- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Timing diagram



NOTE

The system scans the counter limit value once per interval G_T.

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.

NOTE

f_a always represents the total pulses measured per time unit G_T.

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 ≥ Off threshold, then Q = 1, if f_a > On or Q = 0, if f_a ≤ Off.
- If the On threshold < Off threshold, then Q = 1 if On ≤ f_a < Off.

5.4.18 Analog threshold trigger

Short description

The output is set and reset at two configurable thresholds.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1] [2]		
Parameter	Range of values	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	On (On threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Off (Off threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	p (Number of decimals)	0, 1, 2, 3	/
Output **Q**	**Q** is set or reset depending on the set thresholds.		

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Gain and offset parameters

Please note the information on gain and offset parameters in topic "Calculating the gain and offset of analog values (Page 139)".

Parameters On and Off

The actual value of another already-programmed function can provide the On and Off parameters. You can use the actual values of the following functions:

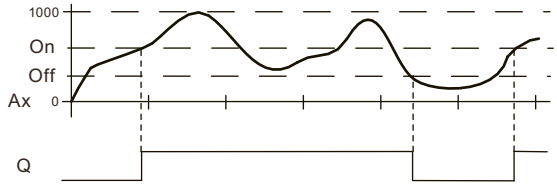
- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Analog threshold trigger (actual value Ax)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Parameter p (number of decimals)

Applies only 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



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 • gain) + offset = 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 ≥ Off threshold, then Q = 1, if the actual value Ax > On or Q = 0, if the actual value Ax ≤ Off.
- If the On threshold < Off threshold, then Q = 1 if On ≤ actual value Ax < Off.

5.4.19 Analog differential trigger

Short description

The output is set and reset depending on a configurable threshold and a differential value.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]		
Parameter	Range of values	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	

Parameter	**On** (On/Off threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	-3.402823E38 to +3.402823E38
	Δ (Differential value for calculating the off parameter)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	p (Number of decimals)	0, 1, 2, 3	/
Output **Q**	**Q** is set or reset, depending on the threshold and difference values.		

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

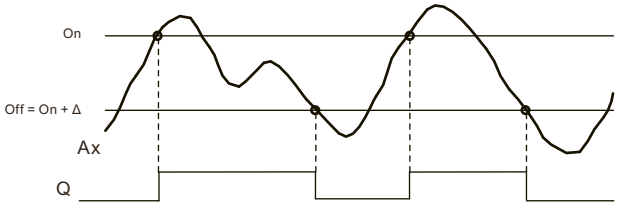
Gain and offset parameters

Please note the information on gain and offset parameters in topic "Calculating the gain and offset of analog values (Page 139)".

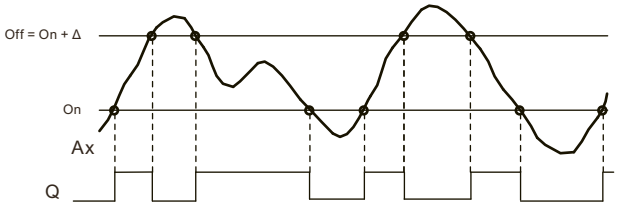
Parameter p (number of decimals)

Applies only to the display of On, Off and Ax values in a message text.

Timing diagram A: Function with negative difference Δ



Timing diagram B: Function with positive difference Δ



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 • gain) + offset = actual value of Ax.

Output Q is set or reset, depending on the set (On) threshold and difference value (Δ). The function automatically calculates the Off parameter: Off = On + Δ, whereby Δ may be positive or negative. See the calculation rule below.

Calculation rule

- When you set a negative differential value Δ, the On threshold ≥ Off threshold, and Q = 1if the actual value Ax > On or Q = 0 if the actual value Ax ≤ Off.
  See the timing diagram A.
- When you set a positive differential value Δ, the On threshold < the Off threshold, and Q = 1, if On ≤ actual value Ax < Off.
  See the timing diagram B.

5.4.20 Analog comparator

Short description

The output is set and reset depending on the difference Ax - Ay and on two configurable thresholds.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	**Description**		
Inputs **Ax**, **Ay**	Inputs **Ax**, **Ay** are two analog signals (integer or float) from the followings: • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • NFAI [2]: NFAI1 to NFAI16 • FAM [2]: FAM1 to FAM32 • The block number of a function with analog output [1 2]		
Parameter	Range of values	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	On (On threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Off (Off threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	

Parameter	**p** (Number of decimals)	0, 1, 2, 3	/
Output **Q**	**Q** is set or reset depending on the set thresholds.		

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Gain and offset parameters

For more information on the gain and offset parameters, refer to topic "Calculating the gain and offset of analog values (Page 139)".

Parameters On and Off

The actual value of another already-programmed function the on threshold On and the off threshold Off. You can use the actual values of the following functions:

- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Analog comparator (actual value Ax - Ay)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)

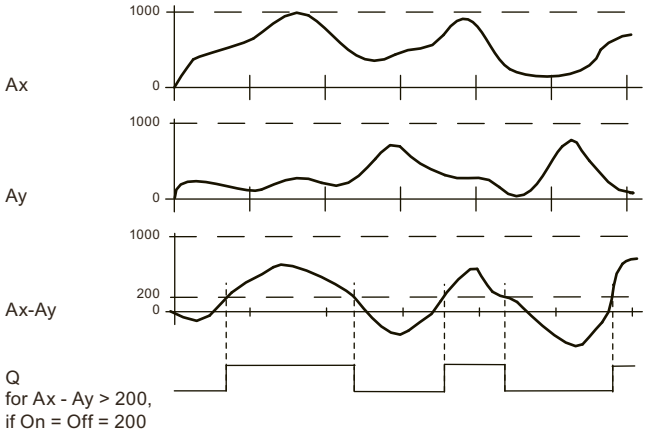
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Parameter p (number of decimals)

Applies only to Ax, Ay, On, Off and Δ 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



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 • gain) + offset = actual value Ax or
(Ay • gain) + offset = actual value Ay.

The function forms the difference ("Δ") 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 ≥ Off threshold, then Q = if (actual value Ax - actual value Ay) > On or Q = 0 if (actual value Ax - actual value Ay) ≤ Off.
- If the On threshold < Off threshold, then Q = 1, if On ≤ (actual value Ax - actual value Ay) < Off.

Setting the Par parameter

The gain and offset parameters are used to adapt the sensors to the relevant application. See the following example.

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 RUN mode.

The thermocouples available have the following technical data: -30 °C to +70 °C, 0 V DC to 10 V DC.

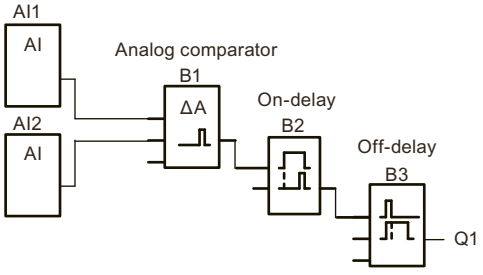
Application	Internal mapping
-30 °C to 70 °C = 0 V DC to 10 V DC	0 to 1000
0 °C	300 → Offset = -30
Range of values: -30 °C to 70 °C = 100	1000 → Gain = 100/1000 = 0.1
On threshold = 15 °C	Threshold = 15
Off threshold = 5 °C	Threshold = 5
See also topic "Calculating the gain and offset of analog values (Page 139) ".	

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



5.4.21 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.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **En**	A positive edge (0 to 1 transition) at input **En** saves the analog value at input **Ax** ("Aen") to memory and starts monitoring of the analog range Aen +- Delta.		
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1] [2]		
Parameter	Value range	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Threshold 1 (Difference value above Aen, on/off threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Threshold 2 (Difference value below Aen, on/off threshold)	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	p (Number of decimals)	0, 1, 2, 3	/
Output **Q**	**Q** is set/reset, depending on the stored analog value and the offset.		

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Gain and offset parameters

For more information on gain and offset parameters, refer to topic "Calculating the gain and offset of analog values (Page 139)".

Parameters Delta1 and Delta2

The actual value of another already-programmed function the Delta1 and Delta2 parameters. You can use the actual value of the following functions:

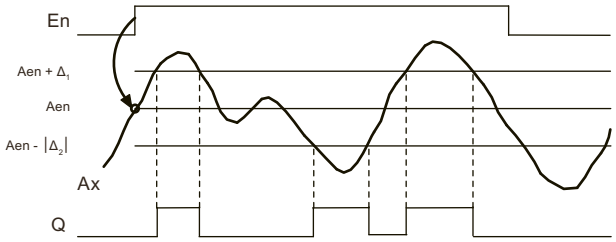
- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Parameter p (number of decimals)

Applies only to the Aen, Ax, Δ_1 and Δ_2 values displayed in a message text.

Timing diagram



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 - Δ_2 to Aen + Δ_1 .

Output Q is reset, when the actual value at input Ax lies within the range of Aen - Δ_2 to Aen+ Δ_1, or when the signal at input En changes to lo.

5.4.22 Analog amplifier

Short description

This special function amplifies the value of an analog input and outputs the result at an analog output.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **Ax**	Input Ax is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]		
Parameter	Value range	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	

Parameter	p (Number of decimals)	0, 1, 2, 3	/
Output **AQ**	**AQ**	-32768 to +32767	-3.402823E38 to +3.402823E38

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Gain and offset parameters

Please note the information on gain and offset parameters in topic Calculating the gain and offset of analog values (Page 139).

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 • gain) + offset = 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 (Page 150)) or the on and/or off limit specification of an up/down counter (Page 175) to the scaled analog value.

For more information with programming examples refer to the Online Help for LOGO!Soft Comfort.

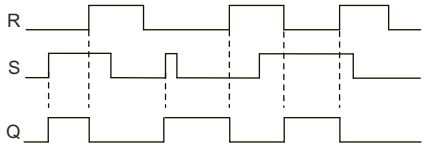
5.4.23 Latching relay

Short description

Input S sets output Q, input R resets output Q again.

Connection	Description
Input S	You set output Q with a signal at input S.
Input R	You reset output Q with a signal at input R. If S and R = 1, the output is reset.
Parameter	Retentivity: / = no retentivity R = the status is retentive.
Output Q	Q is set with a signal at input S, and reset with a signal at input R.

Timing diagram



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:

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

When retentivity is enabled, the current status of the output signal is retained after a power failure.

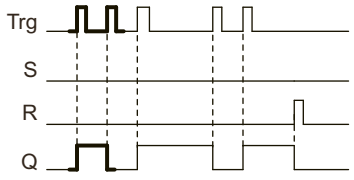
5.4.24 Pulse relay

Short description

A short pulse at the input sets and resets the output.

Connection	Description
Input Trg	You set and reset output Q with a signal at input Trg (Trigger).
Input S	You set output Q with a signal at input S.
Input R	You reset output Q with a signal at input R.
Parameter	Selection: RS (R input priority) or 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

Par	Q_{n-1}	S	R	Trg	Q_n
*	0	0	0	0	0
*	**0**	0	0	0 ->1	**1****
*	0	0	1	0	0

*: RS or SR

**: Triggering signal is effective, because S and R = 0.

Par	Q_{n-1}	S	R	Trg	Q_n
*	0	0	1	0 ->1	0
*	0	1	0	0	1
*	0	1	0	0 ->1	1
RS	0	1	1	0	0
RS	0	1	1	0 ->1	0
SR	0	1	1	0	1
SR	0	1	1	0 ->1	1
*	1	0	0	0	1
*	**1**	0	0	0 ->1	0**
*	1	0	1	0	0
*	1	0	1	0 ->1	0
*	1	1	0	0	1
*	1	1	0	0 ->1	1
RS	1	1	1	0	0
RS	1	1	1	0 ->1	0
SR	1	1	1	0	1
SR	1	1	1	0 ->1	1

*: 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 STOP mode:

This special function is not available for parameter setting when LOGO! is in RUN mode.

NOTE

If Trg = 0 and Par = RS, the special function "Pulse relay" corresponds with the special function "Latching relay (Page 195)".

5.4.25 LCD Message

Short description

With the LCD Message function block, you can configure a message pages that includes text and other parameters for LOGO! to display in RUN mode.

You can configure simple message display and parameters in the message pages from LOGO! onboard display. LOGO!Soft Comfort provides an extended set of message widgets to display on the LOGO! onboard LCD display: function widgets provided by the LCD Message function block, and parameter widgets provided by function blocks in the circuit diagram. Refer to the *LOGO!Soft Comfort Online Help* for detailed information on these features.

LCD Message function block

Connection	Description
Input **En**	A 0 to 1 transition at En (**En**able) triggers the output of the message page.
Input **P**	P* is the display priority of the message page in which the FB is used. 0 is the lowest, 127 the highest priority. Ack: Acknowledgement of the message text
Parameter	**Par**: actual values of the message widgets. You can configure two types of message widgets: • Parameter widget: parameters referenced from other function blocks in the circuit program, or parameters from the configured function widget. See "Visible parameter or process values". • Function widget: – Text label: display text content. – Integer number: display the reference actual value as an integer number (Byte, Word, Dword). – Float number: display the reference actual value as a float number. – Button: control a digital value as a pressing button. – I/O text: display the reference actual value as the configured text, for example, "On", "Off". – I/O icon: display the reference actual value as a button. – Bar: display the reference actual value as a progress bar. – Slider: display the reference actual value as a slider. – Single selector: display the configured selector and you can select configured values from it. – Scale time: display the reference actual value in a specific time base format. – System time: display the current system time or the system time when the LCD Message function block is enabled. The time is displayed in the format **00:00:00**. – System date: display the current system date or the system date when the LCD Message function block is enabled. The date is displayed in the format **YY-MM-DD**.
Output **Q**	Q remains set as long as the message text is queued.
* If you want to change the priority on LCD when the BM is running, you can change it using the Selector widget.	

Functional description

When LOGO! is in RUN mode, LOGO! displays the message page 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! onboard display, the LOGO! TDE, or both.

If you use flag M27 in your circuit program and set to use M27 to determine message page display, then if M27=0 (low) then LOGO! displays the message page 1. If M27=1 (high), then LOGO! displays the message page 2. Refer to Constants and connectors (Page 126) for more information about M27.

If acknowledgment is disabled (Ack = No), the message text is hidden when the status of the signal at input En changes from 1 to 0.

If acknowledgment is enabled (Ack = Yes) 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.

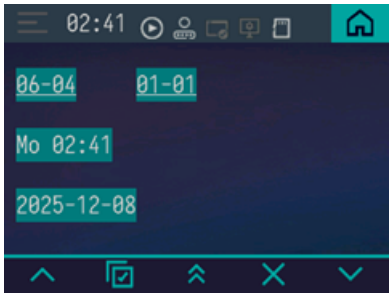
When multiple LCD Message functions are triggered with En=1, LOGO! displays the message page with the highest priority (0 = lowest, 127 = highest). This also means that LOGO! displays a newly activated message page only if its priority is higher than that of previously activated message page.

After a message page is disabled or acknowledged, the function automatically shows the previously active message page that takes the highest priority.

You can press ∧ or ∨ in the tool bar at the bottom of the LCD to browse through multiple active message pages.

Example

This is how two message pages could be shown:

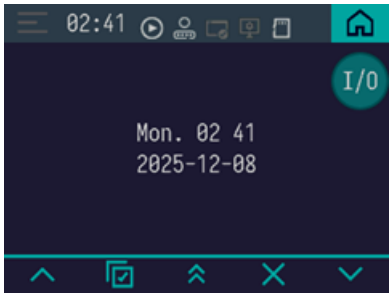


Example: LCD message page with priority 1

Press ∧ or ∨

Example: LCD message page with priority 2

Press ∧ or ∨



Display current date and time (only available for BM versions with real-time clock)

Visible parameters or process variables

The following parameters or process variables can be displayed in a message page, as either numerical values or bar-graph representations of values:

Special function	Parameter or process variable visible in a message page
Timers	
On-delay	T, T_a
Off-delay	T, T_a
On-/Off-delay	T_a, TH, TL
Retentive on-delay	T, T_a
Wiping relay (pulse output)	T, T_a
Edge triggered wiping relay	T_a, TH, TL
Asynchronous pulse generator	T_a, TH, TL
Random generator	T_H, TL
Stairway lighting switch	T_a, T, T!, T!L
Multiple function switch	T_a, T, TL, T!, T!L
Weekly timer	3*on/off/weekdays
Yearly timer	On, Off
Astronomical clock	Longitude, latitude, zone, TS, TR
Stopwatch	TB, Ta, Lap, AQ
Counter	
Up/down counter	Cnt, On, Off
Hours counter	MI, Q, OT
Threshold trigger	f_a, On, Off, G_T
Analog	
Analog threshold trigger	On, Off, A, B, Ax, Error *
Analog differential trigger	On, n, A, B, Ax, Off, Error *
Analog comparator	On, Off, A, B, Ax, Ay, nA, Error *
Analog watchdog	n, A, B, Ax, Aen, Error *
Analog amplifier	A, B, Ax, Error *
Analog multiplexer	V1, V2, V3, V4, AQ
Analog ramp	L1, L2, MaxL, StSp, Rate, A, B, AQ, Error *
PI controller	SP, Mq, KC, TI, Min, Max, A, B, PV, AQ, Error *
Mathematic instruction	V1, V2, V3, V4, AQ
PWM (Pulse Width Modulator)	A, B, T, Ax amplified, Error *
Float calculation instruction	V1, V2, V3, V4, AQ
Miscellaneous	

* An error flag is available to be configured as a parameter widget and displayed in a message page only when the analog function block is in float data type.

Special function	Parameter or process variable visible in a message page
Latching relay	-
Pulse relay	-
LCD Message	-
Softkey	Status
Shift register	-
Analog filter	Sn, Ax, AQ
Max/Min	Mode, Min, Max, Ax, AQ
Average value	Ax, St, Sn, AQ
Mathematic instruction error detection	Overflow, Zero division, Invalid value, referenced mathematic instruction block
Float /Integer Converter	Typ,VM, Res, eAx, Aq,
Integer/Float Converter	Typ,VM, Res, eAx, eAq, Aq,

* An error flag is available to be configured as a parameter widget and displayed in a message page only when the analog function block is in float data type.

For timers, a message page 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 Online Help for LOGO!Soft Comfort.

Changing widget writable values in the active message page

When the message page is active, you can enter the editing mode to change a writable value by long-pressing the value on the LCD.

NOTE

You need to keep pressing the value to be modified for at least one second.

Once entering the editing mode, you can input the new value, then press ✓ button to apply the change and exit the editing mode. Or press **X** button to cancel the input and exit the editing mode.

Key input simulation in the active message page

Press ⌃ in the toolbar of the LCD to access the cursor key menu, where you can find the four Cursor keys CK1, CK2, CK3, CK4. For LOGO! TDE, besides the four Cursor keys, you can use four Function keys F1, F2, F3 and F4.

5.4.26 Softkey

Short description

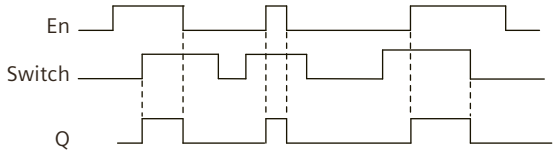
This special function has the effect of a mechanical pushbutton or switch.

Connection	Description
Input En	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.
Parameter	STOP mode: Type: 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. Retentivity: / = no retentivity R = the status is retentive. RUN mode: Switch: switches the momentary pushbutton (switch) on or off.
Output Q	Switches on if En=1 and Switch=On was confirmed with **OK**.

Factory setting

The default parameter setting is switching action.

Timing diagram



Functional description

When LOGO! is in RUN 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 RUN mode

If retentivity is not set, output Q is initialized after a power failure according to your configuration at the "Start" parameter.

5.4.27 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.

Connection	Description
Input In	Input read at the start of the function.
Input Trg	A positive edge (0 to 1 transition) at input Trg (Trigger) starts the special function. 1 to 0 transitions are irrelevant.
Input Dir	The signal at input Dir determines the shifting direction for the shift register bits Sx.1 to Sx.8. "x" refers to the configured shift register byte index 1, 2, 3, or 4. Dir = 0: shift up (Sx.1>>Sx.8) Dir = 1: shift down (Sx.8>>Sx.1)
Input R	The SFB is reset with a positive edge (0 to 1 transition) at input R (Reset). All the shift register bit (Sx.1 to Sx.8) are set to 0 when the SFB is reset.
Parameter	Shift register bit that determines the value at output Q. Possible settings: Byte index: 1 to 4 Q: S1 to S8 LOGO! provides a maximum of 32 shift register bits, with eight bits per shift register. Retentivity: / = no retentivity R = the status is retentive.
Output Q	The output value corresponds with the configured shift register bit.

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 Sx.1 or Sx.8 depending on the shifting direction, where "x" refers to the index number of the shift register and the number after the decimal point refers to the bit number:

- Shift up: the value at input In is set at Sx.1; the previous value at Sx.1 is shifted to Sx.2; the previous value at Sx.2 is shifted to Sx.3 etc.
- Shift down: the value at input In is set at Sx.8; the previous value at Sx.8 is shifted to Sx.7; the previous value at Sx.7 is shifted to Sx.6 etc.

Output Q returns the value of the configured shift register bit.

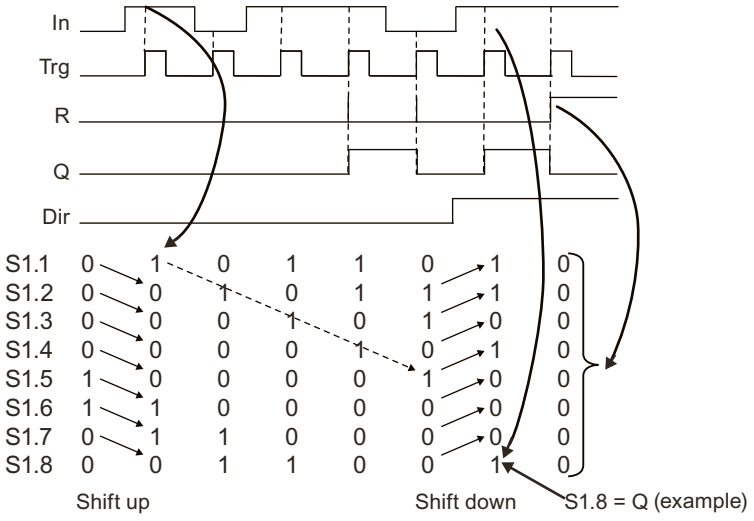
If retentivity is disabled, the shift function restarts at Sx.1 or Sx.8 after a power failure. When enabled, retentivity always applies to all shift register bits.

NOTE

There are a maximum of four shift register function blocks available for use in the circuit program in LOGO!.

Timing diagram

The timing diagram example for the shift register in LOGO! is shown as follows:



5.4.28 Analog multiplexer

Short description

This special function outputs one of four predefined analog values or 0 at the analog output.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **En**	1 on input En (Enable) switches, dependent on S1 and S2, a parameterized analog value to the output AQ. 0 on input EN switches 0 to the output AQ.		
Inputs **S1** and **S2**	S1 and S2 (selectors) for selecting the analog value to be issued. S1 = 0 and S2 = 0: The value V1 is issued S1 = 0 and S2 = 1: The value V2 is issued S1 = 1 and S2 = 0: The value V3 is issued S1 = 1 and S2 = 1: The value V4 is issued		
Parameter	Value range	Integer	Float
	V1 to V4 (Analog values that will be issued)	-32768 to +32767	-3.402823E38 to +3.402823E38
	p (Number of decimal places)	0, 1, 2, 3	/
Output **AQ**	AQ	-32768 to +32767	-3.402823E38 to +3.402823E38

Parameters V1...V4

The analog values for the parameters V1to V4 can be derived from another already-programmed function. You can use the actual values of the following functions:

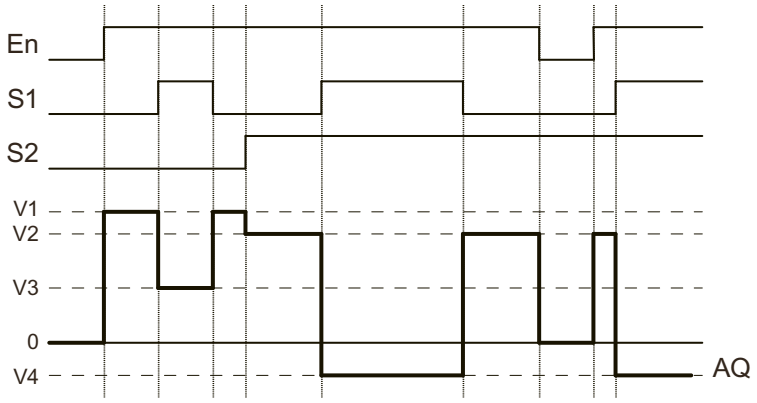
- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog multiplexer (actual value Aq)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 145) topic.

Parameter p (number of decimals)

Applies only to the values displayed in a message text.

Timing diagram



Functional description

If input En is set, then the function issues one of four 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.

5.4.29 Analog ramp

Short description

This function allows the output to be changed from the current level to the selected level at a specified rate.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description
Input **En**	A change in the status from 0 to 1 at input En (**En**able) applies the start/stop level (Offset "B" + **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 "B", which makes output AQ equal to 0.
Input **Sel**	Sel = 0: The step 1 (level 1) is selected. Sel = 1: The step 2 (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.
Input **St**	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 "B" + StSp) is reached. The start/stop level is maintained for 100 ms and then the current level is set to Offset "B", which makes output AQ equal to 0.

Connection	Description		
Parameter	Range of values	Integer	Float
	L1 and **L2**: Levels to be reached; value range for each level	• Analog resolution 0 - 1000: -10000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	-3.402823E38 to +3.402823E38
	MaxL: Maximum value that must not be exceeded.	• Analog resolution 0- 1000: -10000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	StSp: Start/Stop offset: value that is added to Offset "B" to create the start/stop level. If the Start/Stop offset is 0, then the start/stop level is Offset "B").	• Analog resolution 0 - 1000: 0 to 20000 • Analog resolution 0 - 4095: 0 to 32767 • Analog resolution 0 - 10000: 0 to 32767	• 0 • +1.175495E-38 to +3.402823E38
	Rate: Speed with which level 1, level 2 or offset is reached. Steps/seconds are issued.	• Analog resolution 0 - 1000: 1 to 10000 • Analog resolution 0 - 4095: 1 to 32767 • Analog resolution 0 - 10000: 1 to 32767	+1.175495E-38 to +3.402823E38
	Gain	• Analog resolution 0 - 1000: 0.00 to 10.00 • Analog resolution 0 - 4095: 0.00 to 10.00 • Analog resolution 0 - 10000: 0.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	p: Number of decimal places	0, 1, 2, 3	/
Output **AQ***	The output **AQ** is scaled using the formula: (Current Level - Offset "B") / Gain "A"	-32768 to 32767	-3.402823E38 to +3.402823E38
*: 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 (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)

- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Analog ramp (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

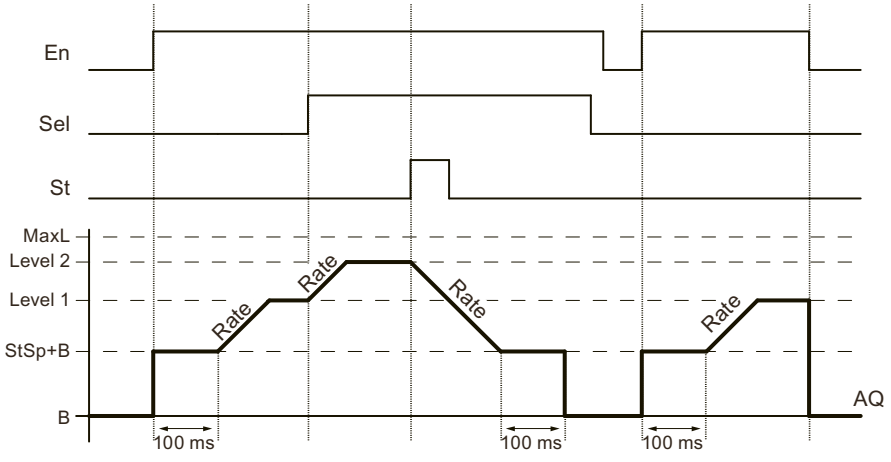
Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 145) topic.

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

When the parameter Gain = 1, the timing diagram for AQ is as follows:



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 following 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.

5.4.30 PI controller

Short description

Proportional-action and integral-action controllers. You can use both types of controller individually or combined.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description		
Input **A/M**	Set the mode of the controller: 1: automatic mode 0: manual mode		
Input **R**	Use the input R to reset the output AQ. As long as this input is set, the input A/M is disabled. The output AQ is set to 0.		
Input **PV**	Analog value: process value, influences the output		
Parameter	Range of values	Integer	Float
	Min.: Minimum value for PV	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	-3.402823E38 to +3.402823E38
	Max.: Maximum value for PV	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	

Connection	Description		
Parameter	**Offset**	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	-3.402823E38 to +3.402823E38
	SP: Set-value assignment	• Analog resolution 0 - 1000: -10000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Mq: Value from AQ with manual mode	• Analog resolution 0 - 1000: 0 to 1000 • Analog resolution 0 - 4095: 0 to 4095 • Analog resolution 0 - 10000: 0 to 10000	
	KC: Gain	00.00 to 99.99	
	TI: Integral time	00:01 min to 99:59 min	00:01 min to 99:59 min
	Dir: Action direction of the controller	Possible settings: + or -	Possible settings: + or -
	p: Number of decimal places	Possible settings: 0, 1, 2, 3	/
Output **AQ**	Analog output (manipulated variable)	0 to 1000	-3.402823E38 to +3.402823E38

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 (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)

- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- PI controller (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 145) topic.

Parameters KC, TI

Please note the following circumstances:

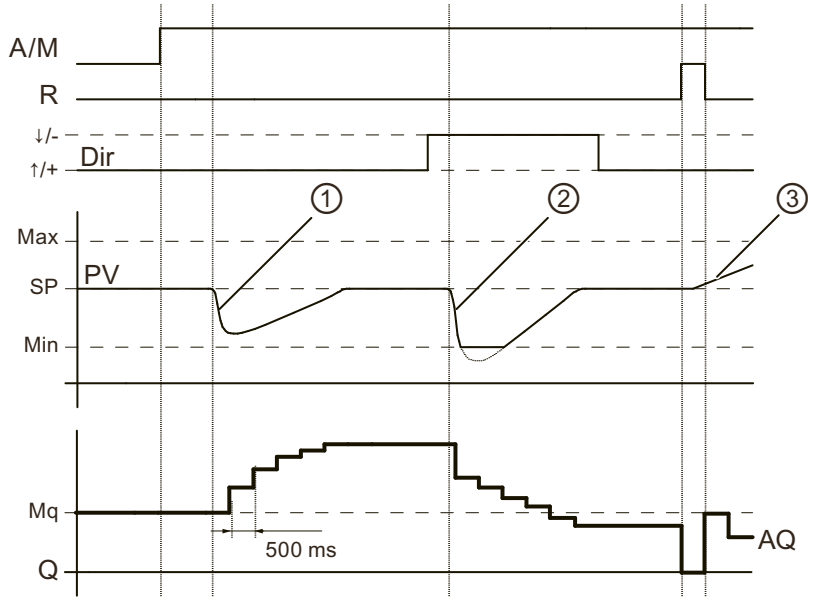
- If parameter KC has value 0, the "P" function (proportional control) will not be executed.
- If parameter TI has value 99:59 m, the "I" function (integral-action control) will not be executed.

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.

5.4.31 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.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description
Input **En**	A positive edge (0 to 1 transition) at input En enables the PWM function block.
Input **Ax**	Analog signal to be modulated to a pulsed digital output signal. Input is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]

Parameter	Value range	Integer	Float
	Gain	• Analog resolution 0 - 1000: -10.00 to 10.00 • Analog resolution 0 - 4095: -10.00 to 10.00 • Analog resolution 0 - 10000: -10.00 to 10.00	-3.402823E38 to +3.402823E38
	Offset	• Analog resolution 0 - 1000: -10000 to 10000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Range Min	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Range Max	• Analog resolution 0 - 1000: -20000 to 20000 • Analog resolution 0 - 4095: -32768 to 32767 • Analog resolution 0 - 10000: -32768 to 32767	
	Pt	Periodic time over which the digital output is modulated Range of value: 0 to 99	
	p (Number of decimals)	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.		

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Parameter T

Note the defaults of the T parameters listed in topic Time response (Page 137).

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 (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)

- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 145) topic.

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 • Gain) + Offset = Actual value Ax

The function block calculates the proportion of the actual 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

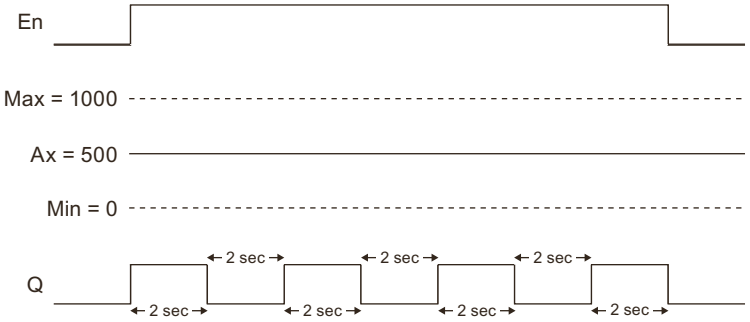
The following examples show how the PWM instruction modulates a digital output signal from the analog input value:

Example 1

Analog input value: 500 (range 0 to 1,000)

Periodic time T: four seconds

The digital output of the PWM function is 2 seconds high, 2 seconds low, 2 seconds high, 2 seconds low and continues in that pattern as long as parameter "En" = high.

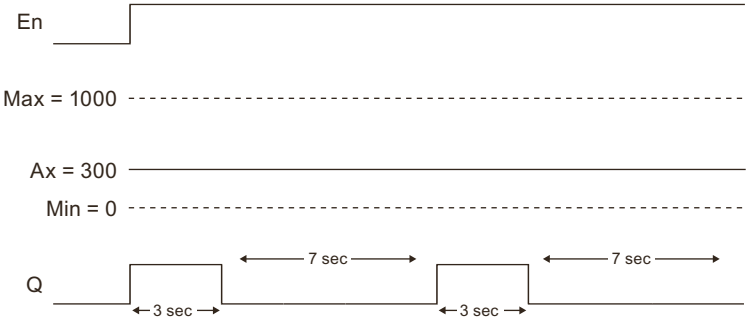


Example 2

Analog input value: 300 (range 0 to 1,000)

Periodic time T: 10 seconds

The digital output of the PWM function is three seconds high, seven seconds low, three seconds high, seven seconds low and continues in that pattern as long as parameter "En" = high.



Calculation rule

Q = 1, for (Ax - Min)/ (Max - Min) of time period T, when Min < Ax < Max.
Q = 0, for PT - [(Ax - Min) / (Max - Min)] of periodic time T.

Note: Ax in this calculation refers to the actual value Ax as calculated using the Gain and Offset.

5.4.32 Mathematic instruction

Short description

The mathematic instruction block calculates the value AQ of an equation formed from the user-defined operands and operators.

Connection	Description
Input En	A change in the status from 0 to 1 at input En (Enable) enables the mathematic instruction function block.
Parameter	**V1:** first operand value **V2:** second operand value **V3:** third operand value **V4:** fourth operand value **Op1:** first operator **Op2:** second operator **Op3:** third operator **Operator Prio:** priority of the operands **Qen→0:** 0: reset value of AQ to 0 when En=0 1: retain last value of AQ when En=0 **p:** number of decimals Range of values: 0, 1, 2, 3
Output AQ	The output AQ is the result of the equation formed from the operand values and operators. AQ will be set to 32767 if a divide by 0 or overflow occurs, and -32768 if a negative overflow (underflow) occurs.

Parameters V1 to V4

Another already-programmed function can provide the analog values for the parameters V1 to V4. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)

- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Mathematic instruction (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 145) topic.

NOTE

If the analog value for parameter V1, V2, V3 or V4 is derived from another already-programmed function whose actual value exceeds the value range for V1 to V4, LOGO! will display the limit value -32768 if the value is less than the lower range or 32767 if the value is greater than the upper range.

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 mathematic instruction function combines the four operations and three operators to form an equation. The operator can be any one of the four standard operators: +, -, *, or /. The priority of operators is determined by "( )" and "[ ]", in which "( )" has a higher priority. The operand values can reference another previously-defined function to provide the value. The mathematic instruction function rounds the result to the nearest integer 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.

Possible errors: zero division and overflow

If the mathematic instruction function block execution results in zero division or overflow, it sets internal bits that indicate the type of error that occurred. You can program a mathematic instruction error detection function block in your circuit program to detect these errors, and to control the program behavior as needed. You program one mathematic instruction error detection function block to reference one specific mathematic instruction function block.

Examples

The following tables show some simple example mathematic instruction block parameters, and the resulting equations and output values:

V1	Op1 (Priority)	V2	Op2 (Priority)	V3	Op3 (Priority)	V4
12	[+]	6	(/)	3	-	1

Equation: [12 + (6 / 3)] - 1

Result: 13

V1	Op1 (Priority)	V2	Op2 (Priority)	V3	Op3 (Priority)	V4
2	+	3	[*]	1	(+)	4

Equation: 2 + [3 * (1 + 4)]

Result: 17

V1	Op1 (Priority)	V2	Op2 (Priority)	V3	Op3 (Priority)	V4
100	(-)	25	/	2	[+]	1

Equation: (100 - 25) / [2 + 1]

Result: 25

5.4.33 Mathematic instruction error detection

Short description

The mathematic instruction error detection block is used to detect error of Mathematic instruction block (Page 217) and Float Calculation instruction block (Page 230). The mathematic instruction error detection block sets an output if an error has occurred in the referenced Mathematic instruction block or Float Calculation instruction block.

Connection	Description
Input En	A change in the status from 0 to 1 at input En (Enable) enables the mathematic instruction error detection block.
Input R	A signal at input R resets the output.
Parameter	MathBN: block number of a mathematic instruction

Connection	Description
	Err: ZD: divide by 0 error OF: overflow error IV: invalid value error ZD/OF/IV: (divide by 0 error) OR (overflow error) OR (invalid value error) AutoRst: reset the output before the next execution of the mathematic instruction error function block. Y = yes; N = no
Output Q	Q is set high if the error to detect occurred in the last execution referenced mathematic instruction function block.

Parameter MathBN

The value for the MathBN parameter references the block number of an already-programmed mathematic instruction function block.

Functional description

The mathematic instruction error detection block sets the output when the referenced mathematic instruction function block has an error. You can program the function to set the output on a zero division error, an overflow error, or when either type of error occurs.

If AutoRst is set, the output is reset prior to the next execution of the function block. If AutoRst is not set, then whenever the output is set it remains set until the mathematic instruction error detection block is reset with the R parameter. In this way, even if the error subsequently clears, the circuit program still has knowledge that an error did occur at some point.

In any scan cycle, if the referenced mathematic instruction function block executes before the mathematic instruction error detection function block, the error is detected in the same scan cycle. If the referenced mathematic instruction function block executes after the mathematic instruction error detection function block, the error is detected in the next scan cycle.

Mathematic instruction error detection logic table

In the table below, Err represents the parameter of the mathematic instruction error detection instruction that selects which type of error to detect. ZD represents the zero division bit set by the mathematic instruction at the end of its execution: 1 if the error occurred, 0 if not. OF represents the overflow bit set by the mathematic instruction: 1 if the error occurred, 0 if not. IV represents the invalid value bit set by the mathematic instruction: 1 if the error occurred, 0 if not. The ZD/OF/IV Err parameter represents the logical OR of the zero division bit, overflow bit and invalid value bit of the referenced mathematic instruction. Q represents the output of the mathematic instruction error detection function. An "x" indicates that the bit can be either 0 or 1 with no influence on the output.

Err	ZD	OF	IV	Q
ZD	1	x	x	1
ZD	0	x	x	0
OF	x	1	x	1

Err	ZD	OF	IV	Q
OF	x	0	x	0
IV	x	x	1	1
IV	x	x	0	0
ZD/OF/IV	1	0	0	1
ZD/OF/IV	0	1	0	1
ZD/OF/IV	0	0	1	1
ZD/OF/IV	1	1	0	1
ZD/OF/IV	1	0	1	1
ZD/OF/IV	0	1	1	1
ZD/OF/IV	1	1	1	1
ZD/OF/IV	0	0	0	0

If the MathBN parameter is null, then the output Q is always 0.

5.4.34 Analog filter

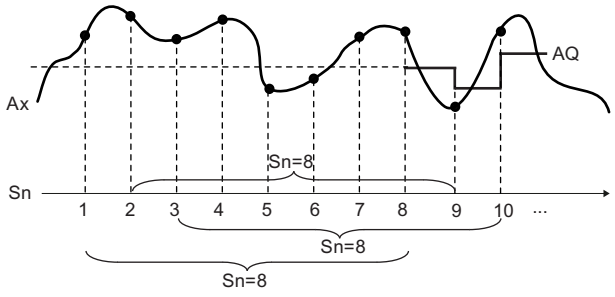
Short description

The analog filter function smooths the analog input signal.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]
Parameter	**Sn** (Number of samples): determines how many analog values are sampled within the program cycles that are determined by the set number of samples. LOGO! samples an analog value within every program cycle. The number of program cycles is equal to the set number of samples. Possible settings: 8, 16, 32, 64, 128, 256
Output **AQ**	**AQ** outputs an average value of the analog input **Ax** over the current number of samples, and it is set or reset depending on the analog input and the number of samples.
[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data. [2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data. [3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).	

Timing diagram (example)



Functional description

The function fetches the analog signal at input Ax based on the set number of samples (Sn) and outputs the average value.

NOTE

There are a maximum of 16 analog filter function blocks available for use in the circuit program in LOGO! 0BA9.

5.4.35 Max/Min

Short description

The Max/Min function records the maximum or minimum value of Ax.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description
Input **En**	The function of input En (**En**able) depends on the settings of parameter Mode and the selection of check box "when En = 0, reset Max/Min".
Input **S1**	This input is enabled when you set **Mode =2:** A positive transition (0 to 1) at input **S1** sets the output **AQ** to the maximum value. A negative transition (1 to 0) at input **S1** sets the output **AQ** to the minimum value.
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]

Parameter	**Mode** Possible settings: 0, 1, 2, 3 Mode = 0: AQ = Min Mode = 1: AQ = Max Mode = 2 and S1= 0 (low): AQ = Min Mode = 2 and S1= 1 (high): AQ = Max Mode = 3 or Mode = referenced value: AQ = Ax
Output **AQ**	**AQ** outputs a minimum, maximum, or actual value depending on the inputs, or is reset to 0 if configured to do so when function is disabled
[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data. [2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data. [3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).	

Parameter Mode

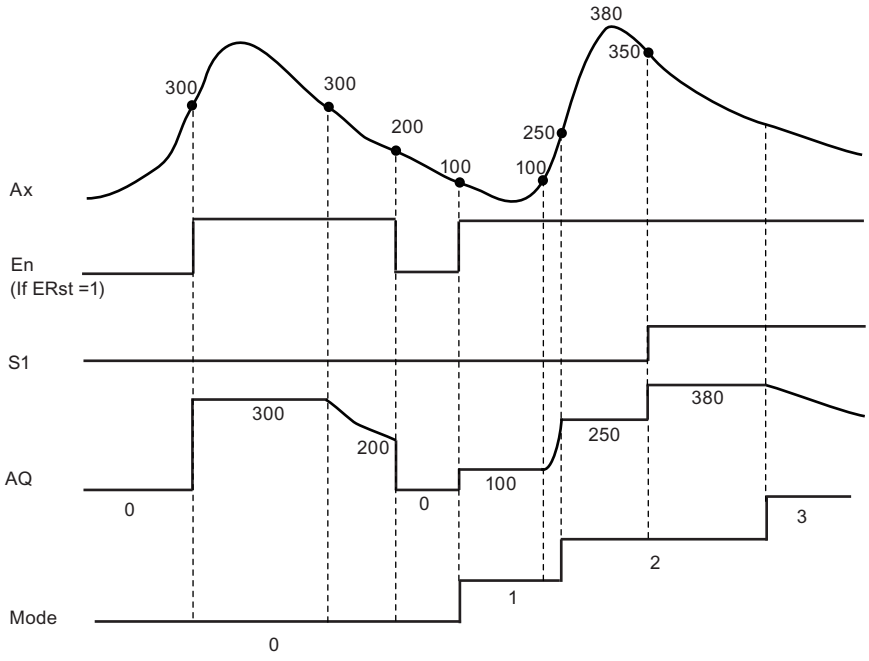
The actual value of another already-programmed function can provide the value for parameter Mode. You can use the actual values of the following functions:

- Analog comparator (Page 187) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Max/Min (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)

- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Timing diagram (example)



Functional description

ERst = 1 and En = 0: the function sets the AQ value to 0.

ERst = 1 and En = 1: the function outputs a value at AQ, depending on the settings of Mode and S1.

ERst = 0 and En = 0: the function holds the value of AQ at the current value.

ERst = 0 and En = 1: the function outputs a value at AQ, depending on the settings of Mode and S1.

Mode = 0: the function sets AQ to the minimum value

Mode = 1: the function sets AQ to the maximum value

Mode = 2 and S1 = 0: the function sets AQ to the minimum value

Mode = 2 and S1 = 1: the function sets AQ to the maximum value

Mode = 3: the function outputs current analog input value.

5.4.36 Average value

Short description

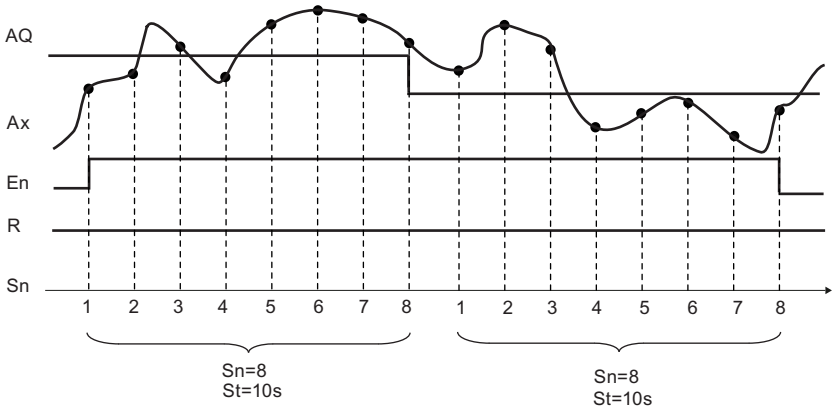
The average value function calculates the average value of an analog input over a configured time period.

LOGO! 9 and later versions support two data types: integer (16-bit) and float (32-bit).

Connection	Description
Input **En**	A positive edge (0 to 1 transition) at input En (**En**able) sets the output **AQ** to the average value of input Ax after the configured time. A negative edge (1 to 0 transition) holds the output at its last calculated value.
Input **R**	A positive edge (0 to 1 transition) at input R (**R**eset) resets the output AQ to 0.
Input **Ax**	Input **Ax** is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1 2]
Parameter	**St** (Sampling time): You can set it to Seconds, Days, Hours or Minutes. Range of values: If St = Seconds: 1 to 59 If St = Days: 1 to 365 If St = Hours: 1 to 23 If St = Minutes: 1 to 59 **Sn** (Number of samples): Range of values: If St = Seconds: 1 to St*100 If St = Days: 1 to 32767 If St = Hours: 1 to 32767 If St = Minutes and St ≤ 5 minutes: 1 to St * 6000 If St = Minutes and St ≥ 6 minutes: 1 to 32767
Output **AQ**	**AQ** outputs the average value over the specified time of sampling. When **Sn** = 1, **AQ** is the last value of Ax**.**

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Timing diagram (example)



Functional description

This function fetches the analog input signal according to both the set sampling time St and the number of samples Sn and outputs the average value. A signal at R sets AQ to 0.

5.4.37 Float/Integer Converter

Short description

LOGO! 0BA8 and previous versions devices can only deal with integer. If you transfer some float from outer system by network with S7/Modbus protocol, LOGO! cannot deal with it directly. With this Float /Integer Converter function block, you can convert a float to integer by dividing a resolution in the range of values, and then the LOGO! can process the logic with this integer. If required, use Integer/Float Converter to convert the result into float and store it in the VM; and transfer the float to outer system with S7/Modbus protocol. You need to set a suitable resolution for the input float in the parameter setting.

Connection	Description
Parameter	• Typ. : It specifies the type of input data. – Float: it is a 32 bits single-precision float number; – Double: it is a 64 bits double-precision float number. • VM. : Variable Memory Address, starting address of float or double stored in VM. Range of values: – For Float: 0-847 – For Double: 0-843 • Res. : Resolution, it's a divider for output value. Range of values: 0.001 to 1000
Extended analog output **eAQ**	Extended analog output for programming via parameter reference. • Used as a reference parameter of the other function block. • Signed 32 bits value. • Range of values: -999,999,999 to 999,999,999.

Connection	Description
Output **AQ**	AQ is the analog output value. It has the following features. • Used as input value of the other function block. • Signed 16 bit value. • Range of values: -32768 to 32767.

Functional description

You usually need both the blocks Float/Integer converter and Integer/Float converter to complete a task. A typical way to use these function blocks is:

1. Transfer the floats from outer system by network (with S7/Modbus protocol) and store them in VM.
2. Convert the floats stored in VM to integer by Float/Integer converter.
3. Process the integer with LOGO! BM.
4. Convert the result to floats by Integer/Float and store them in the VM.
5. Transfer the floats to outer system (with S7/Modbus protocol).

Calculation rule

Define Q =Data Input/Resolution

Analog output (AQ)

- if -32768 ≤ Q ≤ 32767, the Analog output = Q.
- if the Q ≥ 32767, then Analog output = 32767.
- if the Q ≤ -32768, then Analog output = -32768.

Extended analog output (eAq)

- if -999,999,999 ≤ Q ≤ 999,999,999, the Extended analog output = Q.
- if the Q ≥ 999,999,999, then Extended analog output = 999,999,999.
- if the Q ≤ -999,999,999, then Extended analog output = -999,999,999.

5.4.38 Integer/Float Converter

Short description

LOGO! 0BA8 and previous versions devices only can deal with integer. If you transfer some float from outer system by network with S7/Modbus protocol, LOGO! cannot deal with it directly. With this Integer/Float Converter function block, you can convert an integer to float by multiplying a resolution in the range of values, and stored it in VM, then you can transfer this result to the outer system through network. You need to set a suitable resolution for the output float in the parameter setting.

Connection	Description
Analog input **Ax**	Input Ax is one of the following analog signals (integer or float): • AI [1]: AI1 to AI16 [3] • AM [1]: AM1 to AM128 • NAI [1]: NAI1 to NAI128 • AQ [1]: AQ1 to AQ16 • FAM [2]: FAM1 to FAM32 • NFAI [2]: NFAI1 to NFAI16 • The block number of a function with analog output [1] [2]
Extended analog input **eAx**	If the analog input (Ax) is not available, you can assign a value to Extended analog input (eAq) by inputting a value to the eAx field or referring to other FB's parameter. Range of values: -999,999,999 to 999,999,999
Parameter **Par**	• Type: It specifies the type of output data. – Float: it is a 32 bits single-precision float number; – Double: it is a 64 bits double-precision float number. • VM: Variable Memory Address, starting address of float or double stored in VM: – For Float: 0-847 – For Double: 0-843 • Resolution: it's a multiplier for input data. Range of values: 0.001 to 1000
Output Aq	Aq is the analog output value. It has the following features. • Used as input value of the other function block. • Signed 16 bit value. • Range of values: -32768 to 32767.
Extended analog output **eAq**	Extended analog output for programming through parameter reference. • Used as a reference parameter of the other function block. • Signed 32 bits value. • Range of values: -999,999,999 to 999,999,999.

[1] If the data type of Ax is integer and the data type of this FB is configured as float, LSC will convert Ax into 32-bit receivable float data.
[2] If the data type of Ax is float and the data type of this FB is configured as integer, LSC will cut off the decimal numbers of Ax and convert it into 16-bit receivable integer data.
[3] AI1 to AI16: 0 to 10 V corresponds with 0 to 1000, 0 to 4095 or 0 to 10000 (internal value).

Functional description

You usually need both the blocks Float/Integer converter and Integer/Float converter to complete a task. A typical way to use these function blocks is:

1. Transfer the floats from outer system by network (with S7/Modbus protocol) and store them in VM.
2. Convert the floats stored in VM to integer by Float/Integer converter.
3. Process the integer with LOGO! BM.
4. Convert the result to floats by Integer/Float and store them in the VM.
5. Transfer the floats to outer system(with S7/Modbus protocol).

Extended analog input eAx

The eAx value can be provided by another already-programmed function:

- Analog comparator (Page 187) (actual value Ax- Ay)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Analog threshold trigger (Page 183) (actual value Ax)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (actual value eAq)
- Float calculation instruction (Page 230) (actual value Aq)

Select the required function by the block number.

Calculation rule

Float Value in VM address
Float Value in VM address = Analog input x Resolution

Analog output (AQ)

- Analog input connector is connected: Analog output = Analog input
- Analog input connector isn't connected:
  - if -32768 ≤ Extended analog input ≤ 32767, the Analog output = Extended analog input.
  - if the Analog input ≥ 32767, then Analog output = 32767.
  - if the Analog input ≤ -32768, then Analog output = -32768.

Extended analog output (eAQ):

- If the analog input connector is connected: Extended analog input = analog input.
- Extended analog input connector isn't connected:
  - if -999,999,999 ≤ Extended analog input ≤ 999,999,999, the Extended Analog Output = Extended analog input.
  - if the Extended analog input ≥ 999,999,999, then Extended analog output = 999,999,999.
  - if the Extended analog input ≤ -999,999,999, then Extended analog output = -999,999,999.

5.4.39 Float calculation instruction

Short Description

The float calculation instruction block calculates the float output of an equation formed from the user-defined operands and operators. The float calculation instruction supports two kinds of operator input: Standard and Advances.

Connection	Description
Input **En**	A positive edge at input En enables the float calculation instruction function block
Parameter	The operand values are float: **V1:** Value 1: First operand **V2:** Value 2: Second operand **V3:** Value 3: Third operand **V4:** Value 4: Fourth operand Range of values: -3.4028235E38 to +3.4028235E38
Output **AQ**	The output AQ is the result of the equation formed from the operand values and operators.

Parameter V1, V2, V3, and V4

The eAx value can be provided by another already-programmed function:

- Analog comparator (Page 187) (actual value Ax- Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 193) (actual value Ax)
- Analog multiplexer (Page 204) (actual value Aq)
- Analog ramp (Page 206) (actual value Aq)
- PI controller (Page 209) (actual value Aq)
- Up/down counter (Page 175) (actual value Cnt)
- Analog filter (Page 221) (actual value Aq)
- Average value (Page 225) (actual value Aq)
- Max/Min (Page 222) (actual value Aq)
- On-delay (Page 145) (current time Ta)
- Off-delay (Page 148) (current time Ta)
- On-/off-delay (Page 150) (current time Ta)
- Retentive on-delay (Page 152) (current time Ta)
- Wiping relay (pulse output) (Page 153) (current time Ta)
- Edge-triggered wiping relay (Page 155) (current time Ta)
- Asynchronous pulse generator (Page 158) (current time Ta)
- Stairway lighting switch (Page 161) (current time Ta)
- Multiple function switch (Page 164) (current time Ta)
- Stopwatch (Page 173) (actual value Aq)
- Mathematic instruction (Page 217) (actual value Aq)
- Threshold trigger (Page 180) (actual value fa)
- Float/Integer convertor (Page 226) (actual value eAq)
- Integer/Float convertor (Page 228) (actual value eAq)
- Float calculation instruction (actual value Aq)

Select the required function by the block number.

Description of the function

The float calculation instruction combines four operands and the formula editor. You can input the operand values or reference the actual value of another previously-defined function.

For the mathematic formula, LOGO!Soft Comfort support the standard and advanced mathematic formula. You can use the keyboard in LSC to input up to 100 characters, and up to 11 numbers and operators.

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.

Possible errors: Zero division, overflow or invalid value

If the float calculation instruction function block execution results in zero division, overflow or invalid value, it sets internal bits that indicate the type of error that occurred. You can program an mathematic instruction error detection function block in your circuit program to detect these errors, and to control the program behavior as needed. You can program one mathematic instruction error detection (Page 219) function block to reference one specific mathematic instruction function block.

Example

The following is an example of float calculation instruction parameters, equation and the output value.

V1	V2	V3	V4
3	4	5	0

Equation: (V1 + V2) * V3 + sin (PI / 2)

Result: 36.0

UDF (User-Defined Function)

6

User-Defined Function (UDF)

LOGO!Soft Comfort provides you with a UDF (User-Defined Function) editor for creating circuit programs. You can save circuit programs created in the UDF editor as individual UDF blocks for use in a circuit program in the UDF or FBD editor.

A UDF block is a preconfigured circuit program that you create. You can add it to an existing circuit program as you do with a function block. If the circuit program in LOGO!Soft Comfort already contains a UDF, after transferring the program from LOGO!Soft Comfort to the LOGO! BM, you can edit the elements connected to this UDF from the module.

For a detailed description of the UDF configuration in LOGO!Soft Comfort, refer to the Online Help for LOGO!Soft Comfort.

NOTE

UDF password

UDF in LOGO! 9 (and later versions) doesn't support password protection anymore.

If you want to download a diagram containing UDF password to LOGO! 9 (or later versions), LOGO!Soft Comfort V9.0 (or later versions) will remove the UDF password when converting the diagram.

Setting the Par parameter

You can edit the **Par** parameter for your UDF block on the LOGO! BM if you have configured parameters for this UDF using LOGO!Soft Comfort; otherwise, you cannot edit parameters for UDF blocks. You can set the parameter for the UDF block when LOGO! is in RUN or STOP mode.

If your UDF block contains the **Par** parameter, follow these steps to edit the parameters. The following example shows LOGO! in RUN mode.

1. Press Program in the home page.
2. Press Set Parameter in the menu.
3. Select the UDF block.
4. Long-press the parameter with the underline that you want to modify.
5. Change the value in the editing page. Then press ✓ button to confirm the value change.
6. Now the modified parameter is in a green block. Press ✓ button to apply the change.

Data log

7

You can configure a maximum of one data log for your circuit program using LOGO!Soft Comfort. The data log records process measurement variables for function blocks that you configure for data logging. You can add the data log instruction to your circuit program as you do with a function block.

For a detailed description of configuration of the data log function in LOGO!Soft Comfort, refer to the Online Help for LOGO!Soft Comfort.

LOGO! BM provides a 4096-byte buffer for data logging. If no micro SD card is inserted in the LOGO! BM card slot before running a circuit diagram, LOGO! BM writes data to buffer temporarily. Buffer keeps the latest 4096-byte data while the old data gets lost. If a micro SD card is inserted in the LOGO! BM card slot before running a circuit diagram, LOGO! writes data in the buffer to SD card firstly, and LOGO! writes data generated later into SD card as well. If the SD card is removed out of LOGO! in the process of a circuit running, the generated data gets lost. If the speed of data generation in LOGO! is faster than that of data writing to the micro SD card, data loss can occur. To avoid the occurrence of data loss, apply an enable signal to the data log function block at a minimum time interval of 500 ms.

A micro SD card can store a maximum of 50 latest data log files for each circuit diagram running in each LOGO! Base Module. If the inserted SD card already stores 50 data log files for a circuit diagram, the SD card stores newly created data log files and deletes the oldest ones to keep the maximum number of 50 data log files. The micro SD card stores another 50 data log files of another circuit program running in the same LOGO! Base Module, but the maximum number of lines that a card can store is limited to its memory size. A data log file on the micro SD card can contain a maximum of 20000 lines. If the memory of the micro SD card is full and you want to create a new data file, then an error message will be generated automatically.

LOGO! automatically creates file names with the format of "<IP>_<date>_<number>_<checksum>.csv". <IP> stands for the IP address of the connected LOGO! Base Module. <date> stands for the date when creating this data log file. <number> indicates the sequential number of the created data file and ranges from 1 to 9999. <checksum> identifies the circuit diagram. Do not change the file name because the LOGO! Base Module cannot recognize user-defined names.

You can upload the data log files in buffer or micro SD card from LOGO! to the connected PC through LOGO!Soft Comfort or web server (Page 244).

Under the following circumstances, LOGO! creates a new data log file:

- When the circuit program in LOGO! is changed
- When the IP address of the connected LOGO! Base Module is changed
- When the number of lines in the data log file exceeds 20000

The created file will have a name with an increased number index, for example, if the name for the current data file is "192_168_0_3_2023_06_30_0001_ad4b810.csv", the new file will be named "192_168_0_3_2023_06_30_0002_ad4b810.csv".

Web server

8

LOGO! has a built-in Web server which enables you to operate the LOGO! Base Module or the LOGO! TDE from a PC or a mobile device.

In this approach, you can access the LOGO! Base Module or the LOGO! TDE using a connected device (PC, tablet or smart phone with Web browsing capabilities) through its IP address.

The Web server allows you to use the mouse pointer or the touch screen, depending on the device you are using, to perform fast and easy operations on the virtualized LOGO! Base Module and LOGO! TDE.

LOGO! supports the following protocols for Web server communication:

- HTTP
- HTTPS (recommended)

NOTE

To use the HTTPS protocol for the Web server access, you need to configure LOGO! certificate strategy in LOGO!Soft Comfort. To learn how to configure LOGO! certificate strategy, refer to *LOGO!Soft Comfort Online Help*.

For detailed information about security functions on LOGO!, see Chapter Security (Page 256).

8.1 Enabling the Web server

Make sure you have connected your PC or mobile device to the desired LOGO! Base Module or LOGO! TDE, and guarantee you have enabled the Web server access in LOGO!Soft Comfort. To learn how to enable Web server access, refer to LOGO!Soft Comfort Online Help.

If you enabled HTTPS access for web server, after configuring the LOGO! certificate strategy in LOGO!Soft Comfort, you need to install the generated PSK certificate or the trusted external certificate in the web browser. Refer to Installing LOGO! PSK certificate (Page 264) to learn an example.

Supported network explorers

The LOGO! Web server supports the following OS and Web browsers:

- Windows
  - Edge 90.0 to 143.0
  - Firefox 67.0 to 146.0
  - Google Chrome 63.0 to 143.0
  - Opera 84.0 to 125.0
- Mac OS and IOS
  - Apple Safari 17.6 to 18.3
  - Firefox 67.0 to 146.0
  - Google Chrome 70.0 to 138.0
  - Opera 84.0 to 125.0
- Linux (64 bit)
  - Firefox 91.8 to 115.13
  - Google Chrome 91.0 to 126.0
  - Opera 81.0 to 84.0

NOTE

Make sure you do not disable cookies on your browser.

Supported devices

The LOGO! Web server supports the following communications devices when you use one of the above explorers:

- Conventional PC
- Apple iPhone series
- Apple iPad series
- Smart phones and tablets with Android system with minimum version Android 2.0

Supported Web page language

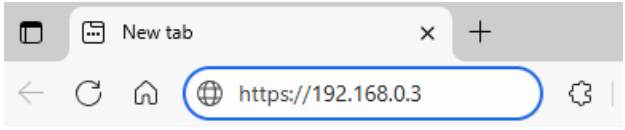
The LOGO! Web server supports the following Web page languages:

- German
- English
- Italian
- French
- Spanish
- Chinese Simplified
- Japanese

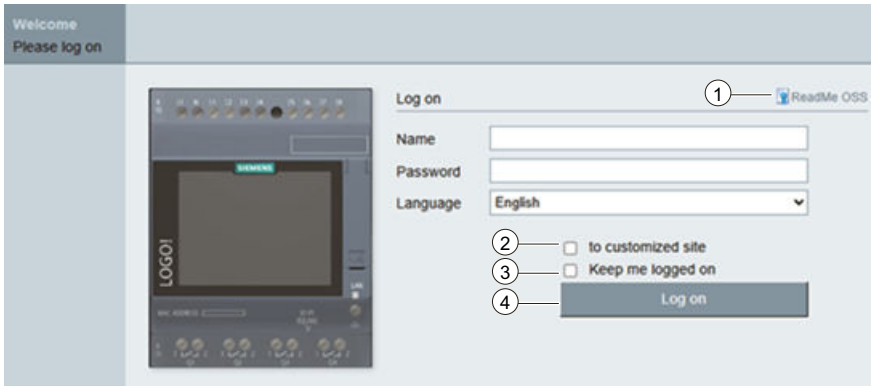
8.2 Logging on to the Web server

Follow the steps below to log on to the desired LOGO! Base Module.

1. Open your Web browser.
2. Enter the IP address of your LOGO! Base Module in the IP address bar.



3. Press **Enter** key on your keyboard. The LOGO! Web server redirects you to the welcome page.
4. Enter the user name and password.



5. Select an appropriate language from the drop-down menu if needed.

6. Click or tap "①" to view the OSS Readme.

NOTE

You can view the OSS Readme without enabling the Web server.

7. If you want to view the web project deployed on BM after logon, select the "②" check box.
8. Enter the password.

NOTE

- You can only enable the Web server access or change the logon password using LOGO!Soft Comfort. For more information about setting the user password, refer to the Online Help for LOGO!Soft Comfort.
- If you do not desire to enter the user name and password again at the next logon, you can select the "③" check box. Make sure you do not set your browser to private mode, since your browser does not record any browsing history or passwords in this mode.
- You can access one LOGO! Base Module from multiple LOGO! Web server clients, but due to memory usage, this might also impact the performance of the connected Base Module.

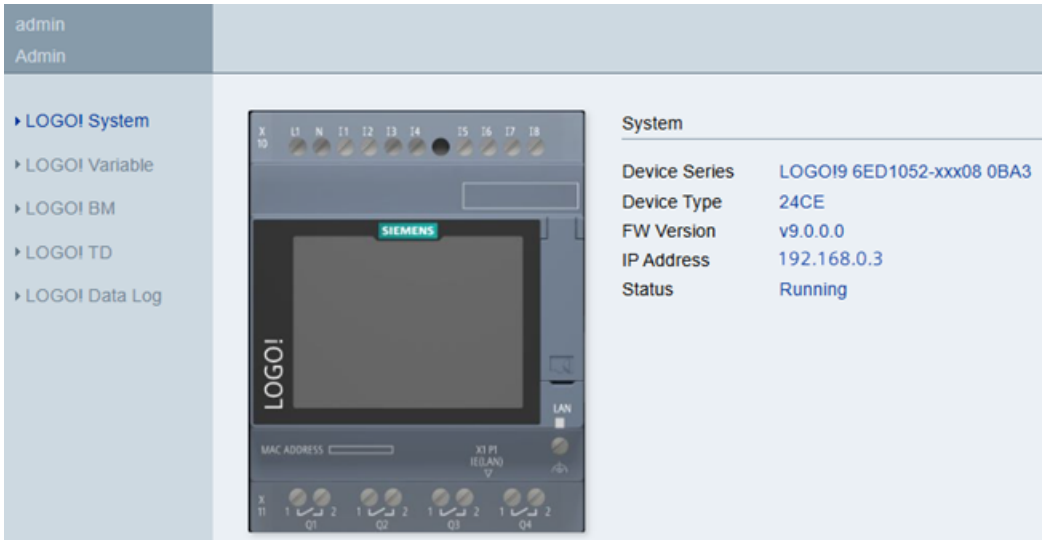
9. Click or tap "④" to log on to the Web server.

NOTE

- For remote access, the logon may take several seconds.
- If your logon fails, press or tap the refresh button on your browser (or press the keyboard shortcut "F5" on the conventional PC) to try it again.

8.3 Viewing LOGO! system information

Once logged in, the LOGO! Web server displays all the system information of the LOGO! Base Module including module generation, module type, firmware (FW) version, IP address, and module status.



NOTE

The firmware version in the above screen is listed for an example, your LOGO! device may be of a later version.

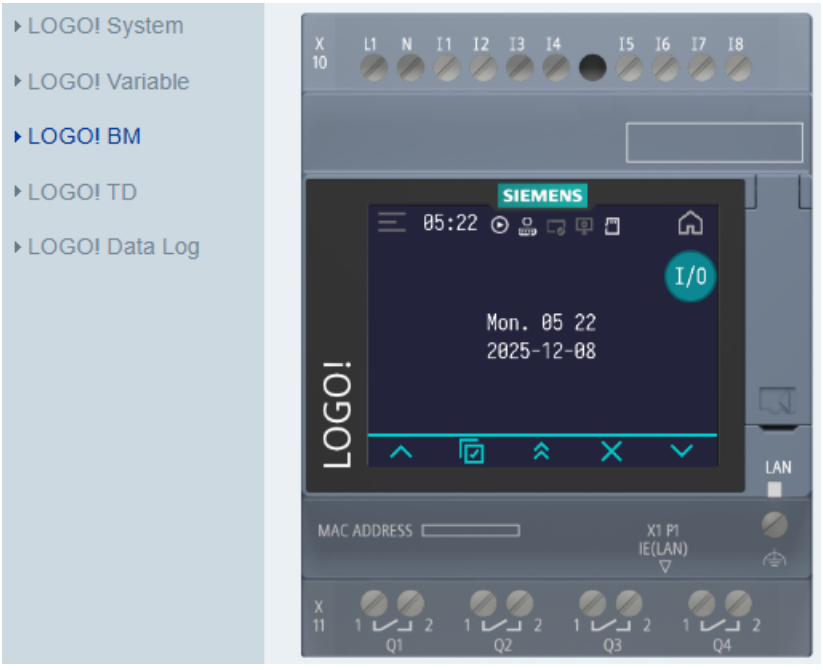
8.4 Operating the virtual module on the Web server

The LOGO! Web server enables you to do the following operations on the virtual LOGO! Base Module through **LOGO! BM** toolbar and the virtual LOGO! TDE through **LOGO! TD** toolbar.

Viewing message page

If you have configured your message page using LCD Message blocks in LOGO!Soft Comfort, you are then able to see them on the virtual screen of the module.

Click **LOGO! BM** or **LOGO! TD** on the left navigation bar and you can view the active message page on the virtual device.



Click ^ or v in the toolbar of the virtual device to browse next available page. Click ^^ to call the menu of virtual cursor key and virtual function key (virtual function keys are only available on LOGO! TDE).

You can also view the I/O status on the virtual devices when LOGO! is in RUN mode. Press the I/O button on the date and time page to enter the I/O status page.

Setting parameters in the message page

If you have configured to show certain parameters in message pages on LOGO! Base Module or LOGO! TDE, you can see them displayed on the virtual device in the Web server.

The configurable parameters are displayed with the underline in the message page. Long-press the underlined parameter to enter the parameter editing mode. Then you can change the parameter.

Checking status bar color display

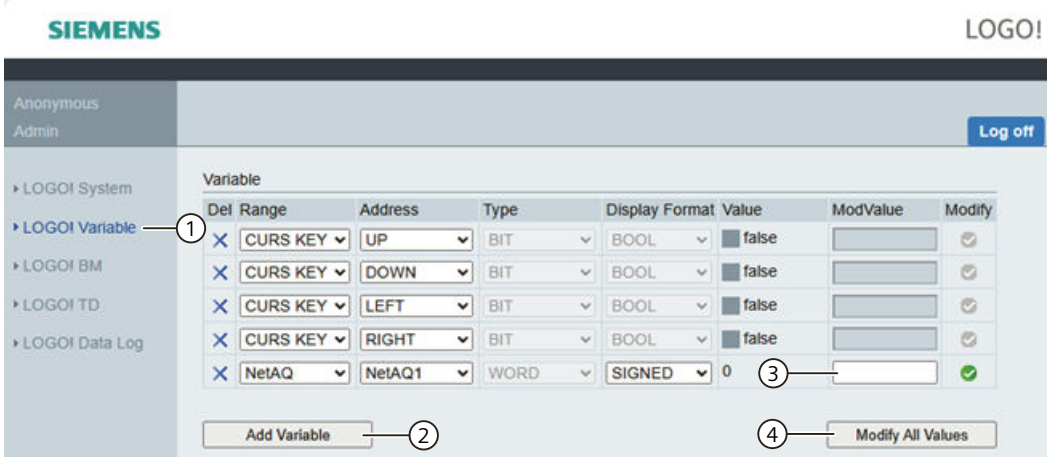
If you have configured BM/TDE status bar color display using Flag blocks in LOGO!Soft Comfort, you can see the same color effect displayed on the status bar of virtual LOGO! Base Module or LOGO! TDE.

8.5 Viewing and editing variable memory tables

The LOGO! Web server allows you to check and modify variable memory tables on the Web browser.

For complete description on the LOGO! variables, refer to the "Parameter VM mapping" section of the Online Help for LOGO!Soft Comfort.

Click or tap "①" on the left navigation bar to show the variable table.



Click or tap "②" to add a new variable. Follow the steps below to set the variable.

1. Choose a desired range. Web server displays the mapping address, variable type, display format of the range.
2. Enter the new mapping address in the added empty column "③".

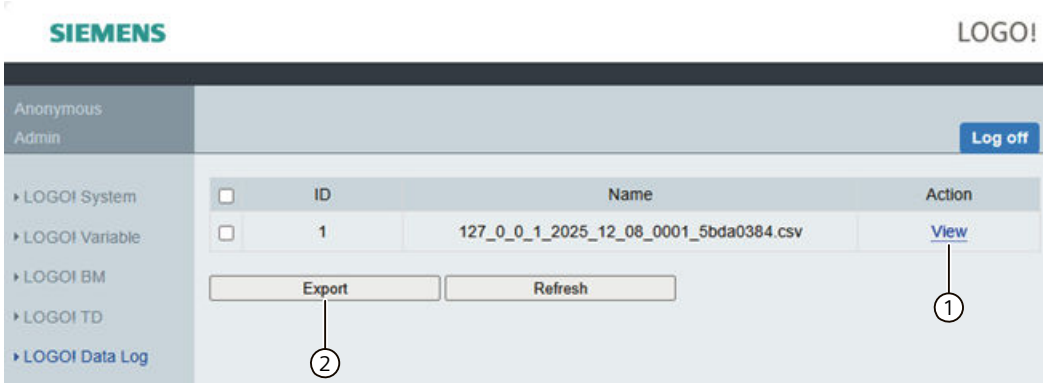
The indicates the variable is to be modified.

The indicates it is not editable.

Click or tap "④" to apply the new mapping addresses.

8.6 Viewing and uploading data log

The LOGO! Web server allows you to view data log (Page 235) of LOGO! Base Module, and upload data log files into the connected PC.



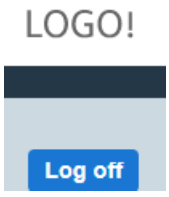
Click "①" to view the detailed information of the data log file.

To upload certain data log files into the connected local PC, follow these steps:

1. Check the box of the displayed data log file you want to upload. You can select all files by checking the box in the header of the table.
2. Click "②" to start the upload process. The uploaded data log files are saved in the default directory set by the web browser, and they are in .CSV format. You can open these files by Microsoft Excel or a text editor.

8.7 Logging off from the Web server

To log off from the Web server, click or tap the button on top of the left navigation bar .



Cloud IoT connection

9

Functions of LOGO! Cloud connection

With the LOGO! 9 product portfolio, you can access and work with LOGO! BM and its extension modules connected through public IoT Cloud. With this new function, you can

- publish LOGO! BM data to the supported public IoT Cloud and MQTT brokers (for example, HiveMQ, EMQX, Mosquitto, ioBroker) as configured
- change LOGO! BM data remotely through the supported public IoT Cloud and MQTT brokers

The following public IoT Cloud are supported:

- AWS (Amazon Web Services) Cloud
- Azure
- Alibaba
- General MQTT broker

NOTE

Cloud connection is available when Cloud connection is configured and regardless of whether circuit diagram is in RUN or STOP mode. Cloud data is transferred when Cloud connection is configured and circuit diagram is in RUN mode.

Protocols for the Cloud connection

LOGO! 9 supports the following protocols for communication with a Cloud server:

- MQTT over TLS (Transport Layer Security), according to OASIS standard version 3.1 / 3.1.1
- MQTT over TCP (Transmission Control Protocol)

9.1 LOGO! Cloud configuration

LOGO! Cloud connection is between the supported IoT Cloud and LOGO! BM (registered and configured by LOGO!Soft Comfort V9.0 or later version).

NOTE

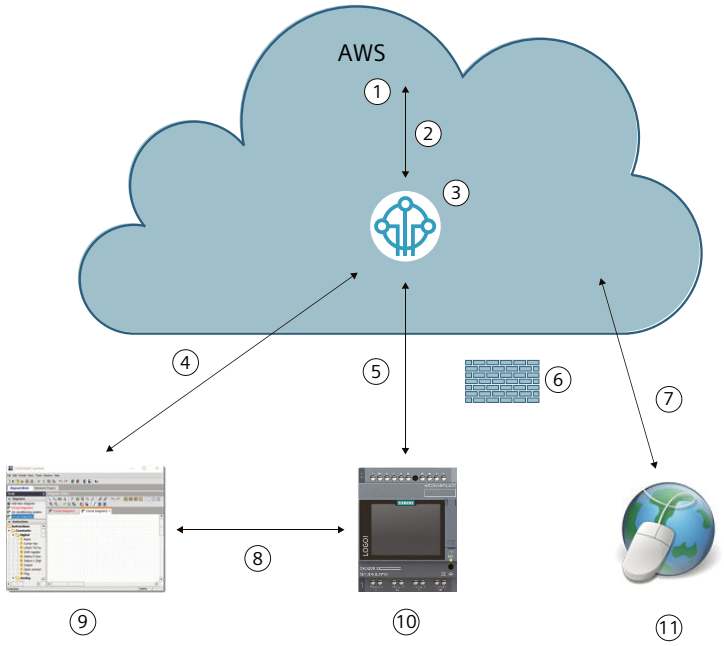
The data collected by AWS IoT can be used by other services only with your own AWS account. And other AWS services or applications are also created by yourself. So all the data and applications are under your instance and belong to you. According to AWS rules, you can use correct "AWSAccessKeyId" and "AWSSecretKey" to fetch data from IoT shadow by yourself too.

You can also use AWS Temporary Credential Account (TVM) to establish AWS IoT Cloud connection. You can use correct "AWSAccessKeyId", "AWSSecretKey" and "SessionToken"to fetch data from IoT shadow by yourself.

On how to establish a Cloud connection to LOGO! BM, refer to section *Tools -> Transfer -> Cloud Settings -> Cloud Connection Settings* in *LOGO!Soft Comfort Online Help*.

AWS Cloud configuration

The following picture shows the relationship and roles each part plays in AWS Cloud configuration.



① Other AWS services
② AWS rules (https://docs.aws.amazon.com/iot/latest/developerguide/iot-rules-tutorial.html)
③ AWS IoT
④ Register
⑤ Transfer Data through MQTT
⑥ Firewall
⑦ Http/Https
⑧ Configure connection and transfer
⑨ LOGO!Soft Comfort
⑩ LOGO! Base Module
⑪ Browser

NOTE

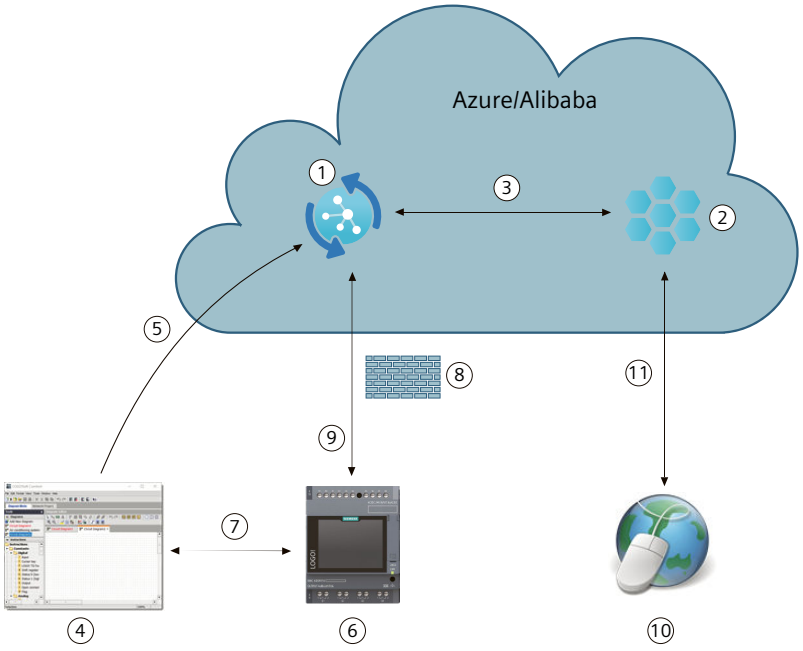
All data in Other AWS services, AWS IoT and AWS Elastic Beanstalk belong to the login account.

NOTE

Siemens recommends you use standalone firewall to protect you LOGO! BM device.

Azure/Alibaba Cloud configuration

The following picture shows the relationship and roles each part plays in Azure/Ali Cloud configuration.



① Azure/Alibaba IoT Hub
② Other services
③ Azure/Alibaba rules
④ LOGO!Soft Comfort
⑤ Register
⑥ LOGO! Base Module
⑦ Configure connection and transfer
⑧ Firewall
⑨ Transfer Data through MQTT
⑩ Browser
⑪ Http/Https

NOTE

Siemens recommends you use standalone firewall to protect you LOGO! BM device.

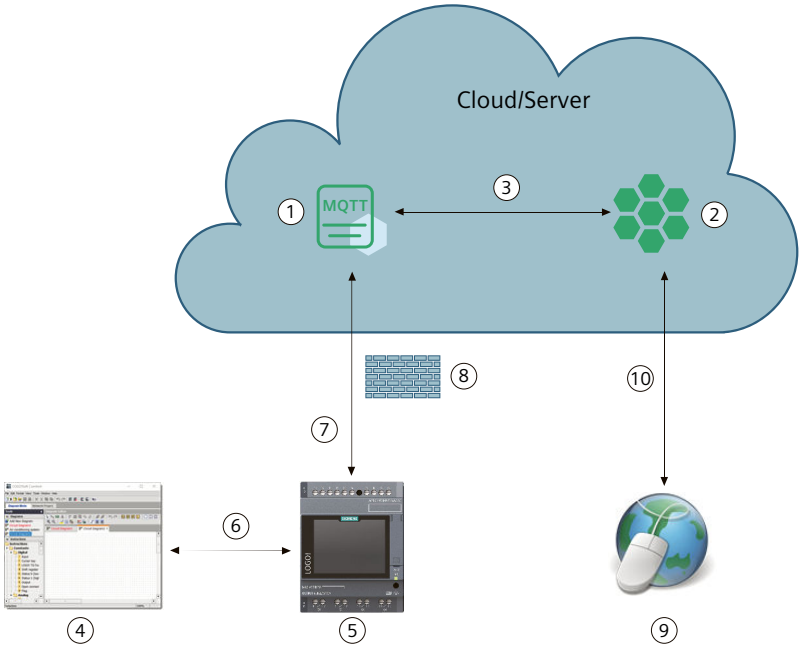
MQTT configuration

General MQTT can be used to connect LOGO! BM to other Clouds/Servers that support MQTT. You cannot register IoT things/devices for these Clouds/Servers on LOGO!Soft Comfort, but you can configure general MQTT on LOGO!Soft Comfort.

NOTE

LOGO! BM only supports JSON format, therefore, only general MQTT which support JSON format can establish IoT connection with LOGO! BM and transfer data.

The following picture shows the relationship and roles each part plays in MQTT configuration.



① MQTT broker
② Other services
③ Cloud/Server specific rules
④ LOGO!Soft Comfort
⑤ LOGO! Base Module
⑥ Configure connection and transfer
⑦ Transfer Data through MQTT
⑧ Firewall
⑨ Browser
⑩ Http/Https

NOTE

Siemens recommends you use standalone firewall to protect you LOGO! BM device.

9.2 Secure Cloud connection

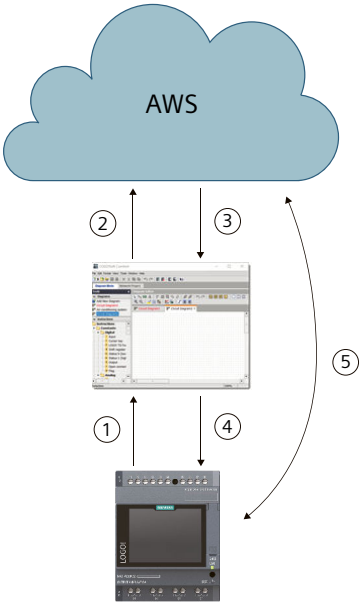
Secure Cloud connection to AWS

You can register LOGO! BM and download the Amazon Root CA Certificate to LOGO! BM using LOGO!Soft Comfort. LOGO! BM saves the certificates for Cloud and devices in it. LOGO! BM establishes connection to AWS through TLS (Transport Layer Security).

On how to register LOGO! BM and download the Amazon Root CA certification, refer to Chapter *Tool -> Transfer -> Cloud Settings -> Cloud Connection Settings* in *LOGO!Soft Comfort Online Help*.

LOGO!Soft Comfort creates the AWS Cloud certificate as follows:

① LOGO!Soft Comfort connects to LOGO! BM and gets the certificate signing request (CSR).



② LOGO!Soft Comfort connects to AWS through HTTPS and send the CSR to AWS.

③ AWS returns the signed certificate to LOGO!Soft Comfort.

④ LOGO!Soft Comfort downloads certificate to LOGO! BM.

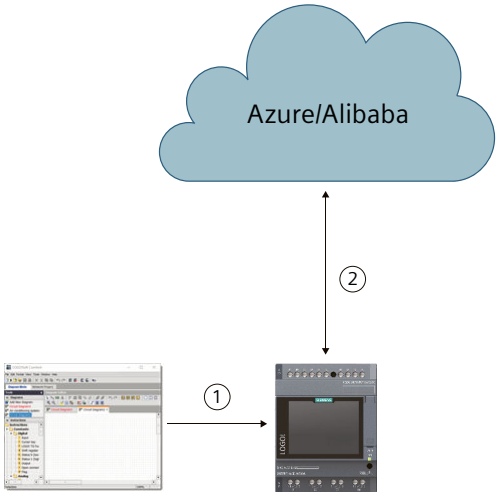
⑤ LOGO! BM connects to AWS through encrypted channel.

NOTE

If the Cloud security configuration is out of date or invalid, you should reconfigure it through LOGO!Soft Comfort.

Secure Cloud connection to Azure/Alibaba

LOGO! BM supports Azure/Alibaba IoT Cloud connection. LOGO! BM builds the secure connection with Azure/Alibaba as follows:



① LOGO!Soft Comfort downloads Azure/Alibaba CA certificate to LOGO! Base Module.

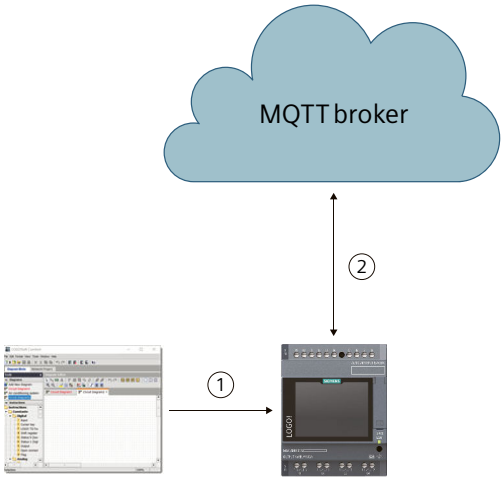
② LOGO! Base Module connects to Azure/Alibaba through encrypted channel.

Secure Cloud connection to general MQTT

LOGO! BM supports general MQTT connection modes as follows:

Connection mode	Description
TCP	Data transfer channel is not encrypted.
TLS without authentication	Data transfer channel is encrypted, but both server and client are not authenticated. Siemens doesn't recommend you use this connection mode as connection is not secure enough.
TLS one-way	Data transfer channel is encrypted, and only the client authenticates the server.
TLS two-way	Data transfer channel is encrypted, and both server and client are authenticated.

When you use TCP or TLS without authentication connection mode, LOGO! Base Module connects to the Cloud directly. When you use TLS one-way or two-way mode, the secure connection is as follows:



① TLS one-way: LOGO!Soft Comfort downloads server's CA certificate to LOGO! Base Module.
TLS two-way: LOGO!Soft Comfort downloads server's CA certificate as well as registered device's key and certificate to LOGO! Base Module.

② TLS one-way/two-way: LOGO! Base Module connects to server through encrypted channel.

9.3 AWS Cloud data format

Customized format for LOGO! JSON document

LOGO! Base Module publishes data to the supported IoT Cloud with its device shadow. A device's shadow is a JSON document that is used to store and retrieve current state information for a device in the Cloud. Each device's shadow is uniquely identified by the name of the corresponding thing. You can use the shadow to get and set the state of LOGO! BM over MQTT, regardless of whether the LOGO! BM is connected to the Internet. If BM is not connected to internet, when Cloud sends data to the BM, the data is saved in buffer and will be send to the BM when it is connected to internet.

Siemens customized the format of JSON document for LOGO! BM. When you change the values in the shadow of LOGO! BM, follow the customized format. Otherwise, LOGO! BM ignores the changes.

LOGO! JSON documents have the following format:

```
"range.sub_range.data_type:start_addr-number":"value"
```

Variables	Mandatory or not	Description			
range	Yes	Range of a block type. Support I, Q, M, AI, AQ, AM, FAM, V, VX, VR, Cursors key (CK), function key (FK), shift register (SR). All range should be capitalized.			
sub_range	No	Reserved			
data_type	No	1	2	4	6
		bit	byte	word	double word
start_addr	Yes	The start address of data.			
number	Yes	The length of data value. The unit depends on data_type.			
value	Yes	The value of data. It is hex string.			

Variables	Bit range	Word range	Double word range	V range	Range shift register
range	I, Q, M, Cursors key (CK), Function key (FK)	AI, AM, AQ	FAM	V	Shift register (SR)
sub_range	Reserved				
data_type	1	4	6	1, 2, 4, 6 default value is 2.	1
start_addr	1 to n	1 to n	1 to n	0 to n If the data type is 1 (bit), the starts address starts from 0.0. Otherwise, the start address starts from 0.	1.1 to n.8
number	1 to n	1 to n	1 to n	1 to n+1	1 to 8n

Example

- **Bit range**: Q1~Q2:11. Start_addr = Q1, number = 2. Format: "Q..:1-2":"03" or "Q..1:1-2":"03"
- **Word range**: AI1~AI4: 0x1111222233334444 Start_addr = AI2, number = 2. Format: "AI..4:2-2":"22223333" or "AI..:2-2":"22223333"
- **V range**: V0~V8: 00112233445566778 Start_addr = V1.1, number = 3. Format: "V..1:1.1-3":"01" Start_addr = VB0, number = 2. Format: "V..2:0-2":"0011" or "V..:0-2":"0011" Start_addr = VW2, number = 2. Format: "V..4:2-2":"22334455" Start_addr = VD3, number = 1. Format: "V..6:3-1":"33445566"
- **SR1.1~S2.8**: 1134 Start_addr = SR1.1, number = 3. Format: "SR..1:1.1-3":"01" or "SR..:1.1-3":"01"

Cloud variable parsing strategy

- If the value field is not byte-aligned (odd characters), add '0' before the first character to align its bytes.

  Example: "Q..1:1-2":"3" → "Q..1:1-2":"03"

- In a left-aligned manner, BM parses each element specified by key (WORD,DWROD)

  Example: "AI..:2-2":"22223333" → AI2: 0x2222; AI3: 0x3333

- If the length of value is smaller than that specified by key, the values of the remaining elements are '0' by default.

  Example: "V..2:0-2":"11" → VB0: 0x11; VB1: 0x00

- If the length of the last element of value does not meet the length of a single element, fill '0' in the MSB (Most Significant Bit).

  Example: 'V..6:3-1":"334455" → VD3: 0x00334455

  "V..6:3-2":"334455667788" → VD3: 0x33445566; VD4: 0x00007788

- If the length of value is larger than the length specified by key, the data of extra length is discarded.

  Example: "V..6:3-2":"33445566778899AA001122" → VD3: 0x33445566; VD4: 0x778899AA

General array data format

LOGO! BM also support array data format for Cloud data transfer.

Array data follows below format:

```
"{name}":{
"desc":"{range}-{type}-{start address}-{count}",
"value":[signed decimal, signed decimal ......]
}
```

Variables	Mandatory or not	Description
`{name}`	Yes	You can configured it through "Cloud Data Transfer Settings" in *LOGO!Soft Comfort*.
`{range}`	Yes	Range of a block type. Support I, Q, M, AI, AQ, AM, FAM, V, VX, VR, Cursors key (CK), function key (FK), shift register (SR). All range should be capitalized.
`{start address}`	Yes	The start address of data.
`{count}`	Yes	The length of data value.
`{type}`	Yes	It can be bit, byte, word or dword.

"`value`" is represented as an array of signed decimal integers, and the number of integers is the same with `{count}` in "`desc`".

Example:

- Bit range: Q1-Q2:11. Start address = Q1, number = 2. Format: "desc": "Q-bit-1-2", "value": [1, 1]
- Word range: AI1-AI4: 0x1111222233334444. Start address = AI2, number = 2. Format: "desc": "AI-word-2-2", "value": [8738, 13107]
- V range: V0-V8: 0x001122334455667788. Start address = V1.1, number = 3. Format: "desc": "V-bit-1.1-3", "value": [1, 0, 0]. Start address = VB0, number = 2, Format: "desc": "V-byte-0-2", "value": [0, 17]. Start address = VW2, number = 2, Format: "desc": "V-word-2-2", "value": [8755, 17493]. Start address = VD3, number = 1, Format: "desc": "V-dword-3-1", "value": [860116326]
- SR1.1-S2.8: 0x1134. Start address = SR1.1, number = 3. Format: "desc": "SR-bit-1.1-3", "value": [1, 0, 0]

Cloud variable parsing strategy

- If the length of value array is smaller than that specified by count in `"desc"`, the values of the remaining elements are unchanged.

  Example: "desc": "V-byte-0-2", "value": [3] → VB0: 0x11; VB1: 0x00

- If the length of value array is larger than that specified by count in `"desc"`, the data of extra length is discarded.

  Example: "desc": "V-dword-3-2", "value": [860116326, 2005440938, 4386] → VD3: 0x33445566; VD4: 0x778899AA

- If some values in array are out of range specified by type, these values are ignored.

  Example: "desc": "V-word-100-3", "value": [100,40000,60] (40000 is out of range: -32768 to 32767) → VW100: 0x64; VW101: unchanged; VW102: 0x3C

Send data to broker

According to the configuration in Cloud Data Transfer Settings in LOGO!Soft Comfort, LOGO! BM sends data to broker only when it's in RUN mode. To learn more about cloud data transfer configuration, refer to section *Tools -> Transfer -> Cloud Settings -> Cloud Data Transfer Settings* in *LOGO!Soft Comfort Online Help*.

When LOGO! BM is set from STOP to RUN mode, BM publishes below messages to the public topic:

- Clean broker shadow caches:

```
{
 "state": {
 "reported": null
 }
}
```

- Send data format version information to parse data:

```
{
 "state": {
 "reported": {
 "$style": 1
 }
 }
}
```

When LOGO! BM is in RUN mode, BM publishes LOGO! time data value at the user-defined time frequency. The LOGO! time data value can be concluded in a message that contains other data values. The following are examples of messages containing LOGO! time data value:

- LOGO! time data value in hex string format (Compatible to 8.3 cloud data format):

```
{
 "state": {
 "reported": {
 "I..1:1-1": "00",
 "V..2:990-6": "282303060313"
 }
 }
}
```

- LOGO! time data value in array data format:

```
{
 "state": {
 "reported": {
 "I": {
 "desc": "I-bit-1-1",
 "value": [
 0
 ]
 },
 "$logotime": 1678072448
 }
 }
}
```

Security

10

Overview

This chapter describes the following security functions on LOGO!:

Security function	Description
Network security	To protect your network communication, LOGO! 9 (and later version) Base Module uses HTTPS for the following connections: • LOGO!Soft Comfort V9.0 (or later version) and LOGO! 9 TDE • LOGO! 9 BM and LOGO!Soft Comfort V9.0 (or later version) • Standard web browser and LOGO! 9 BM If authentication, encryption, or integrity protection is required in the Network, Siemens recommends that you protect network and physical access to the LOGO! devices with appropriate measures. Refer to Network security (Page 257) for more information.
Program access security	The following protection methods can help you protect your circuit programs from unauthorized access: • Password protection • Copy protection Refer to Program access security (Page 260) for more information.
Certificate strategy	You can configure the certificate strategy for different communications. Refer to LOGO! certificate (Page 262) for more information.
Menu access security	You can limit access to specific menus of LOGO! by setting and managing different user roles. Refer to Menu access security (Page 279) for more information.
Security audit logs	You can archive and view the security audit logs that LOGO! BM generates and records. Refer to LOGO! security audit log (Page 282) for more information.
Decommissioning security	Decommissioning includes: • Securely removing all digital data in the device • Environmentally sound disposal of the device Refer to Secure decommissioning (Page 284) for more information.

⚠ WARNING

Protect the device against unauthorized access

An unauthorized user can operate the device incorrectly, read or write data and bypass logon by restarting the device.

Operation by unauthorized persons jeopardizes operational reliability.

You must protect these forms of communication by limiting physical access. Siemens recommend you lock the LOGO! devices in a cabinet.

NOTE

The communication protocol for LOGO! is designed for use in a trusted environment, and allows unauthenticated access to the devices. Siemens therefore strongly recommends you protect network access to the LOGO! devices with appropriate mechanisms.

NOTE

Protect communication with LOGO! devices through white list mechanism.

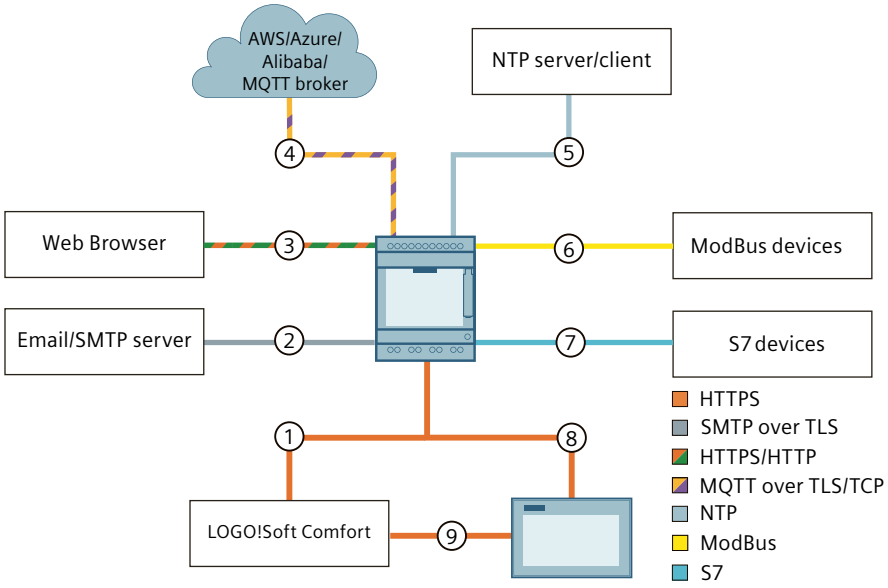
Siemens recommends that you use white list mechanism to protect the communication with LOGO! devices. White list mechanism works when you don't use the default product root certificate as trust anchor, but use each independent unique issuing certificate. When one LOGO! device is broken or out of use, you can remove the device issuing certificate out of trusted repository.

About how to download LOGO! issuing certificate, refer to section *Tools -> Transfer -> Certificate Settings* in *LOGO!Soft Comfort Online Help*.

10.1 Network security

With the enhanced network security of LOGO! 9 devices, you can access the LOGO! 9 Base Modules through a local area network, a remote area network or a Cloud.

Different devices/software connect to LOGO! devices with different channels.



Con-nec-tions	Supported APP/Device	Port	Protocols	Remarks
①	LSC V9.0 (or later)	• 8443 • 10006	• HTTPS • UDP	LOGO! user verification is required for the connection between LOGO! 9 BM and LSC V9.0 (or later versions) if the UMAC (User Management and Access Control) is enabled. LSC V9.0 (or later versions) scans accessible BM/TDE devices through port 10006 using UDP protocol.

Connections	Supported APP/Device	Port	Protocols	Remarks
②	Email/SMTP server		SMTP over TLC/TCP	You can choose to use TCP, STARTTLS or TLS for SMTP server connection in LOGO!Soft Comfort V9.0 (or later version).
③	Web Browser	80/443	HTTPS/HTTP	You can select to use HTTPS or HTTP by LOGO!Soft Comfort V9.0 (or later version).
④	Cloud		MQTT over TLS/TCP	• For AWS, Azure and Alibaba Cloud connection, the connection mode is MQTT over TLS. • For general MQTT broker connection, you can choose the connection mode as MQTT over TLS or TCP. Refer to Secure Cloud connection (Page 249) for details.
⑤	NTP server/client	123	NTP/UDP	LOGO! BM connects to the NTP server or client through unsecure channel. The NTP function is disabled by default. You can enable it on BM or through LOGO!Soft Comfort.
⑥	Modbus devices	502-510	Modbus	You can enable or disable the S7/Modbus connections through LOGO!Soft Comfort V9.0 (or later version). • In the programs created by LOGO!Soft Comfort V9.0 (or later version), the S7/Modbus connections are disabled by default. • In the programs converted from previous version LOGO!Soft Comfort, the S7/Modbus connections are enabled after the conversion. • LOGO! communication (port 8102) is supported for connections between LOGO! 9 (or later versions) devices.
⑦	S7 devices	102	S7	
⑧	LOGO! TDE	8443	HTTPS	LOGO! 9 TDE connects to LOGO! BM through secure channel. You can configure the TDE user management in LOGO!Soft Comfort.
⑨	LSC V9.0 (or later)	• 8443 (on TDE) • 10006	• HTTPS • UDP	LOGO!Soft Comfort V9.0 (or later version) can connect to only one LOGO! 9 TDE at a time. LSC V9.0 (or later versions) scans accessible BM/TDE devices through port 10006 using UDP protocol.

In order to maintain an adequate security level, Siemens strongly recommends that you open the ports only at firewalls within the Secure Network. The table above lists all the port information for the LOGO! supported applications.

All static resources used in LOGO! Web server or User Defined Web Page project, for example, pictures or PDF files, is not protected by login password. You can access to these resources by entering corresponding static resource URL in the web browser without logging in LOGO! Web server.

For more information about network security, refer to Network Security (http://www.industry.siemens.com/topics/global/en/industrial-security/network-security/Pages/Default.aspx).

⚠ WARNING

Unauthorized access to the LOGO! through the Web server

Unauthorized access to the LOGO! devices or changing LOGO! variables to invalid values could disrupt process operation and could result in death, severe personal injury and/or property damage. Because enabling the Web server allows authorized users to perform operating mode changes, writes to LOGO! data, and firmware updates, Siemens recommends that you observe the following security practices:

- Enable access to the Web server only with the HTTPS protocol.
- Password-protect LOGO! users with a strong password. Strong passwords are at least eight characters in length, mix letters, numbers, and special characters, are not words that can be found in a dictionary, and are not names or identifiers that can be derived from personal information. Keep the password secret and change it frequently.
- Perform error-checking and range-checking on your variables in your program logic because Web page users can change PLC variables to invalid values.
- Use a secure Virtual Private Network (VPN) to connect to the Logo! Web server when you use HTTP protocol.

⚠ WARNING

Unauthorized access to the LOGO! through unsecure port (502-510 for Modbus, 102 for S7, 123 for NTP)

Unauthorized access to the LOGO! devices or changing LOGO! variables to invalid values could disrupt process operation and could result in death, severe personal injury and/or property damage.

Because enabling the unsecure port allows authorized users to perform operating mode changes, writes to LOGO! data, firmware updates, batch clock setting, and unauthorized IP setting, Siemens strongly recommends that you open the ports only at firewalls within the Secure Network.

10.2 Program access security

10.2.1 Program password protection

You can protect your circuit program from unauthorized access with a password. Siemens strongly recommends you use password protection to prevent unauthorized reading or editing of your circuit programs.

For more information about assigning and changing a program password, refer to Section "Setting circuit program password (Page 82)".

NOTE

If a password protection program is stored in a LOGO! Base Module and you want to download a new one, you must enter the password in order to unlock the current program.

NOTE

Circuit programs edited and saved in LOGO! 9 and later versions BM are encrypted.

10.2.2 Program copy protection

The copy protection function provides protection for circuit programs on micro SD cards. A circuit program is **protected** when you transfer it to a protected memory card.

This additional security feature allows you to bind the circuit program to a specific memory card. If you copy a protected circuit program to another memory card, LOGO! cannot recognize the program and rejects loading it after you insert the card.

To execute this circuit program in LOGO!, you must leave the card in the LOGO! Base Module; that is, you cannot remove the card to copy the program to other LOGO! devices.

A circuit program with password protection is no longer protected after the correct password has been entered; that is, you can then edit or copy the program and remove the card.

Operation status under the different functions

The following table describes which operations are possible:

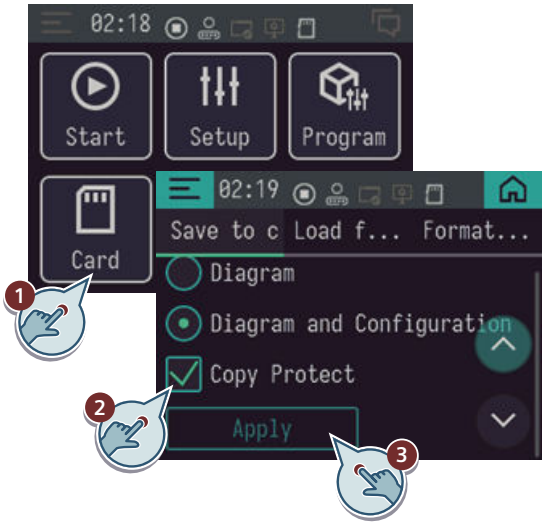
Operations	Editing parameter	Copying program	Deleting program
Program copy protection disabled without program password	Yes	Yes	Yes
Program copy protection disabled with program password	Yes, with password	Yes	Yes
Program copy protection enabled without program password	• STOP mode: No • RUN mode: Yes	No	Yes
Program copy protection enabled with program password	• STOP mode: Yes, with password • RUN mode: Yes, without password	No	Yes

Enabling the protection function

NOTE

You can only enable or disable the card protection function when LOGO! BM is in STOP mode.

To enable the copy protection function to the card, follow these steps:



1. Press Card in the home page.
2. Check the box of Copy Protect in the Save to card tab window.
3. Press Apply button.

   Then a dialog appears to remind you that the program (and the device configuration) is saved to the card successfully and copy-protected.

NOTE

The protection function only works for the circuit diagram, not the device configuration.

NOTE

The protection function applies only to the card; you must copy (Page 116) the circuit program to the card in a separate action at power-on.

10.3 LOGO! certificate

10.3.1 LOGO! certificate strategy

LOGO! provides three certificate strategies for communication verification:

- Build-in certificate

  The build-in certificate Includes LOGO! root certificate, LOGO! issuing certificate and LOGO! device certificate. You can find these certificates in LOGO!Soft Comfort.

- PSK (Pre-shared Key) certificate

  You can use LOGO!Soft Comfort to generate the LOGO! issuing certificate by entering PSK password.

  When LOGO! devices use the same PSK password, trusting the PSK certificate generated by any one of the LOGO! devices will allow the remaining LOGO! devices to be trusted.

  When LOGO! devices use different PSK passwords, to set up the communication between these devices, the SK issuing certificates of these devices should be trusted by each device.

  NOTE

  With the PSK certificate strategy, you can easily set up your own trusted network with LOGO! BM/TDE using a single password.

- External certificate

  You can use LOGO!Soft Comfort to generate the CSR (Certificate Signing Request) file, which can be used to generate an external certificate by a third-party certificate authority.

  Each LOGO! device generates one unique and exclusive CSR file. When the LOGO! device is reset to factory settings, the previously generated CSR file and the issuing certificates are invalid.

LOGO! uses different certificate strategies for different communication scenarios:

LOGO! communication	Applicable certificate strategy
• LSC & TDE access • LOGO! communication	• Build-in certificate (default setting) • PSK certificate • External certificate
Web server access with HTTPS mode	• PSK certificate (default setting) • External certificate

LOGO! Web server access uses the PSK certificate strategy by default. You can configure the certificate strategy, generate and manage certificates in LOGO!Soft Comfort. To learn how to configure certificate, refer to the section Tools -> Transfer -> Certificate settings in *LOGO!Soft Comfort Online Help*.

When you have configured the PSK certificate or external certificate, if the certificate becomes invalid, LOGO! will apply the certificate into the communication in this sequence: external certificate → PSK certificate → build-in certificate. For web server connection, LOGO! skips checking the build-in certificate.

To learn how to check the configured certificate strategy and certificate status on the LOGO! BM, refer to Viewing LOGO! certificates (Page 109).

NOTE

Certificates validity period

For PSK certificates and external certificates, the device certificate's validity period is 47 days, while the issuing certificate's validity period is longer.

Verification of the certificate chain fails if the issuing certificate's validity period falls outside the device certificate's validity period.

To ensure that the PSK and external certificates work properly, it's recommended that you regularly check the their validity periods and regenerate them when necessary.

Trust certificate manager

If you choose to use external certificate strategy, you need to import the trust external certificates to LOGO!Soft Comfort. To learn the detailed configuration, refer to the section Tool -> Transfer -> Trust CA settings in *LOGO!Soft Comfort Online Help*.

The following table lists the certificates trusted by LOGO! when using different certificate strategies:

Certificate strategy	Trusted certificate
Build-in certificate	• LOGO! build-in certificates • Certificates in the Trust CA management
PSK certificate	• The generated PSK certificate • Certificates in the Trust CA management
External certificate	Certificates in the Trust CA management

The following table lists the certificates trusted by the target device when communicating to LOGO!:

Certificate strategy	Trusted certificate
Build-in certificate	• LOGO! root certificate • LOGO! issuing certificate
PSK certificate	LOGO! PSK issuing certificate
External certificate	LOGO! external issuing certificate

10.3.2 Installing LOGO! PSK certificate

To set up the communication between LOGO! BM and the web browser, you need to install the LOGO! PSK issuing certificate or the LOGO! external issuing certificate to the web browser. Then you can access the LOGO! BM's web server through the web browser using HTTPS.

You can install the LOGO! PSK certificate to the following OS and browsers:

- Windows
  - Edge 90.0 to 143.0
  - Firefox 67.0 to 146.0
  - Google Chrome 63.0 to 143.0
  - Opera 84.0 to 125.0
- Mac OS and IOS
  - Apple Safari 17.6 to 18.3
  - Firefox 67.0 to 146.0
  - Google Chrome 70.0 to 138.0
  - Opera 84.0 to 125.0
- Linux (64 bit)
  - Firefox 91.8 to 115.13
  - Google Chrome 91.0 to 126.0
  - Opera 81.0 to 84.0

NOTE

LOGO! PSK certificate cannot be installed in Android system.

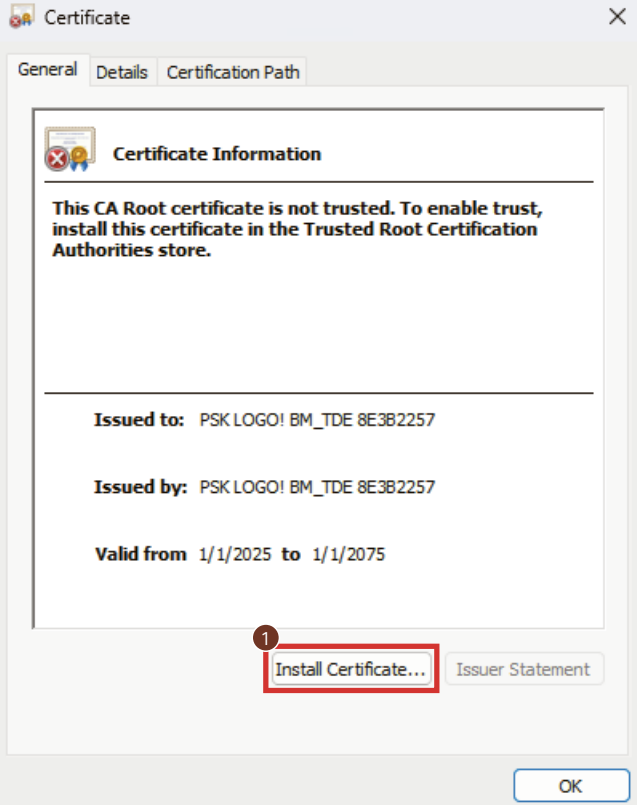
Getting LOGO! PSK certificate

You can get the LOGO! PSK certificate in LOGO!Soft Comfort. To learn how to get the LOGO! PSK certificate, refer to the section Tools -> Transfer -> Certificate settings in *LOGO!Soft Comfort Online Help*.

10.3.2.1 Installing the certificate for Windows

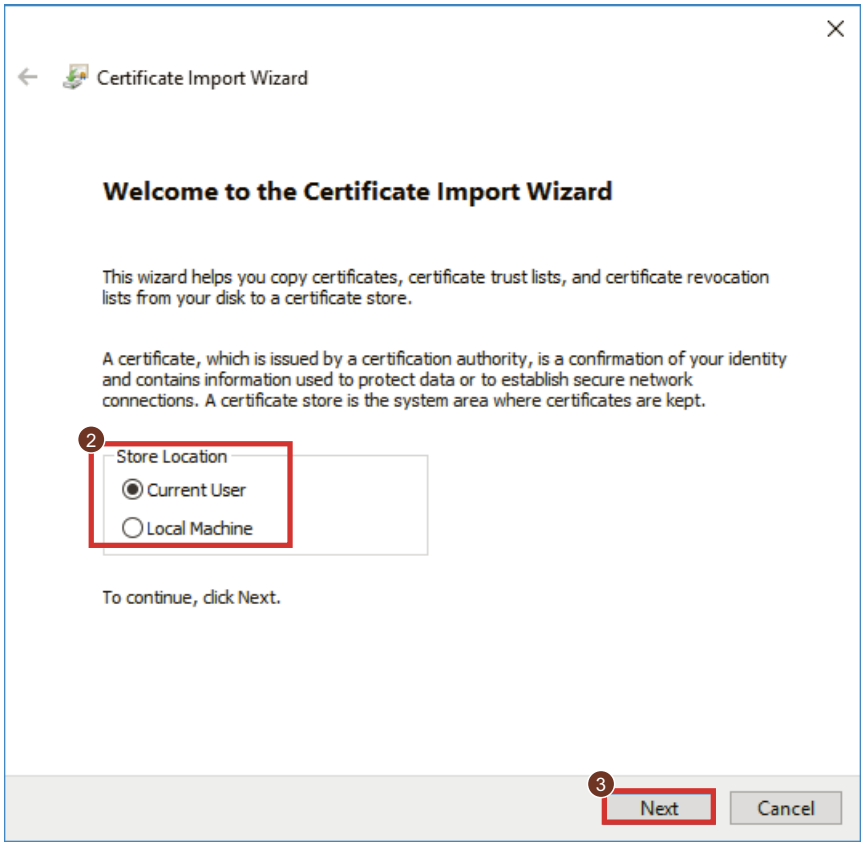
Install LOGO! PSK certificate for Windows

1. Open the certificate by double-clicking the **LOGO! PSK issuing certificate.cer**, and the click ①.



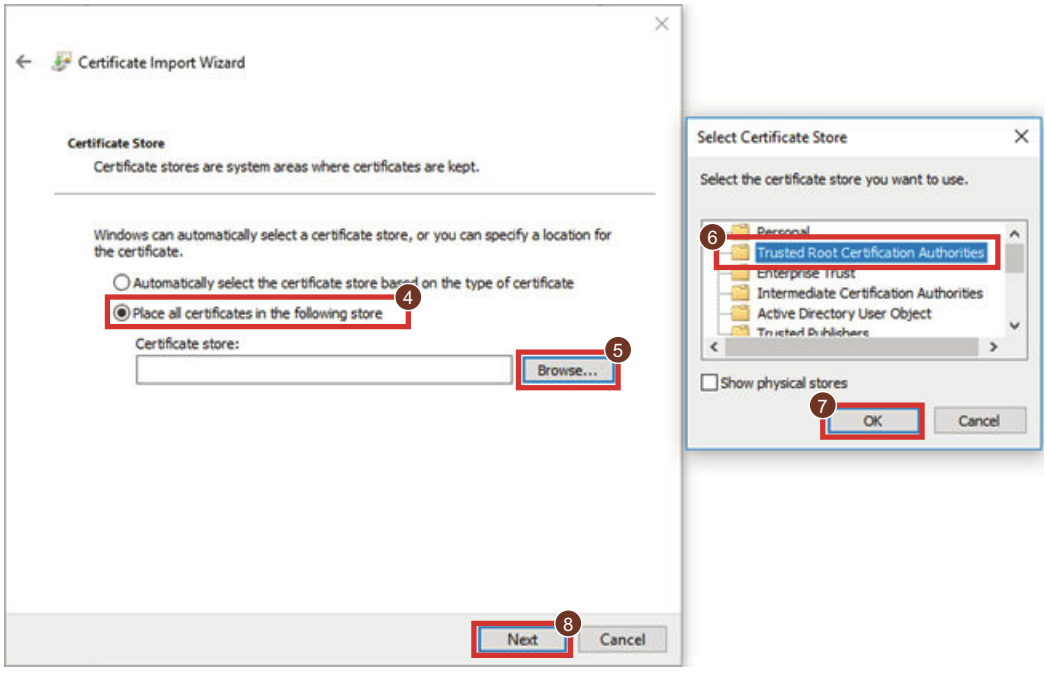
2. In the certificate import Wizard welcome page, select the store location ②.
   - If you select “Current User”, the certificate is only valid for the current user.
   - If you select "Local Machine", the certificate is valid for all the user on this PC. Only administrator can install the certificate as "Local Machine".

3. Click ③ to continue.

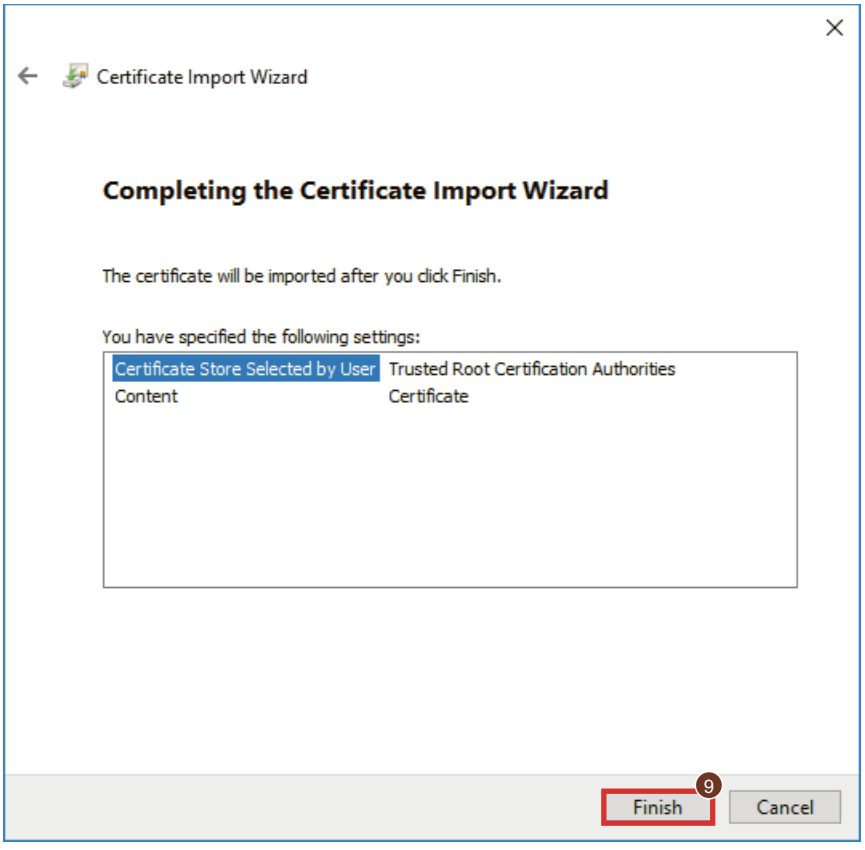


4. Select the check box of ④ and click ⑤ to store the certificate.
5. Trust the certificate by selecting ⑥ in the pop-up window and then clicking ⑦.

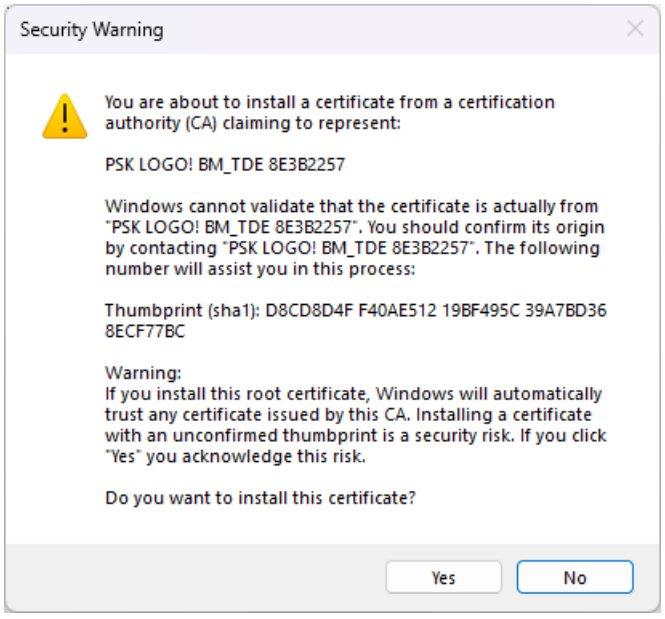
6. Click ⑧ to continue.



7. Click ⑨ to confirm your selection.

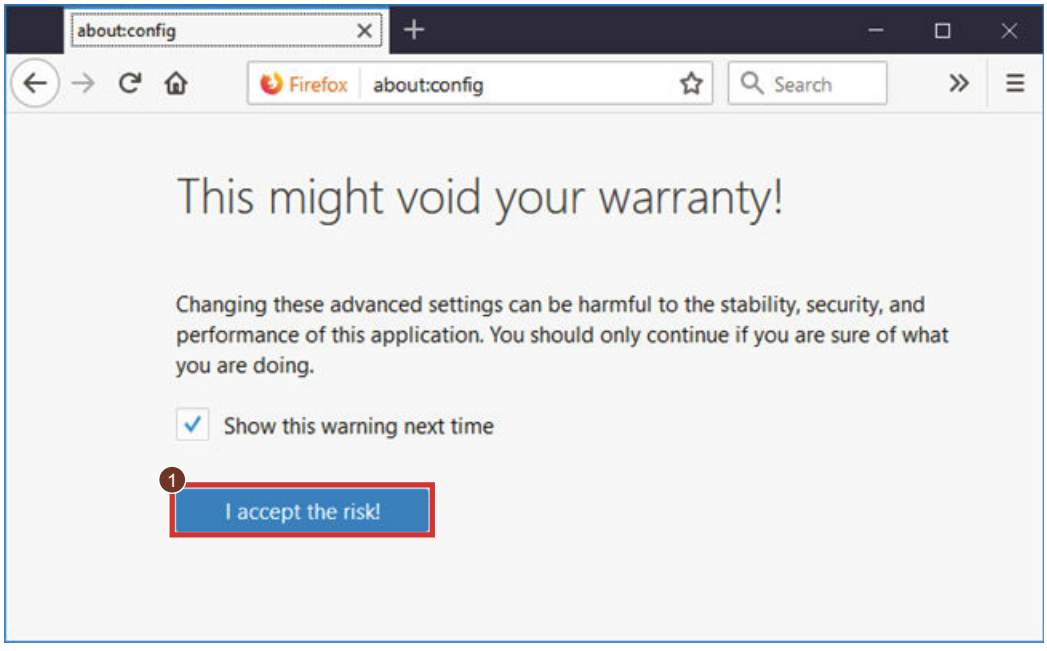


8. Click the "Yes" button to confirm the installation.

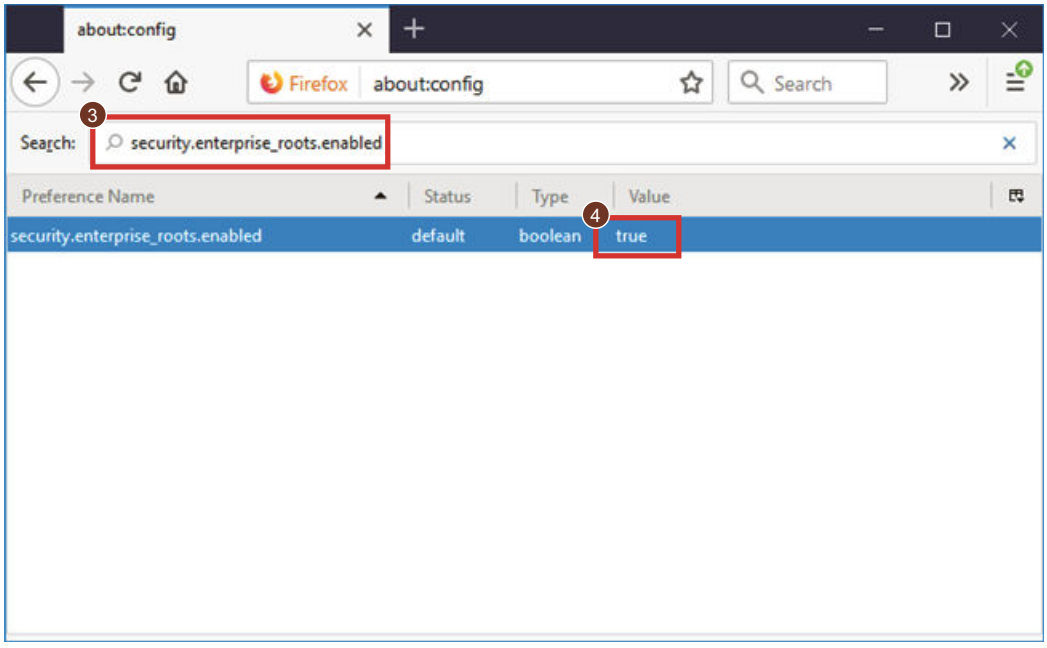


If Firefox still cannot trust the certificate after you installed the certificate, modify the setting as below steps:

1. Start Firefox.
2. Enter `about:config` in the address bar at the top of the browser.
3. Click ①.



4. Enter `security.enterprise_roots.enabled` in the search bar and set its value as "true".

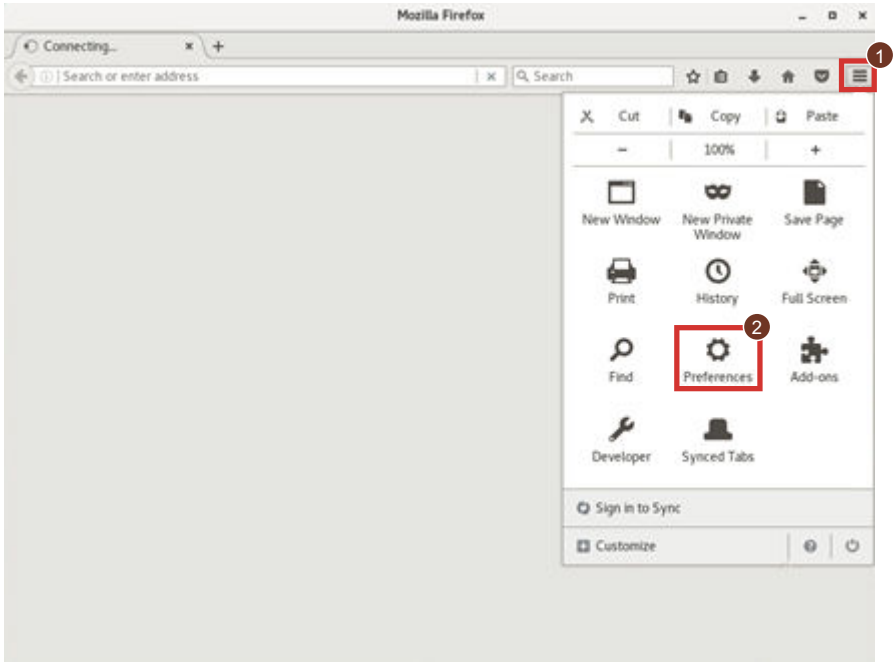


10.3.2.2 Installing the certificate for Linux

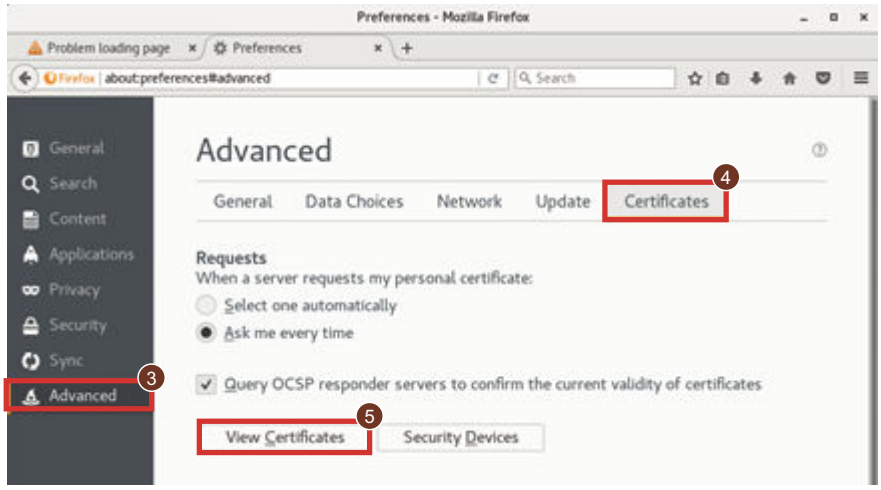
In the Linux system, you need to import the certificate in each browser separately.

Install the certificate for Firefox

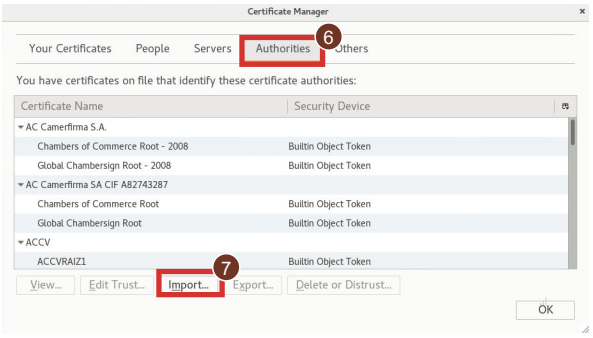
1. Start Firefox.
2. Select ① → ② to open the preference.



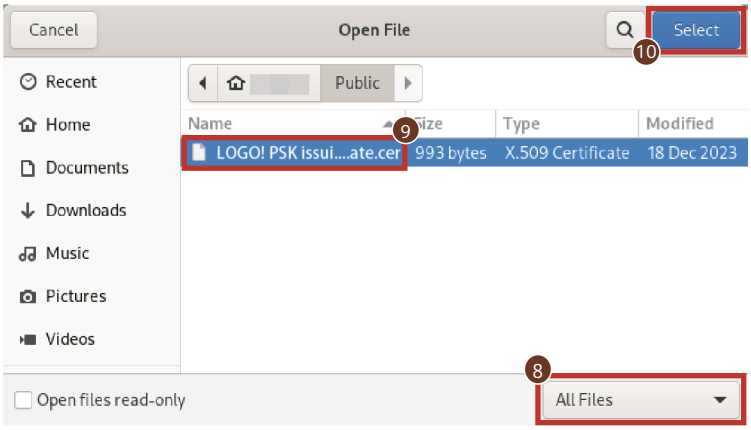
3. Select ③ → ④ → ⑤ to view the certificates.



4. Click ⑥ and then click ⑦ to import **LOGO! PSK issuing certificate.cer**.



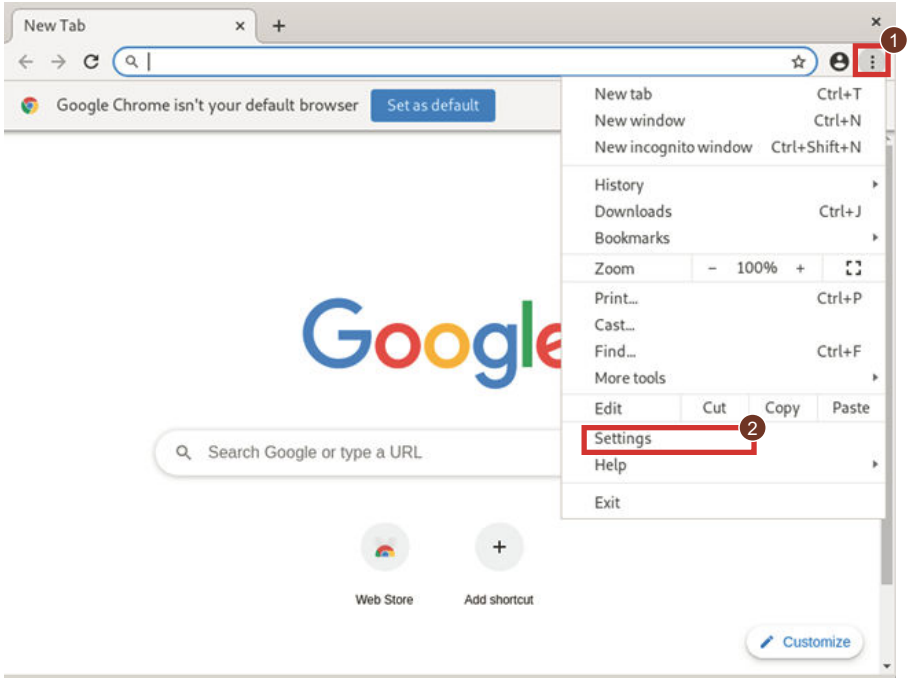
5. Select the certificate in ⑧ and click ⑨.



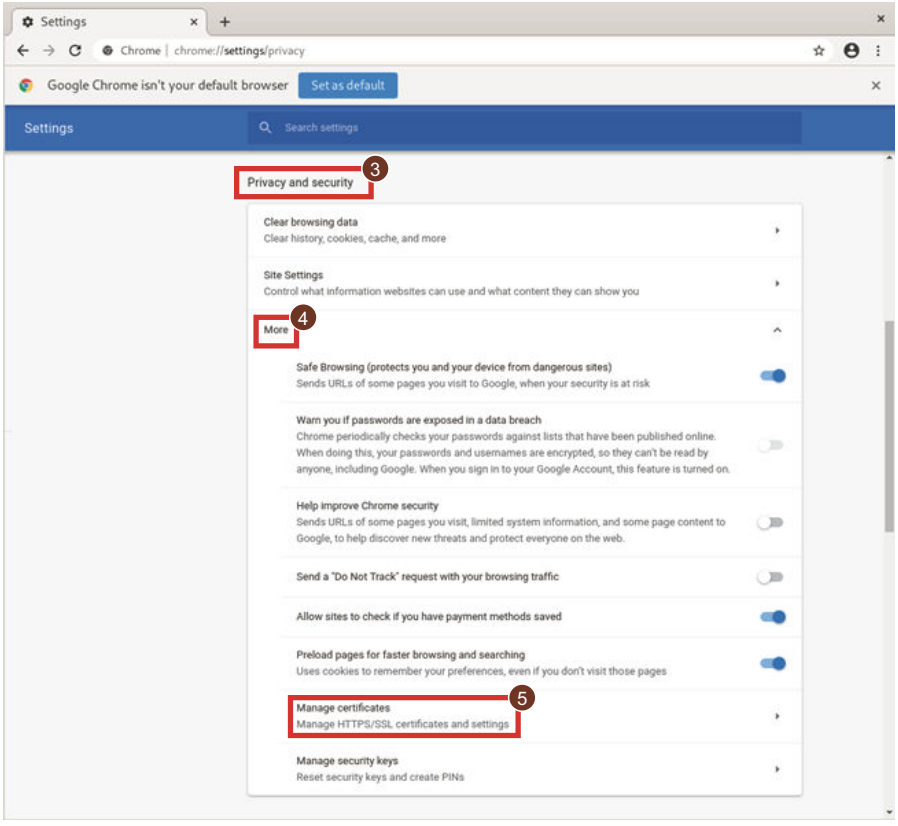
6. Select the checkbox next to ⑩ and then clicking ⑪.

Install the certificate for Google Chrome

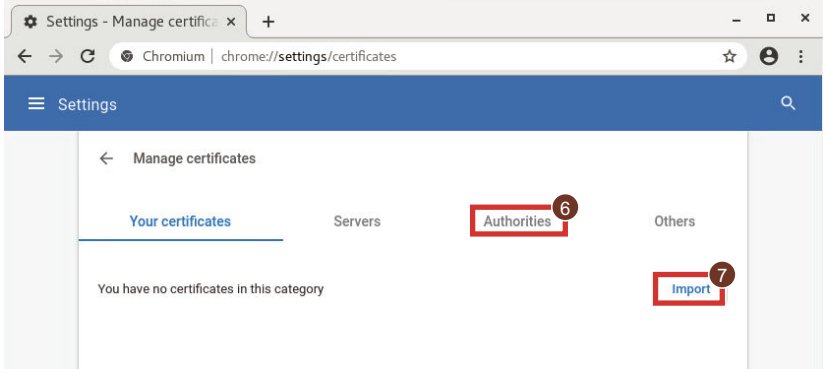
1. Start Chrome.
2. Select ① → ② to open the settings.



3. Select ③ → ④ → ⑤ to view the certificates.



4. Click ⑥ and then click ⑦ to import **LOGO! PSK issuing certificate.cer**.



5. Select ⑧, select the certificate ⑨ and click ⑩.

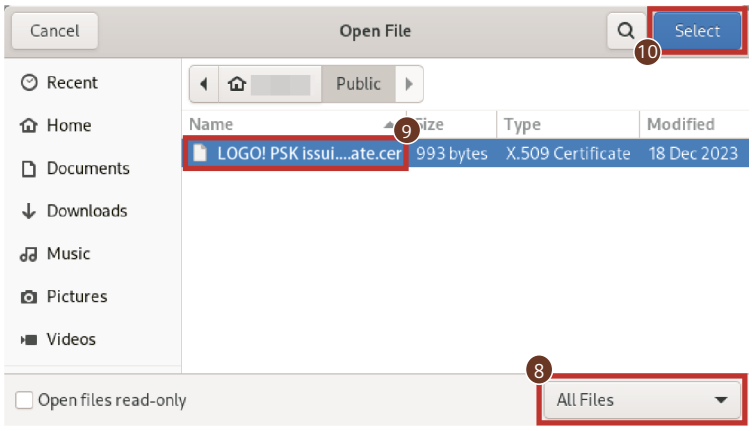
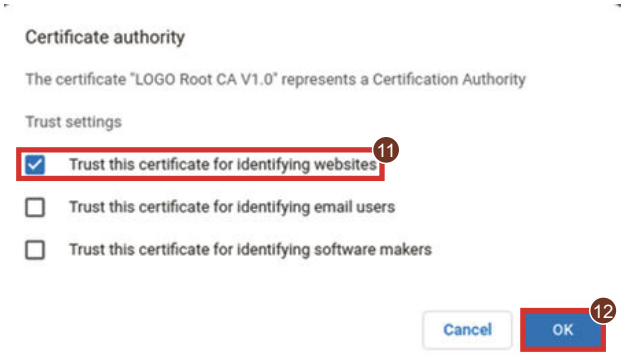


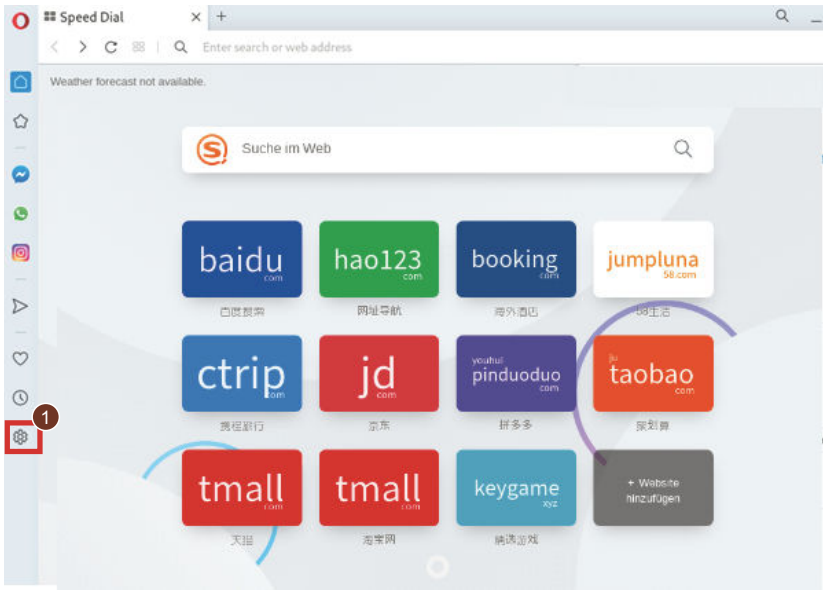
Figure 10-1 Import_cer_linux_firfox_4

6. Select the checkbox next to ⑪ and then clicking ⑫.

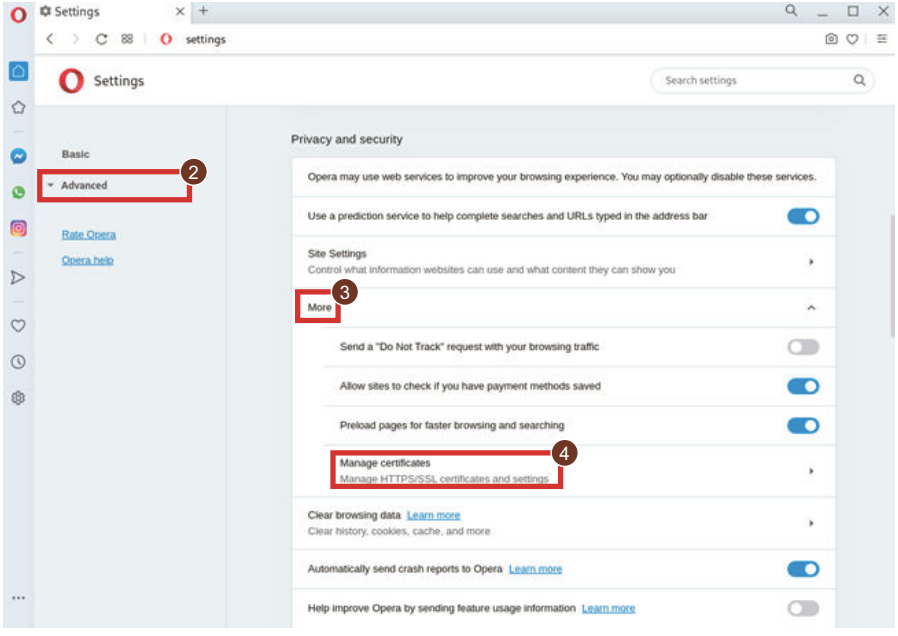


Install the certificate for Opera

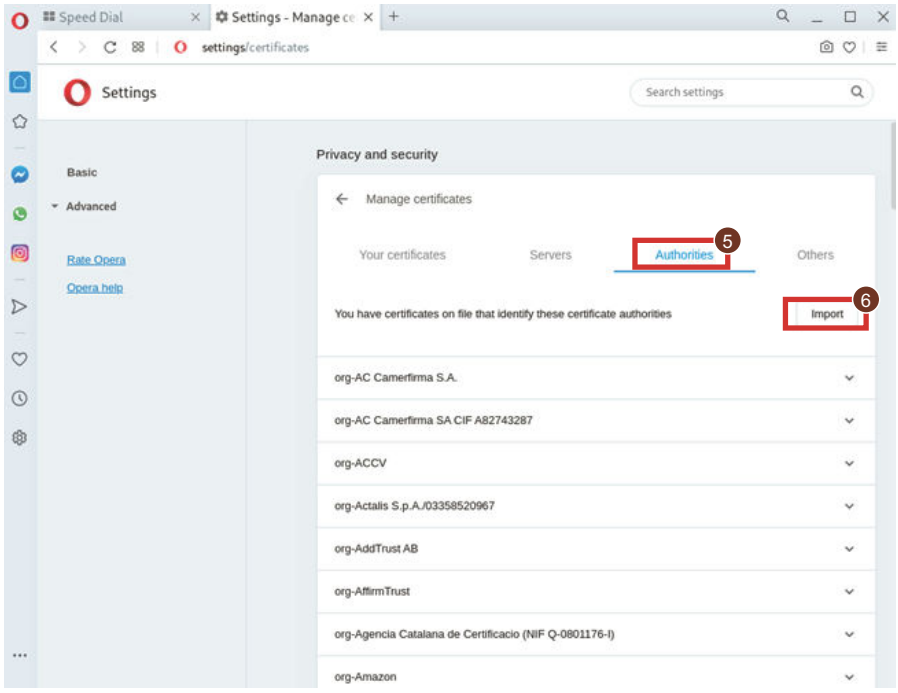
1. Start Opera.
2. Select ① to open the settings.



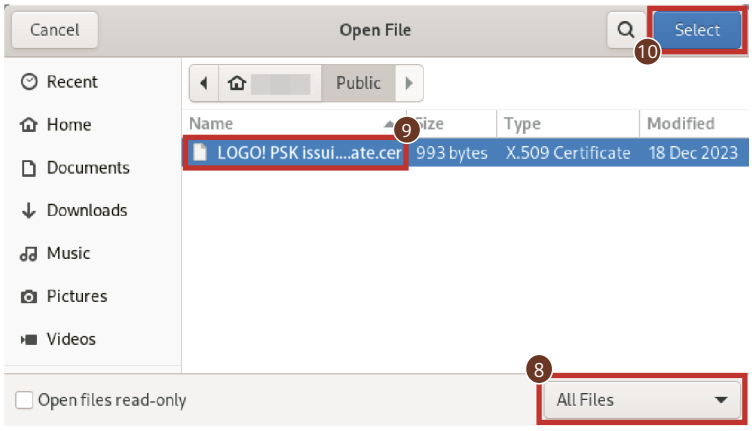
3. Select ② → ③ → ④ to view the certificates.



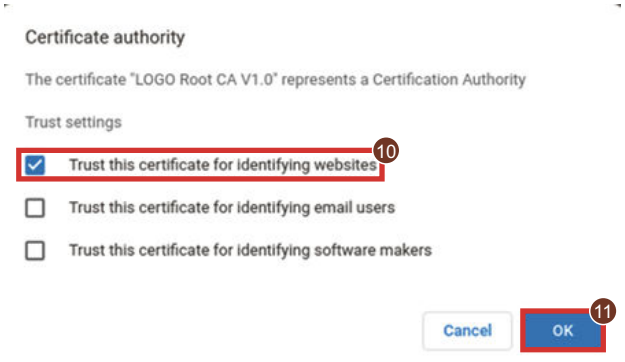
4. Click ⑤ and then click ⑥ to import **LOGO! PSK issuing certificate.cer**.



5. Select ⑦, select the certificate ⑧ and click ⑨.



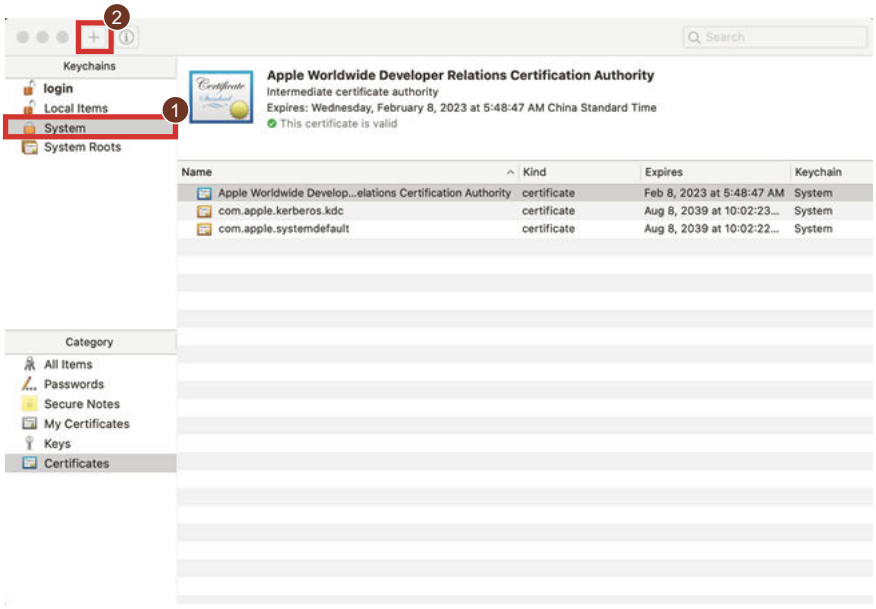
6. Select the checkbox next to ⑩ and then clicking ⑪.



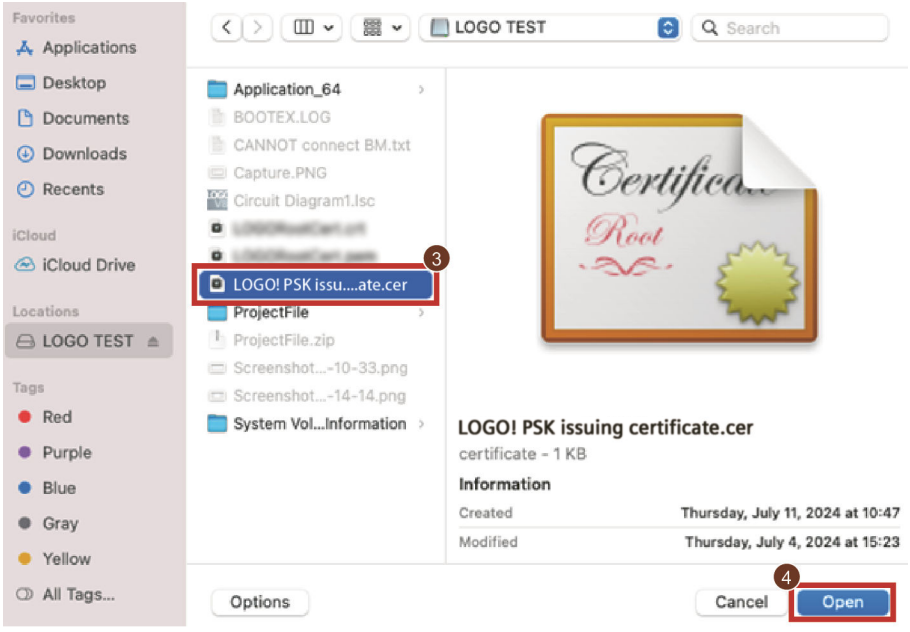
10.3.2.3 Installing the certificate for Mac OS and IOS

Install the certificate for MAC OS

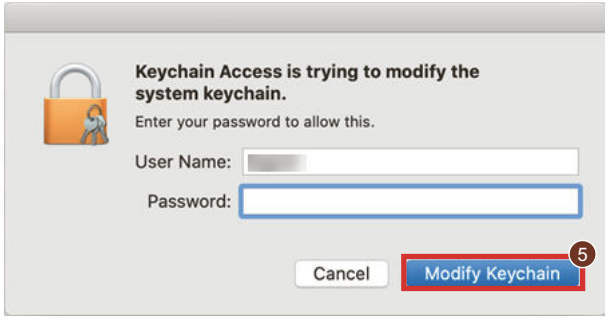
1. Open the Keychain.
2. The add a certificate, select ① → ②.



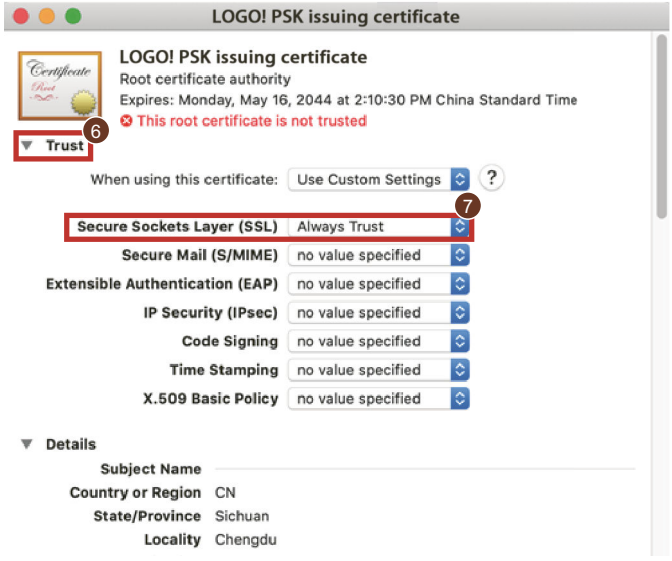
3. Select ③ and then click ④ to add **LOGO! PSK issuing certificate.cer**.



4. Enter the password, and then Click ⑤.



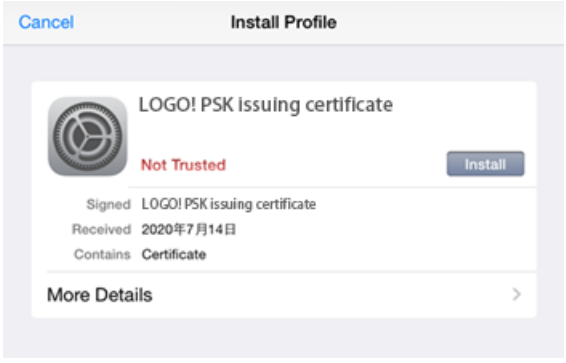
5. Double-click **LOGO! PSK issuing certificate.cer** to open it.
6. Trust the certificate by clicking ⑥ and setting ⑦ as "Always trust".



7. Enter the password, and confirm the modification.

Install the certificate for IOS

1. Click **LOGO! PSK issuing certificate.cer**.
2. Click "Install" button.



3. Click "Install" in the prompt warning window.
4. Enter the password.
5. System prompts that **LOGO! PSK issuing certificate.cer** is installed.
   Click the "Done" button.

10.4 Menu access security

LOGO! provides the following user roles to limit access to specific menus on LOGO! BM:

- Administrator (Admin)
- Maintainer
- Operator
- Viewer

LOGO! supports at most 11 users. As the Admin, you have the full access to all BM menus, LOGO! TDE menus and LOGO!Soft Comfort. You will automatically log in LOGO! as the last login user after powering off and on again.

When you power-on the LOGO! BM for the first time or after the device factory reset, you are required to set the Admin password.

To learn how to manage LOGO! users in LOGO!Soft Comfort, refer to the section Tools -> Transfer -> Access control (LOGO! 9 and later versions only) in *LOGO!Soft Comfort Online Help*.

To learn how to switch between different LOGO! users, refer to Configuring menu access protection for LOGO! (Page 65).

NOTE

LOGO! TDE Admin

LOGO! TDE has only one user role: Admin. LOGO! TDE Admin is not LOGO! BM Admin.

When you power-on the LOGO! TDE for the first time or after the device factory reset, you are required to set the TDE Admin password.

You can change the TDE Admin password through the menu: User -> Change password in TDE, or through TDE online settings in LOGO!Soft Comfort.

NOTE

Strong password

For menu access security, Siemens recommend that you set a strong password. Strong passwords are at least eight characters in length; mix letters, numbers, and special character; are not words that can be found in a dictionary; and are not names or identifiers that can be derived from personal information. Keep the password secret and change it frequently.

User access to BM

Access to LOGO! BM menu differs by user role. The following table lists the user role access to LOGO! BM menu:

Home page	Configuration item	User role			
		Admin	Maintainer	Operator	Viewer
Start/Stop	/	W	W	/	/
Setup	Clock	R/W	R/W	R/W	R
	Network	R/W	R/W	R	R
	Start Screen	R/W	R/W	R/W	R
	Message Configuration	R/W	R/W	R/W	R
	LCD	R/W	R/W	R/W	R/W
	Touch Calibration	R/W	R/W	R/W	R/W
	Menu Language	R/W	R/W	R/W	R/W
	BM AI Number	R/W	R/W	R	R
	AQ	R/W	R/W	R	R
	Power-on Delay	R/W	R/W	R	R
	Factory Reset	R/W	R	R	R
Program	Set Parameter	R/W	R/W	R/W	R
	Program Name	R/W	R/W	/	/
	Clear Program	R/W	R/W	/	/
	Memory Usage	R	R	R	R
	Program Password	R/W	R/W	/	/

R/W = Read & Write (modify); W = Write (modify); R = Read

Home page	Configuration item	User role			
		Admin	Maintainer	Operator	Viewer
Card	/	R/W	R/W	R	R
Diagnostics	Software	R	R	R	R
	Hardware	R	R	R	R
	Tools	R/W	R/W	R/W	R/W
	Cloud	R	R	R	R
	Email	R	R	R	R
	Toggle Error	R/W	R/W	R/W	R/W
	Certificate	R	R	R	R
User	/	R/W	R/W	R/W	R/W

R/W = Read & Write (modify); W = Write (modify); R = Read

User access to web server

Access to LOGO! web server differs by user role. The following table lists the user role access to LOGO! web server:

Web server	Web page	User roles			
		Admin	Maintainer	Operator	Viewer
LOGO! build-in web	LOGO! System	R	R	R	R
	LOGO! Variable	R/W	R/W	R/W	R
	LOGO! BM [1]	R/W	R/W	R/W	R
	LOGO! TD [1]	R/W	R/W	R/W	R
	LOGO! Datalog (view and export)	Yes	Yes	Yes	Yes
User Defined Web Page	Login/Logout [2]	Yes	Yes	Yes	Yes
	Web page components (variables)	R/W	R/W	R/W	R

R/W = Read & Write (modify); W = Write (modify); R = Read

1: The build-in web pages synchronize the message pages displaying on the LOGO! BM/TDE. Admin, maintainer and operator can view and modify the parameters on the message pages, while the viewer can only view parameters on the message pages.

2: All the user roles can log in or log out the User Defined Web Page on the web server if the login page has been configured in the web project.

Other access

Using micro SD card

Only Admin and Maintainer have access to the Card menu on LOGO! screen.

The following operations are available to the four user roles:

- Loading program from the micro SD card to LOGO! BM

  LOGO! supports loading diagram with device configuration from the inserted micro SD card. If the device configuration contains LOGO! certificate settings or the UMAC settings, only the Admin has the permission to load the diagram with the device configuration from the micro SD card by powering BM off and on again. For detailed information, refer to Copying data from the card to LOGO! (Page 117).
- Resetting the LOGO! BM to factory settings (Page 284) using the reset.bm file in the micro SD card.
- Upgrading LOGO! BM firmware (Page 120) using the firmware upgrade file in the micro SD card.

Using LOGO!Soft Comfort

Access to LOGO!Soft Comfort differs by user role. The Admin has full access to LOGO!Soft Comfort. The viewer can only view information on LOGO!Soft Comfort.

- All user roles can log in or log out LOGO! through LSC
- Only the Admin and maintainer can start/stop LOGO! running through LSC
- Only the Admin and maintainer can download/upload the program (with or without device configuration) to/from LOGO!. Only the Admin has access to download/upload the device configuration containing certificate settings or UMAC settings.
- The following device online settings are available only to the Admin:
  - UMAC setting (in Access control settings)
  - Dynamic server IP filter
  - Certificate settings
  - Trust CA settings
  - Factory reset

Refer to *LOGO!Soft Comfort Online Help* for detailed information.

10.5 LOGO! security audit log

LOGO! 9 Base Module generates and records BM security events as the audit logs.

LOGO!Soft Comfort supports the following operations for the audit logs:

- viewing the audit logs in LOGO!Soft Comfort
- exporting the audit logs to your PC
- importing the audit logs from your PC to LOGO!Soft Comfort to view them

To learn how to view, export or import LOGO! audit logs, refer to the section Tools -> Transfer -> Audit Log Settings in *LOGO!Soft Comfort Online Help*.

An audit log contains the following information:

Audit log	Description
Event ID	The ID of the audit log event. The maximum value for this ID is 0x7FFFFFFF. LOGO! BM can only store up to 64 audit log records. When the number of records exceeds this limit, the oldest records are overwritten by newly generated audit logs. The internal audit log storage is split into security and non-security regions; overwrites occur independently within each region (i.e., each region only overwrites records in its own area). Note: When an overwrite event occurs, an audit log named as "Audit log first-time overwritten" will be generated and recorded. This audit log will never be overwritten by any newly generated audit logs.
Date and Time	The BM date and time when the event occurs.
Event Type	The brief description of the event, for example, diagram stopped/started, SD card inserted/pulled out, device IP changed and so on.
Event Class	LOGO! BM records the following types of audit event: • Access control • Request error • System • Backup and recovery • Configuration change • Auditable log
Severity	The severity level of event impacting the system: • Critical • Error • Warning • Info • Debug
Event Origin	The origin of the audit event: • Bootloader • SD card • Certificate management module • Device info module • Diagram management module • Communication management module • Time management module • EM module • Auditable log management module • Driver • Power • User management module
Extra Info	Additional information of the event.

10.6 Secure decommissioning

In this section, you will find information on how to properly decommission individual components of your automation system. Decommissioning is necessary when the component has reached the end of its service life.

Decommissioning includes environmentally sound disposal and secure removal of all digital data of electronic components with storage medium.

10.6.1 Securely removing data

Before disposing of components of your automation system, you should securely delete all data from the storage media of these components. How to securely delete data from the devices so that it cannot be recovered is described below.

NOTICE
Data misuse resulting from non-secure deletion of data Incomplete or non-secure deletion of data from data memories can result in data misuse by third parties. For this reason, ensure secure deletion of data from all storage media used before disposing of the product.

To delete all data from the data memories of LOGO! device, reset the device to factory setting. The function deletes all information that was saved internally on the module. You can take the following three methods to reset your LOGO! device to factory setting.

Factory reset by LOGO! BM menu command

NOTE

You can only reset LOGO! BM to the factory settings through the BM menu command when LOGO! is in STOP mode.

To reset LOGO! to the factory settings, follow these steps:

1. Press Setup in the home page.
2. Press Factory Reset in the menu.
3. Read the notices about the factory reset operation.

   You can select to retain the network setting after the reset.

   Press Apply button. Then press Yes to confirm the operation and start the reset.

   LOGO! restarts automatically once the reset is complete.

Factory reset by LOGO!Soft Comfort

Use menu command in LOGO!Soft Comfort: Tools -> Transfer -> Factory Reset LOGO!. For detailed operation, refer to the section: *Tools -> Transfer -> Factory Reset LOGO! (LOGO! 8.FS4 and later versions only)* in *LOGO!Soft Comfort Online Help*.

Factory reset using micro SD card

1. Copy __reset.bm file from the LOGO! USB Stick into the root directory of a micro SD card.
2. Insert the micro SD card into the LOGO! BM.
3. Power on the LOGO! BM to execute factory reset. After the BM is reset to factory settings, __reset.bm file in the SD card is deleted automatically.

NOTE

The __reset.bm file can only be used to reset factory settings for LOGO! BM 8.3 and later versions.

NOTE

If you have forgotten the Admin password, using the reset file is the only way to reset your LOGO! to factory settings and reset the Admin password.

10.6.2 Recycling and disposal

You can fully recycle LOGO! devices due to their low-pollutant equipment. For environmentally friendly recycling and disposal of your old equipment, contact a certified electronic waste disposal company and dispose of the equipment according to the applicable regulations in your country.

LOGO! software

11

11.1 LOGO! software

LOGO!Soft Comfort is available as a programming package for the PC. This software provides many features, for example:

- A graphical user interface for offline creation of your circuit program by means of Ladder Diagram (contact chart / circuit diagram) or Function Block Diagram (function chart)
- A graphical user interface for offline creation of your Network project
- A graphical user interface for offline creation of your User Defined Web Page project, which can be monitored on a supported web browser
- Simulation of your circuit program or User Defined Web Page project 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 testing that provides a display of status changes and process variables of LOGO! in RUN mode:
  - Status of digital I/O, flags, shift register bits and Cursor keys
  - Values of all analog I/O and flags
  - Results of all blocks
  - Current values (including the times) of selected blocks
- Starting and stopping circuit program execution from the PC (switching between RUN and STOP modes)
- Network communication
- Creating UDF blocks (Page 233) for use in a circuit program
- Configuring the Data Log (Page 235) function block for your circuit program to record process values of the configured function blocks
- Configuring to make LOGO! send emails at the triggered events to certain email accounts
- Configuring to connect the LOGO! to the supported IoT Cloud: AWS, Azure, Alibaba or general MQTT broker

The current version is LOGO!Soft Comfort V9.0. The Online Help for LOGO!Soft Comfort describes all of the programming functionality and design features.

The LOGO! advantages

As you can see, LOGO!Soft Comfort offers many 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 hard copies.
- 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!.

Supported operating systems

You can execute LOGO!Soft Comfort on any of the following operating systems:

- Windows: Windows 8.1 (64 bit), Windows 10 (64 bit) or Windows 11
- Linux: SUSE Linux 15 (64 bit), Kylin Desktop V10 SP1
- Mac OS: Mac OS 11 Big Sur, Mac OS 12.1 Monterey, Mac OS 13.7 Ventura, Mac OS 14.5 Sonoma, Mac OS 15.3 Sequoia.
- Recommended Java Runtime Environment version: Amazon Corretto 17.0.17.10.1

Installing/Starting LOGO!Soft Comfort

To install LOGO!Soft Comfort, follow these steps:

1. Connect the LOGO! USB Stick to the PC.
2. View the USB contents using your file-management program.
3. In the main directory of the USB, open the folder with the name of the desired operating system (Windows, Linux, Kylin or MAC)
4. Proceed in either of the following ways:
   - Select the **Setup**, **Start** or **.deb** file to install the program.
   - Select the folder **Application<_operating system version>** (**"<_operating system version>"** is available only for Linux and Windows) and copy it to your hard disk. Double-click LOGO!Comfort.exe in the folder to start the program.

You can find order numbers in Section "Order numbers (Page 324)".

Updates and information

You can download demo versions of the software free of charge from the Internet address specified in the preface (Page 4).

For detailed information on updates, upgrades and the LOGO!Soft Comfort Update Center, refer to the LOGO!Soft Comfort Online Help.

11.2 Connecting LOGO! to a PC

Connecting LOGO! to a PC

You can connect a LOGO! 9 Base Module to a PC with an Ethernet cable.

Switching LOGO! to PC ↔ LOGO! mode

Two methods are available to switch LOGO! to STOP mode:

- Switch LOGO! to STOP mode from your PC (refer to the Online Help for LOGO!Soft Comfort).
- Press the Stop menu command on a LOGO! device with touch screen.

When LOGO! is in STOP mode and online with the PC, the following PC commands are available:

- Switch LOGO! to RUN
- Read/write the circuit program
- Read/write the summertime/wintertime

NOTE

For more information on LOGO! versions without display, refer to the Appendix topic "LOGO! without display ("LOGO! Pure") (Page 314)".

Closing the PC ↔ LOGO! mode

When LOGO! completes the data transfer, it shuts down the connection to the PC.

NOTE

If you have password-protected the program that you created in LOGO!Soft Comfort, LOGO! receives both the circuit program and the password during the download. If you want to configure the program name or parameters on LOGO!, you are required to enter the correct program password.

When uploading a password-protected program from LOGO! to LOGO!Soft Comfort, you are required to enter the correct program password in LOGO!Soft Comfort.

Applications

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NOTE

LOGO! sample applications are available to all our customers free of charge on the Siemens LOGO! website (http://www.siemens.com/logo) (go to Products & Solutions → Applications → Application Examples).

Siemens does not guarantee that the provided examples are error-free; they serve as general information about the fields of application for LOGO!, and can be different from user-specific solutions. Siemens reserves the right to make changes.

You are responsible for the operation of your system.. 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 (for example, 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 three consumers
- Sequential control system for cable-welding machines for large cross–sections
- Step switch (for example, for fans)
- Sequential control for boilers
- Control system for several pump sets with centralized operator control
- Cutting device (for example, for detonating fuses)
- Monitoring periods of utilization, for example of a solar energy system
- 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! TDE 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 Acrobat Reader. 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 information?

For more information about LOGO!, see the Siemens Web page (As mentioned in the first paragraph of the Note in this chapter).

Do you have any suggestions?

There are definitely many more useful applications for LOGO!. If you know of one, please write to the following address or send it to the online Support Request (http://www.siemens.com/automation/support-request). Siemens will collect all the suggestions made and distribute as many of them as possible. Your suggestions are valuable to Siemens.

Write to:

Siemens AG

Division Digital Factory
Postfach 48 48
90026 NÜRNBERG
GERMANY

Technical data

A

A.1 General technical data

Criterion	Values	Tested in accordance with
Dimensions (WxHxD)	• LOGO! Basic: 71.5 x 90 x 58 mm • LOGO! Pure: 71.5 x 90 x 58 mm • LOGO! DM8...: 35.5 x 90 x 58 mm • LOGO! AM...: 35.5 x 90 x 58 mm • LOGO! TDE: 128.2 x 86 x 38.7 mm	
Weight	• LOGO! 230RCE: Approx. 225 g • LOGO! 230RCEo: Approx. 202 g • LOGO! 12/24RCE: Approx. 206 g • LOGO! 12/24RCEo: Approx. 187 g • LOGO! 24RCE: Approx. 205 g • LOGO! 24RCEo: Approx. 186 g • LOGO! 24CE: Approx. 166 g • LOGO! 24 CEo: Approx. 146 g • LOGO! DM8 230R: Approx. 129 g • LOGO! DM8 12/24R: Approx. 127 g • LOGO! AM4 AIAQ: Approx. 97 g • LOGO! TDE: Approx. 205 g	
Installation	• LOGO! BM & EM: – On a 35 mm profile rail four module widths – Wall mounting • LOGO! TDE: bracket mounting	
Climatic conditions		
Ambient temperature (BM, EM, TDE)	• Horizontal installation: -20 °C to +55 °C • Vertical installation: -20 °C to +55 °C	Low temperature to IEC 60068-2-1 High temperature to IEC 60068-2-2
Storage and Transport	- 40 °C to +70 °C	
Relative humidity	From 10% to 95% no condensation	IEC 60068-2-30 IEC 60068-2-78
Atmospheric pressure, Altitude	• Operation: 1140 to 795 hPa, corresponds to an elevation of -1000 m to 2000 m • Storage/transport: 1140 to 660 hPa, corresponds to an elevation of -1000 m to 3500 m	
Pollutants	SO2 10 cm3/m3, 21 days H_2S 1 cm^3/m^3, 21 days	IEC 60068-2-42 IEC 60068-2-43
Pollution degree	2	
Ambient mechanical conditions		
Degree of protection	• IP20 for LOGO! Base Modules, Expansion Modules, and the LOGO! TDE excluding the TDE front panel • IP65 for LOGO! TDE front panel	

Criterion	Values	Tested in accordance with
Enclosure type	• Type 1 for the front panel of LOGO! Base Modules and Expansion Modules • Type 4X/12 for LOGO! TDE front panel	
Vibrations	5 Hz to 8.4 Hz (constant amplitude 3.5 mm) 8.4 Hz to 200 Hz (constant acceleration 1 g)	IEC 60068-2-6
Shock	Half-sine wave 15 g/11 ms	IEC 60068-2-27
Free fall (in product package)	0.3 m	IEC 60068-2-31
Electromagnetic compatibility (EMC)		
Radiated emission	Limit class B group 1 Limit class B	EN 61000-6-3 EN 61000-6-4
Conducted emission	Limit class B group 1 Limit class B	EN 61000-6-3 EN 61000-6-4
Electrostatic discharge	±2 kV, ±4kV, ±8 kV air discharge ±6 kV contact discharge	IEC 61000-4-2
Radiated electromagnetic field	80 MHz-1000 MHz 10V/m, 80% AM(1 kHz) 1.4 GHz-6.0 GHz 3V/m, 80% AM(1 kHz)	IEC 61000-4-3
Conducted disturbance	150 KHz-80 MHz 10 V, 80%AM(1 kHz)	IEC 61000-4-6
Fast transient bursts	• For power port: 2 kV • For signal port: – Signal Lines < 30 m: 1 kV/5 kHz and 100 kHz – Signal Lines ≥ 30 m: 2 kV/5 kHz and 100 kHz	IEC 61000-4-4
Surge immunity (applies only to LOGO! 230RCE, LOGO! 24RCE, DM8 230R, LOGO! TDE)	1 kV line-to-line 2 kV line-to-earth	IEC 61000-4-5
Surge immunity (applies to low-voltage (12 V DC or 24 V DC) LOGO! modules)	• 0.5 kV line-to-line • 1 kV line-to-earth	
Safety to IEC		
Clearance and creepage distance rating	Fulfilled	IEC 60664, IEC 61131-2, cULus to UL 508, CSA C22.2 No. 142, IEC 60730
Insulation strength	Fulfilled	IEC 61131-2
Cycle time		
Cycle time per function	< 0.1 ms	
Startup		
Startup time at power-up	Typ. 1.8 s	
Overvoltage		
Overvoltage category	• Power input & digital input: – OVC II: LOGO! 230RCE/RCEo, LOGO! DM8 230R • Digital output: – OVC III: LOGO! 12/24RCE/RCEo, LOGO! 230RCE/RCEo, LOGO! 24RCE/RCEo, LOGO! DM8 12/24R, LOGO! DM8 230R	

NOTE

The maximum length for directly connecting two LOGO! Base Modules through CAT5e shielded network cable is 100 meters.

A.2 Technical data: LOGO! 230...

	LOGO! 230RCE	LOGO! 230RCEo
Power supply		
Input voltage	115 V AC/DC to 240 V AC/DC	
Permissible range	85 V AC to 265 V AC 100 V DC to 265 V DC	
Input frequency	50/60 Hz	
Permissible mains frequency	47 Hz to 63 Hz	
Current consumption	• 85 V AC: Max. 75 mA • 115 V AC: Max. 65 mA • 240 V AC: Max. 45 mA • 265 V AC: Max. 45 mA • 115 V DC: Max. 25 mA • 240 V DC: Max. 13 mA	• 85 V AC: Max. 60 mA • 115 V AC: Max. 55 mA • 240 V AC: Max. 40 mA • 265 V AC: Max. 40 mA • 115 V DC: Max. 20 mA • 240 V DC: Max. 11.5 mA
Voltage failure buffering	• 115 V AC/DC: Typ. 10 ms • 240 V AC/DC: Typ. 20 ms	
Power consumption	• 85 V AC: Max. 2.85 W, max. 6.38 VA • 115 V AC: Max. 2.95 W, max. 7.48 VA • 240 V AC: Max. 3.15 W, max. 10.8 VA • 265 V AC: Max. 3.2 W, max. 11.9 VA • 115 V DC: Max. 2.88 W • 240 V DC: Max. 3.12 W	• 85 V AC: Max. 2.4 W, max. 5.1 VA • 115 V AC: Max. 2.5 W, max. 6.33 VA • 240 V AC: Max. 2.8 W, max. 9.6 VA • 265 V AC: Max. 2.85 W, max. 10.6 VA • 115 V DC: Max. 2.3 W • 240 V DC: Max. 2.76 W
Backup of the real-time clock at 25 °C	Typ. 20 days	
Accuracy of the real-time clock	Typ. ± 2 s/day	
Digital inputs		
Number	8	
Electrical isolation	Yes	
Number of high speed inputs	0	

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing.
At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 230RCE	**LOGO! 230RCEo**
Input frequency	• Normal input: Max. 4 Hz • High speed input: - -	
Digital input	115 to 240 V AC/DC, 50/60 Hz	
Max. continuous permissible voltage	265 V AC 265 V DC	
Input voltage L1	• Signal 0: – < 40 V AC – < 30 V DC • Signal 1: – > 79 V AC – > 79 V DC	
Input current	• Signal 0: – < 0.07 mA AC – < 0.07 mA DC • Signal 1: – > 0.19 mA AC – > 0.19 mA DC	
Delay time	• at 0 to 1: – 120 V AC: Typ. 40 ms – 240 V AC: Typ. 30 ms – 120 V DC: Typ. 25 ms – 240 V DC: Typ. 20 ms • at 1 to 0: – 120 V AC: Typ. 45 ms – 240 V AC: Typ. 70 ms – 120 V DC: Typ. 60 ms – 240 V DC: Typ. 75 ms	
Line length (unshielded)	Max. 100 m	
Digital outputs [1]		
Number	4	
Output type	Relay outputs	
Electrical isolation	Yes	
In groups of	1	
Control of a digital input	Yes	
Continuous current I_{th}	Recommended range of application ≥ 100 mA at 12 V AC/DC [2] Max. 10 A per relay	
Relay rated voltage	240 V AC	

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing.
At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 230RCE	**LOGO! 230RCEo**
Surge current	Max. 30 A Incandescent lamp load (25000 switching cycles): • 230/240 V AC: 1000 W • 115/120 V AC: 500 W	
Short circuit-proof cos 1	Power protection B16, 600 A	
Short circuit-proof cos 0.5 to 0.7	Power protection B16, 900 A	
Derating	None; across the entire temperature range	
Parallel output circuits for power increase	Not permitted	
Protection of output relay (if desired)	Max. 16 A, characteristic B16	
Line length (unshielded)	Max. 100 m	
Switching rate		
Mechanical	10 Hz	
Ohmic load/lamp load	2 Hz	
Inductive load	0.5 Hz	
Communication port		
Ethernet	One Ethernet interfaces with 10/100 M full/half duplex data transmission rate	
LCD display		
Display	2.4 inch LCD with resistive touch panel	- -
Display lifetime [3]	30,000 hours	- -

[1] Output: R300; 10A, 240 V AC, G.P..

[2] Temperature and humidity can affect contact closing.
At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

[3] The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

A.3 Technical data: LOGO! 24...

	LOGO! 24CE	LOGO! 24CEo
Power supply		
Input voltage	24 V DC	
Permissible range	20.4 V DC to 28.8 V DC	
Reverse polarity protection	Yes	
Permissible mains frequency	- -	
Current consumption at 24 V DC	• Max. 55 mA (no load on digital output) • Max. 1.28 A (with max. load on digital output)	• Max. 50 mA (no load on digital output) • Max. 1.28 A (with max. load on digital output)
Voltage failure buffering	- -	
Power consumption at 24 V DC	Max. 1.32 W	Max. 1.2 W
Backup of the real-time clock at 25 °C	Typ. 20 days	
Accuracy of the real-time clock	Typ. ± 2 s/day	
Digital inputs		
Number	8	
Electrical isolation	No	
Number of high speed inputs	4 (I3, I4, I5, I6)	
Input frequency	• Normal input: Max. 4 Hz • High speed input: Max. 5 kHz	
Digital input	24 V DC	
Max. continuous permissible voltage	28.8 V DC	
Input voltage L+	• Signal 0: < 5 V DC • Signal 1: > 12 V DC	
Input current	• Signal 0 – < 0.9 mA (I3 to I6) – < 0.06 mA (I1, I2, I7, I8) • Signal 1 – > 2.1 mA (I3 to I6) – > 0.18 mA (I1, I2, I7, I8)	

1) Output: 24 V DC, 0.3 A, RES./P.D.

2) When you switch on LOGO! 24CE/24CEo, the CPU sends signal 1 to the digital outputs for about 50 µs. Take this into account, especially when using devices that react to short pulses.

3) The maximum switching rate is only dependent on the switching program's cycle time.

4) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 24CE	LOGO! 24CEo
Delay time	• at 0 to 1: – Typ. 1.5 ms – <1.0 ms (I3 to I6) • at 1 to 0: – Typ. 1.5 ms – <1.0 ms (I3 to I6)	
Line length (unshielded)	Max. 100 m	
Analog inputs		
Number	4 (I1=AI3, I2=AI4, I7=AI1, I8=AI2)	
Range	0 V DC to 10 V DC Input impedance 80 kΩ	
Cycle time for analog value generation	300 ms	
Line length (shielded and twisted)	Max. 10 m	
Error limit	± 1% at FS	
Digital outputs [1]		
Number	4	
Output type	Transistor, current-sourcing [2]	
Electrical isolation	No	
In groups of	- -	
Control of a digital input	Yes	
Output voltage	≤ Supply voltage	
Output current	Max. 0.3 A per channel	
Short circuit-proof and overload-proof	Yes	
Short circuit current limitation	Approx. 1 A per channel	
Derating	None; across the entire temperature range	
Short circuit-proof cos 1	- -	
Short circuit-proof cos 0.5 to 0.7	- -	
Parallel output circuit for power increase	Not permitted	
Protection of output relay (if desired)	- -	
Line length (unshielded)	Max. 100 m	

1) Output: 24 V DC, 0.3 A, RES./P.D.

2) When you switch on LOGO! 24CE/24CEo, the CPU sends signal 1 to the digital outputs for about 50 µs. Take this into account, especially when using devices that react to short pulses.

3) The maximum switching rate is only dependent on the switching program's cycle time.

4) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 24CE	LOGO! 24CEo
Switching rate [3]		
Electrical	10 Hz	
Ohmic load/lamp load	10 Hz	
Inductive load	0.5 Hz	
Communication port		
Ethernet	One Ethernet interfaces with 10/100 M full/half duplex data transmission rate	
LCD display		
Display	2.4 inch LCD with resistive touch panel	- -
Display lifetime [4]	30,000 hours	- -

1) Output: 24 V DC, 0.3 A, RES./P.D.

2) When you switch on LOGO! 24CE/24CEo, the CPU sends signal 1 to the digital outputs for about 50 µs. Take this into account, especially when using devices that react to short pulses.

3) The maximum switching rate is only dependent on the switching program's cycle time.

4) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

A.4 Technical data: LOGO! 24RC...

	LOGO! 24RCE	LOGO! 24RCEo
Power supply		
Input voltage	24 V AC/DC	
Permissible range	20.4 V AC to 26.4 V AC 20.4 V DC to 28.8 V DC	
Reverse polarity protection	- -	
Input frequency	50/60 Hz	
Permissible mains frequency	47 Hz to 63 Hz	
Current consumption	• 24 V AC: Max. 190 mA • 24 V DC: Max. 110 mA	• 24 V AC: Max. 160 mA • 24 V DC: Max. 90 mA
Voltage failure buffering	Typ. 10 ms	
Power consumption	• 24 V AC: Max. 2.5 W, max. 4.4 VA • 24 V DC: Max. 2.4 W	• 24 V AC: Max. 2.0 W, max. 3.84 VA • 24 V DC: Max. 2.16 W

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 24RCE	LOGO! 24RCEo
Backup of the real-time clock at 25 °C	Typ. 20 days	
Accuracy of the real-time clock	Typ. ± 2 s/day	
Digital inputs		
Number	8, optional positive voltage or negative voltage	
Electrical isolation	No	
Number of high speed inputs	0	
Input frequency	• Normal input: Max. 4 Hz • High speed input: - -	
Digital input	24 V AC/DC, 50/60 Hz	
Max. continuous permissible voltage	26.4 V AC 28.8 V DC	
Input voltage	• Signal 0: < 5 V AC/DC • Signal 1: > 12 V AC/DC	
Input current	• Signal 0: < 1.2 mA • Signal 1: > 2.6 mA	
Delay time	• 0 to 1: Typ. 1.5 ms (0 starting phase) • 1 to 0: Typ. 15 ms	
Line length (unshielded)	Max. 100 m	
Analog inputs		
Number	- -	
Range	- -	
Max. Input voltage	- -	
Digital outputs [1]		
Number	4	
Output type	Relay outputs	
Electrical isolation	Yes	
In groups of	1	
Control of a digital input	Yes	
Continuous current I_{th}	Recommended range of application ≥ 100 mA at 12 V AC/DC [2] Max. 10 A per relay	
Relay rated voltage	240 V AC	
Surge current	Max. 30 A	

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 24RCE	LOGO! 24RCEo
Incandescent lamp load (25000 switching cycles) at	1000 W	
Derating	None; across the entire temperature range	
Short circuit-proof cos 1	Power protection B16, 600 A	
Short circuit-proof cos 0.5 to 0.7	Power protection B16, 900 A	
Parallel output circuits for power increase	Not permitted	
Protection of output relay (if desired)	Max. 16 A, characteristic B16	
Line length (unshielded)	Max. 100 m	
Switching rate		
Mechanical	10 Hz	
Ohmic load/lamp load	2 Hz	
Inductive load	0.5 Hz	
Communication port		
Ethernet	One Ethernet interfaces with 10/100 M full/half duplex data transmission rate	
LCD display		
Display	2.4 inch LCD with resistive touch panel	- -
Display lifetime [3]	30,000 hours	- -

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

A.5 Technical data: LOGO! 12/24...

	LOGO! 12/24RCE	LOGO! 12/24RCEo
Power supply		
Input voltage	12/24 V DC	
Permissible range	10.8 V DC to 28.8 V DC	
Reverse polarity protection	Yes	

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 12/24RCE	LOGO! 12/24RCEo
Current consumption	• 12 V DC: Max. 190 mA • 24 V DC: Max. 90 mA	• 12 V DC: Max. 165 mA • 24 V DC: Max. 80 mA
Voltage failure buffering	• 12 V DC: Typ. 2 ms • 24 V DC: Typ. 5 ms	
Power consumption	• 12 V DC: Max. 2.04 W • 24 V DC: Max. 2.16 W	• 12 V DC: Max. 1.8 W • 24 V DC: Max. 1.92 W
Backup of the real-time clock at 25 °C	Typ. 20 days	
Accuracy of the real-time clock	Typ. ± 2 s/day	
Electrical isolation	No	
Digital inputs		
Number	8	
Electrical isolation	No	
Number of high speed inputs	4 (I3, I4, I5, I6)	
Input frequency	• Normal input: Max. 4 Hz • High speed input: Max. 5 kHz	
Digital input	12/24 V DC	
Max. continuous permissible voltage	28.8 V DC	
Input voltage L+	• Signal 0: < 5 V DC • Signal 1: > 8.5 V DC	
Input current	• Signal 0: – < 0.88 mA (I3 to I6) – < 0.06 mA (I1, I2, I7, I8) • Signal 1: – > 1.5 mA (I3 to I6) – > 0.12 mA (I1, I2, I7, I8)	
Delay time	• at 0 to 1: – Typ. 1.5 ms – <1.0 ms (I3 to I6) • at 1 to 0: – Typ. 1.5 ms – <1.0 ms (I3 to I6)	
Line length (unshielded)	Max. 100 m	
Analog inputs		
Number	4 (I1=AI3, I2=AI4, I7=AI1, I8=AI2)	
Range	0 V DC to 10 V DC Input impedance 80 kΩ	

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! 12/24RCE	LOGO! 12/24RCEo
Cycle time for analog value generation	300 ms	
Line length (shielded and twisted)	Max. 10 m	
Error limit	± 1% at FS	
Digital outputs [1]		
Number	4	
Output type	Relay outputs	
Electrical isolation	Yes	
In groups of	1	
Control of a digital input	Yes	
Continuous current $I_{th\ (per\ terminal)}$	Recommended range of application ≥ 100 mA at 12 V AC/DC [2] Max. 10 A per relay	
Relay rated voltage	240 V AC	
Surge current	Max. 30 A	
Incandescent lamp load (25000 switching cycles) at	1000 W	
Derating	None; across the entire temperature range	
Short circuit-proof cos 1	Power protection B16, 600 A	
Short circuit-proof cos 0.5 to 0.7	Power protection B16, 900 A	
Parallel output circuits for power increase	Not permitted	
Protection of output relay (if desired)	Max. 16 A, characteristic B16	
Line length (unshielded)	Max. 100 m	
Switching rate		
Mechanical	10 Hz	
Ohmic load/lamp load	2 Hz	
Inductive load	0.5 Hz	
Communication port		
Ethernet	One Ethernet interfaces with 10/100 M full/half duplex data transmission rate	
LCD display		
Display	2.4 inch LCD with resistive touch panel	- -
Display lifetime [3]	30,000 hours	- -

1) Output: R300; 10A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

3) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

A.6 Technical data: LOGO! DM8 230R

	LOGO! DM8 230R
Power supply	
Input voltage	115 V AC/DC to 240 V AC/DC
Permissible range	85 V AC to 265 V AC 100 V DC to 265 V DC
Input frequency	50/60 Hz
Permissible mains frequency	47 Hz to 63 Hz
Current consumption	• 115 V AC: Max. 40 mA • 240 V AC: Max. 25 mA • 115 V DC: Max. 20 mA • 240 V DC: Max. 10 mA
Voltage failure buffering	• 115 V AC/DC: Typ. 10 ms • 240 V AC/DC: Typ. 20 ms
Power consumption	• 115 V AC: Max. 2.0 W, max. 4.6 VA • 240 V AC: Max. 2.2 W, max. 6 VA • 115 V DC: Max. 2.3 W • 240 V DC : Max. 2.4 W
Digital inputs	
Number	4
Electrical isolation	No
Number of high speed inputs	0
Input frequency	• Normal input: Max. 4 Hz • High speed input: - -
Digital input	115 to 240 V AC/DC, 50/60 Hz
Max. continuous permissible voltage	265 V AC 265 V DC
Input voltage L1	• Signal 0: – < 40 V AC – < 30 V DC • Signal 1: – > 79 V AC – > 79 V DC
Input current	• Signal 0: – < 0.05 mA AC – < 0.05 mA DC • Signal 1: – > 0.09 mA AC – > 0.13 mA DC

1) Output: R300; 5A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

	LOGO! DM8 230R
Delay time	• at 0 to 1: – 120 V AC: Typ. 40 ms – 240 V AC: Typ. 30 ms – 120 V DC: Typ. 25 ms – 240 V DC : Typ. 20 ms • at 1 to 0: – 120 V AC: Typ. 45 ms – 240 V AC: Typ. 70 ms – 120 V DC: Typ. 60 ms – 240 V DC : Typ. 75 ms
Line length (unshielded)	Max. 100 m
Digital outputs [1]	
Number	4
Output type	Relay outputs
Electrical isolation	Yes
In groups of	1
Control of a digital input	Yes
Continuous current I_{th}	Recommended range of application ≥ 100 mA at 12 V AC/DC [2] Max. 5 A per relay
Relay rated voltage	240 V AC
Surge current	Max. 30 A
Incandescent lamp load (25000 switching cycles)	• 230/240 V AC: 1000 W • 115/120 V AC: 500 W
Short circuit-proof cos 1	Power protection B16, 600 A
Short circuit-proof cos 0.5 to 0.7	Power protection B16, 900 A
Derating	None; across the entire temperature range
Parallel output circuits for power increase	Not permitted
Protection of output relay (if desired)	Max. 16 A, characteristic B16
Line length (unshielded)	Max. 100 m
Switching rate	
Mechanical	10 Hz
Ohmic load/lamp load	2 Hz
Inductive load	0.5 Hz

1) Output: R300; 5A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

A.7 Technical data: LOGO! DM8 12/24R

	LOGO! DM8 12/24R
Power supply	
Input voltage	12/24 V DC
Permissible range	10.8 V DC to 28.8 V DC
Reverse polarity protection	Yes
Current consumption	• 12 V DC: Max. 85 mA • 24 V DC: Max. 45 mA
Voltage failure buffering	• 12 V DC: Typ. 2 ms • 24 V DC: Typ. 5 ms
Power consumption	• 12 V DC: Max. 0.96 W • 24 V DC: Max. 1.08 W
Electrical isolation	No
Digital inputs	
Number	4
Electrical isolation	No
Number of high speed inputs	0
Input frequency	• Normal input: Max. 4 Hz • High speed input: - -
Digital input	12/24 V DC
Max. continuous permissible voltage	28.8 V DC
Input voltage L+	• Signal 0: < 5 V DC • Signal 1: > 8.5 V DC
Input current	• Signal 0: < 0.88 mA • Signal 1: > 1.5 mA
Delay time	• at 0 to 1: Typ. 1.5 • at 1 to 0: Typ. 1.5 ms
Line length (unshielded)	Max. 100 m
Digital outputs [1]	
Number	4
Output type	Relay outputs
Electrical isolation	Yes
In groups of	1
Control of a digital input	Yes
Continuous current $I_{th\ (per\ terminal)}$	Recommended range of application ≥ 100 mA at 12 V AC/DC [2] Max. 5 A per relay
Relay rated voltage	240 V AC

1) Output: R300; 5A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

	LOGO! DM8 12/24R
Surge current	Max. 30 A
Incandescent lamp load (25000 switching cycles) at	1000 W
Derating	None; across the entire temperature range
Short circuit-proof cos 1	Power protection B16, 600 A
Short circuit-proof cos 0.5 to 0.7	Power protection B16, 900 A
Parallel output circuits for power increase	Not permitted
Protection of output relay (if desired)	Max. 16 A, characteristic B16
Line length (unshielded)	Max. 100 m
Switching rate	
Mechanical	10 Hz
Ohmic load/lamp load	2 Hz
Inductive load	0.5 Hz

1) Output: R300; 5A, 240 V AC, G.P..

2) Temperature and humidity can affect contact closing. At extremely low temperatures, it is recommended to increase voltage or current to avoid negative effects caused by freezing, such as increased contact resistance.

A.8 Technical data: LOGO! AM4 AIAQ

	LOGO! AM4 AIAQ
Power supply	
Input voltage	24 V DC
Permissible range	20.4 V DC to 28.8 V DC
Current consumption at 24 V DC	Max. 85 mA
Voltage failure buffering	Typ. 10 ms
Power consumption at 24 V DC	Max. 2.04 W
Electrical isolation	No
Reverse polarity protection	Yes
Ground terminal	For connecting ground and shielding of the analog measuring line
Analog inputs	
Number	2
Type	Unipolar
Input range	0 V DC to 10 V DC (input impedance > 200 kΩ) or 0/4 mA to 20 mA (input impedance < 250 Ω)
Resolution	12 bit, normalized to 0 to 10000
Cycle time for analog value generation	50 ms
Electrical isolation	No

	LOGO! AM4 AIAQ
Line length (shielded and twisted)	Max. 10 m
Encoder supply voltage	Yes
Error limit	± 1% FS
Interference frequency suppression	55 Hz
Analog outputs	
Number	2
Voltage range	0 V DC to 10 V DC
Voltage load	≥ 5 kΩ
Current output	0/4 mA to 20 mA
Current load	≤ 250 kΩ
Resolution	16 bit, normalized to 0 to 10000
Cycle time for analog output	Depending on installation (50 ms)
Electrical isolation	No
Line length (shielded and twisted)	Max. 10 m
Error limit	± 1% FS
Short circuit protection	Yes
Overload protection	• Current output: Yes • Voltage output: Yes

A.9 Technical data: LOGO! TDE (Text Display with Ethernet interfaces)

	LOGO! TDE
Power supply	
Input voltage	24 V AC/DC 12 V DC
Permissible range	20.4 V AC to 26.4 V AC 10.2 V DC to 28.8 V DC
Input frequency	50/60 Hz
Permissible mains frequency	47Hz to 63 Hz
Current consumption	• 12 V DC: Max. 210 mA • 24 V DC: Max. 80 mA • 24 V AC: Max. 170 mA
Power consumption	• 12 V DC: Max. 2.04W • 24 V DC: Max. 1.92 W • 24 V AC: Max. 2.1 W, max. 3.72 VA
Degree of protection	
Degree of protection	• IP20 for LOGO! TDE excluding front panel • IP65/NEMA 4X for LOGO! TDE front panel

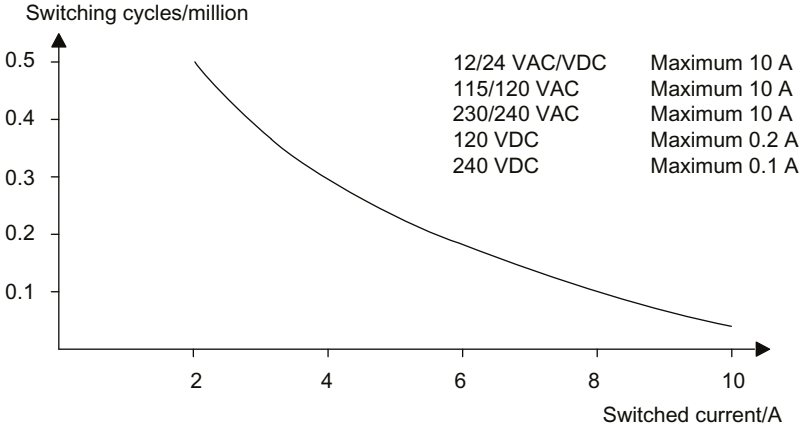
[1] The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

	LOGO! TDE
Enclosure type	Type 4X/12 for LOGO! TDE front panel
Communication port	
Ethernet performance	Two Ethernet interfaces with 10/100 M full/half duplex data transmission rate
Connection distance	Max. 100 m
LCD Display	
Display	4.3 inch LCD with resistive touch panel
Display lifetime [1)]	30,000 hours
Mounting	
Mounting hole dimensions (WxH)	(119 + 0.5 mm) x (78.5 + 0.5 mm)
Mounting conditions	Mount the LOGO! TDE vertically on a flat surface of an IP 65 or Type 4x/12 enclosure.

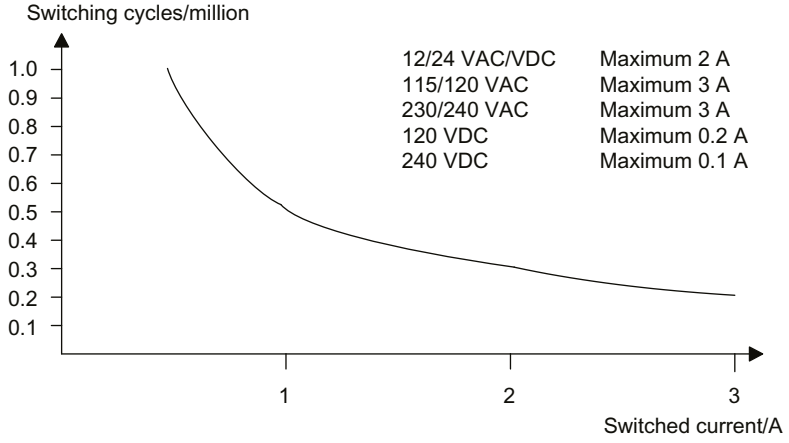
1) The display lifetime is defined as the time of the LCD maximum brightness derating from 100% to 50% continually working under the condition: 25 °C temperature and 100% brightness.

A.10 Switching capacity/service life of the relay outputs

Switching capacity and service life of the contacts with ohmic loading (heating):



Switching capacity and service life of the contacts with high inductive load to IEC 60947-5-1 DC 13/AC 15 (contactors, solenoid coils, motors):



NOTE

To ensure the switching capacity and service life, keep the minimum switching load of the relay outputs at 100 mA with the voltage of 12 V AC/DC.

Determining the cycle time

B

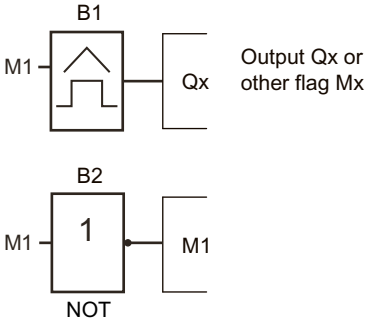
The program cycle is the complete execution of the circuit program, that is, primarily the reading in of the inputs, the processing of the circuit program and the subsequent writing the outputs. The cycle time is the time required to execute a circuit program once in full.

You can determine the time required for a program cycle using a short test program. Create this test program in LOGO! to return a value from which you can calculate the cycle time.

Test program

To program this test program, follow these steps:

1. Create the test program by linking an output to a threshold trigger and connecting the trigger input with an inverted flag.



2. Configure the threshold trigger as shown below. LOGO! generates a pulse in each program cycle due to the inverted flag. The trigger interval is 2 seconds.

3. Now start the circuit program and view the trigger parameters through the menu: Parameter -> Set Parameter.

① f_a = total of measured pulses per timebase G_T

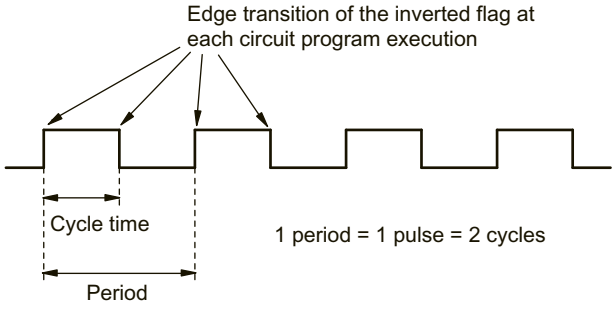
4. The reciprocal value of f_a is equivalent to the LOGO! execution time of the current circuit program in its memory.

$1/f_a$ = 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 two cycles.

The threshold trigger indicates the ratio of periods per two seconds, which results in the ratio of cycles per second.



LOGO! without display ("LOGO! Pure")

C

Because some specific applications do not require operator control or interface elements, such as buttons or a display, Siemens provides the LOGO! 12/24RCEo, LOGO! 24RCEo, LOGO! 24CEo and LOGO! 230RCEo versions without display.

Less is definitely more!

The versions without display offer you the following benefits:

- Even more cost-effective without the operating elements
- Requires less switch cabinet space than conventional hardware
- Substantial benefits with regard to flexibility and prime costs compared to stand–alone electronic switchgear
- Advantageous even for applications in which it replaces merely two or three conventional switching devices
- Very easy to use
- Access-protected
- Compatible to LOGO! versions with display
- Offers the option to read data by means of LOGO!Soft Comfort

Network communication indication

When you create a circuit program with LOGO!Soft Comfort, you need to connect the module to your PC with an Ethernet cable. You can refer to the chapter Connecting the Ethernet interface (Page 55) to find the details about the wiring of the Ethernet interface and also about the status of the Ethernet LEDs.

Operating characteristics

LOGO! is ready for operation when you switch on power. Switching off a LOGO! without display is equivalent to disconnecting the power supply.

You can not start or stop the circuit program of LOGO!...o versions by means of touching the LCD display, therefore, 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 micro SD card, LOGO! remains in STOP mode.

If there is a valid circuit program in LOGO! memory or on the micro SD card, LOGO! automatically switches from STOP mode to RUN mode when you switch on power.

LOGO! automatically copies the circuit program on an inserted micro SD card to memory, immediately after you switch on power. LOGO! rewrites the existing circuit program in memory if one exists, and then changes from STOP mode to RUN mode.

By connecting an Ethernet cable to LOGO! (Page 289), you can use LOGO!Soft Comfort to download the circuit program and place LOGO! in RUN mode.

Operating status indication

An LED on the front panel indicates the operating state:

- Lights red: Power On/STOP
- Lights green: Power On/RUN

The LED lights red after Power On and in all LOGO! states other than RUN mode. The LED lights green when LOGO! is in RUN mode.

Reading current data

LOGO!Soft Comfort 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 micro SD card, you cannot read the current data unless you enter the correct password (Page 260) for the circuit program. LOGO! deletes the circuit program from memory when you remove the micro SD card.

Deleting the circuit program

Use LOGO!Soft Comfort to delete the circuit program and password if a password exists.

LOGO! menu structure

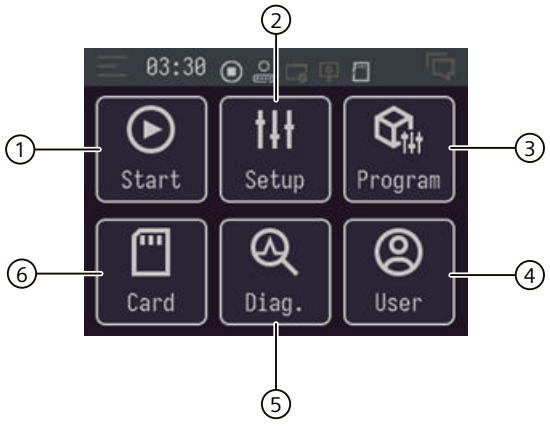
D

D.1 LOGO! Basic

All of the following menu commands are valid for LOGO! Basic with the Admin user role. If you operate the LOGO! with the Maintainer, Operator or viewer access level, some menu commands are not available. For more information about LOGO! user access, refer to Menu access security (Page 279). To have an overview of LOGO! menu and the toolbar and status bar, refer to LOGO! menus (Page 60).

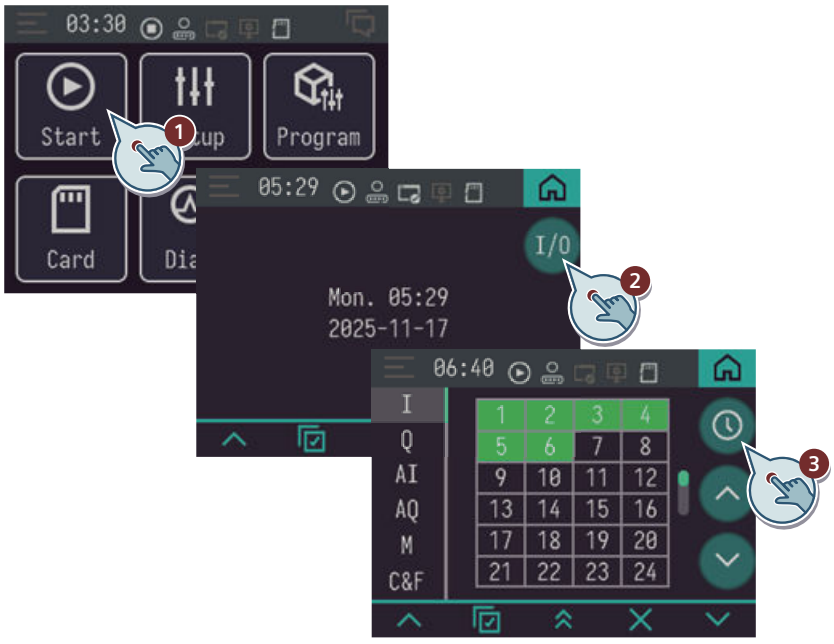
D.1.1 Home page

The following illustration shows the home page when LOGO! is in STOP mode.



1. See "Start menu (Page 317)"
2. See "Setup menu (Page 318)"
3. See "Program menu (Page 317)"
4. See "User menu (Page 320)"
5. See "Diagnostic menu (Page 319)"
6. See "Card menu (Page 318)"

D.1.2 Start menu



① Press to start running the diagram.

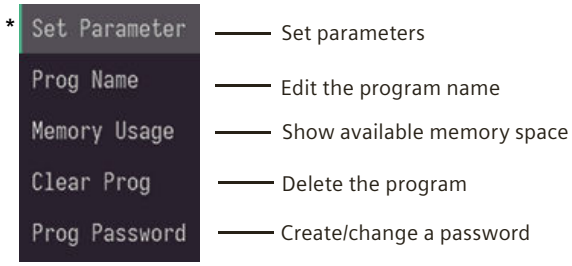
② Press to enter the IO status page.

③ Press to switch back to the date & time page.

When LOGO! is in RUN mode, if you have configured the LCD Message function block in the program, besides the current date and time page, you can press ∧ or ∨ button in the tool bar to switch the message pages.

In the I/O status page, you can press the LCD display and scroll it up or down, or press the Up/Down button on the page, to browse the status of inputs, outputs, analog input, analog outputs, flags, Cursor keys or Functions keys in the program. By pressing the exact AI or AQ on the page, you can enter the analog signal trend view page.

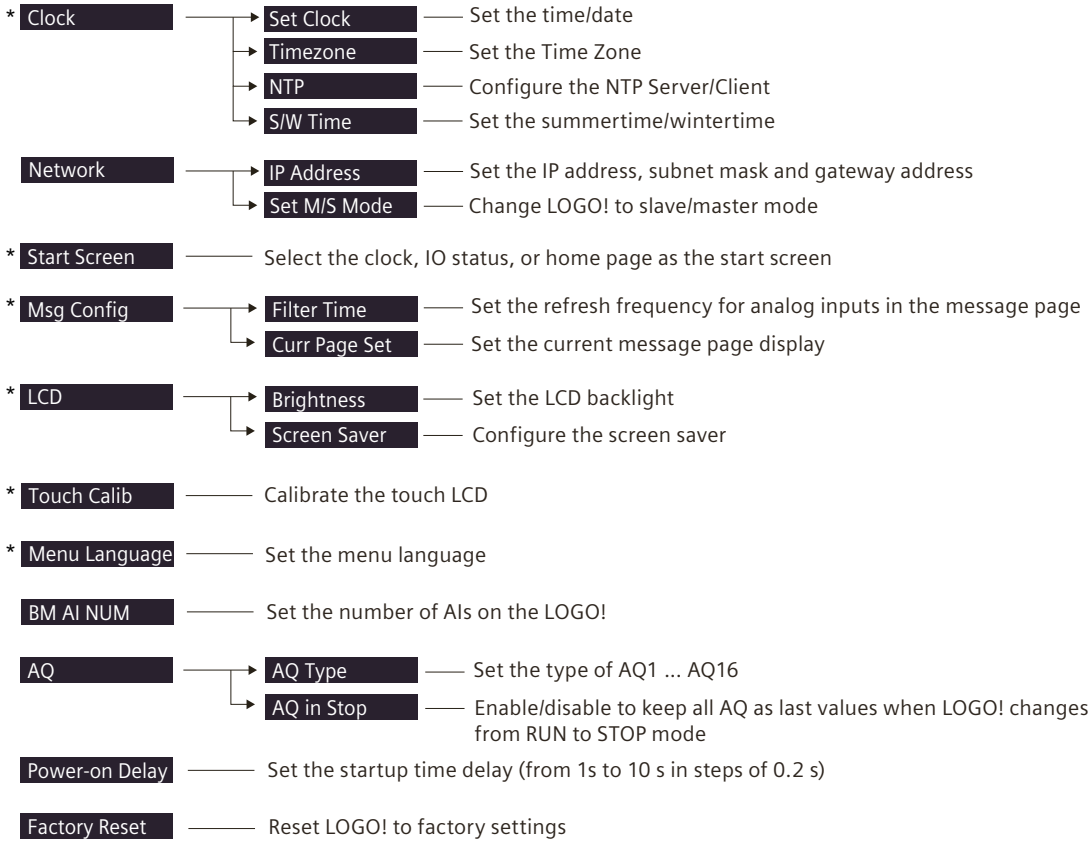
D.1.3 Program menu



NOTE

When LOGO! is in RUN mode, only the menu commands with an asterisk (*) are available for configuration.

D.1.4 Setup menu

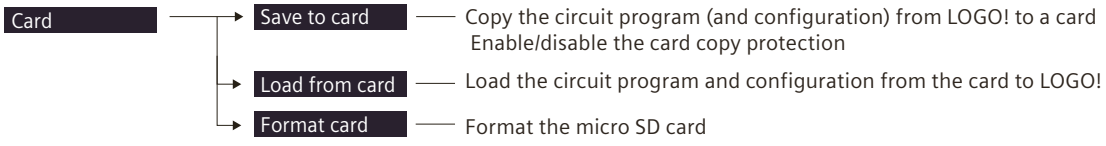


NOTE

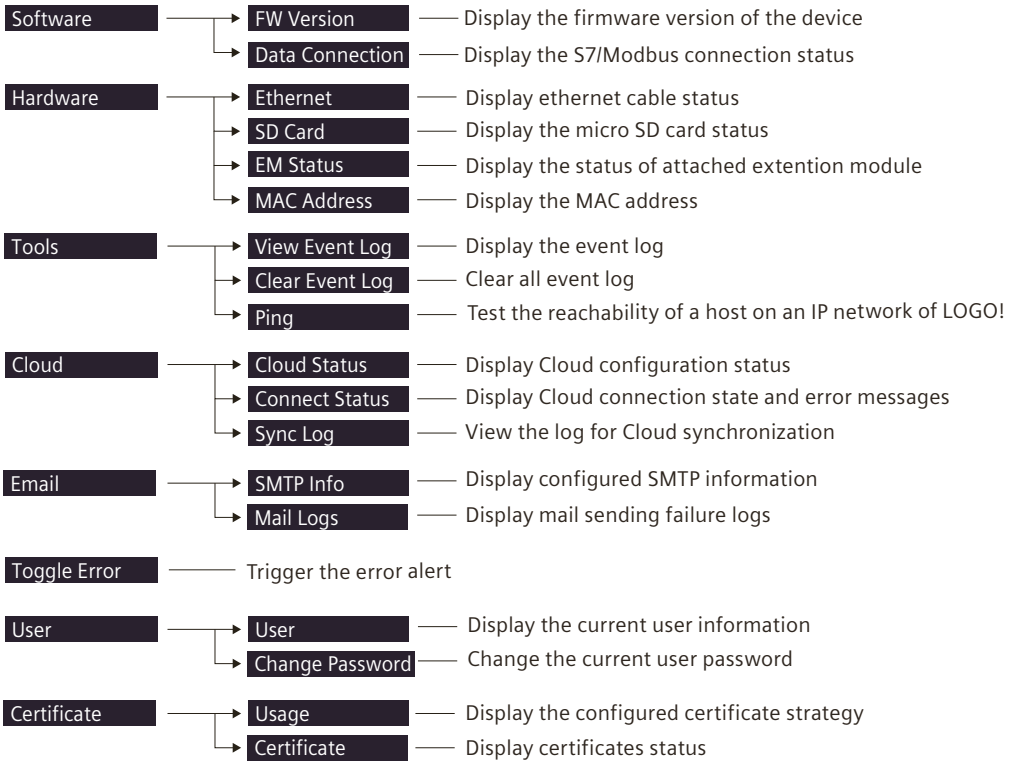
When LOGO! is in RUN mode, only the menu commands with an asterisk (*) are available for configuration.

D.1.5 Card menu

This menu is available only when LOGO! is in STOP mode.



D.1.6 Diagnostics menu



D.1.7 User menu

User	View or log out the current user
Change password	Change the current user password

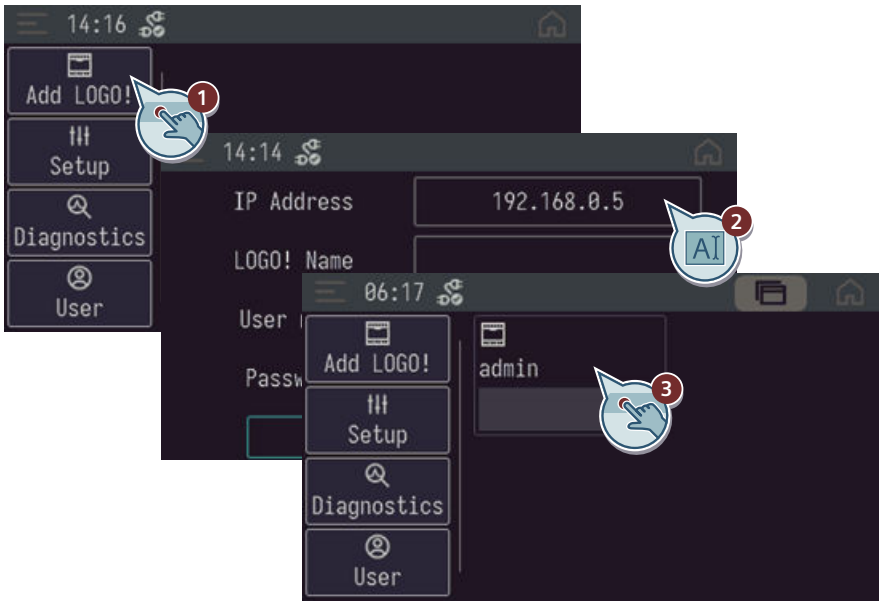
D.2 LOGO! TDE

You can only connect the TDE to BM as the user admin. To learn more about LOGO! menu access protection, refer to Configuring menu access protection for LOGO! (Page 65).

D.2.1 TDE home page

① See "TDE Add BM menu (Page 321)"
② See "TDE Setup menu (Page 321)"
③ See "TDE Diagnostics menu (Page 321)"
④ See "TDE User menu (Page 321)"

D.2.2 TDE Add BM menu



① Press Add BM to create a BM card.

② Enter BM information: IP address, LOGO! name, LOGO! Admin name and the Admin password.

③ Press the BM card to start connecting with the LOGO! BM.

D.2.3 LOGO! TDE settings menu

The LOGO! TDE allows you to view and configure settings of the LOGO! TDE itself.

The following LOGO! TDE settings menu structure applies both when the connected LOGO! Basic is in RUN or STOP mode.

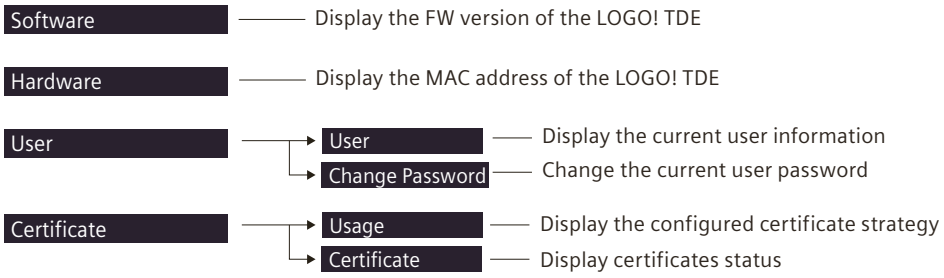
LOGO! TDE setup menu

- **Network** — Set the IP address
- **Msg Config**
  - **Filter Time** — Set the refresh frequency for analog inputs in the message page
  - **Curr Page Set** — Set the current message page display
- **LCD**
  - **Brightness** — Set the LCD backlight
  - **Screen Saver** — Configure the screen saver
- **Touch Calibration** — Calibrate the touch LCD
- **Menu Language** — Set the menu language
- **Factory reset** — Reset TDE to factory settings

NOTE

The IP address of the LOGO! TDE is read-only when it is in RUN mode.

LOGO! TDE diagnostics menu



LOGO! TDE User menu

Here you can change the LOGO! TDE Admin password.

D.2.4 LOGO! settings menu

The LOGO! TDE allows you to view and configure settings of the connected LOGO! Base Module in its LOGO! settings menu.

Program menu

The program menu is the same as that on the LOGO! Base Module. See "Program menu (Page 317)" for more information.

Card menu

The card menu is the same as that on the LOGO! Base Module. See "Card menu (Page 318)" for more information.

Setup menu

The setup menu is the same as that on the LOGO! Base Module, except the Touch Calibration and Menu Language are unavailable. See "Setup menu (Page 318)" for the complete setup menu for LOGO! Basic.

Diagnostics menu

The diagnostics menu is the same as that on the LOGO! Base Module. See "Diagnostics menu (Page 319)" for more information.

Start menu

The start menu is the same as that on the LOGO! Base Module. See "Start menu (Page 317)" for more information.

NOTE

The start screen of the LOGO! TDE is always the clock display when LOGO! Basic is in RUN mode.

User menu

The user menu is the same as that on the LOGO! Base Module. See "User menu (Page 320)" for more information.

Order numbers

E

Modules

Variant	Designation	Order number
LOGO! Basic (Base Module with display)	LOGO! 12/24RCE * LOGO! 24CE * LOGO! 24RCE (AC/DC) LOGO! 230RCE (AC/DC)	6ED1052-1MD08-0BA3 6ED1052-1CC08-0BA3 6ED1052-1HB08-0BA3 6ED1052-1FB08-0BA3
LOGO! Pure (Base Module without display)	LOGO! 12/24RCEo * LOGO! 24CEo * LOGO! 24RCEo (AC/DC) LOGO! 230RCEo (AC/DC)	6ED1052-2MD08-0BA3 6ED1052-2CC08-0BA3 6ED1052-2HB08-0BA3 6ED1052-2FB08-0BA3
Digital modules	LOGO! DM8 230R LOGO! DM8 12/24R	6ED1055-1FB00-0BA3 6ED1055-1MB00-0BA3
Analog modules	LOGO! AM4 AIAQ	6ED1055-1MF00-0BA3
Text Display module with Ethernet interfaces	LOGO! TDE	6ED1055-4MH08-0BA3

*: Also with analog inputs

Accessories

Accessories	Designation	Order number
LOGO!Soft Comfort USB Stick	LOGO!Soft Comfort V9.0	6ED1058-0BA08-0YA3
Switching modules	LOGO! Contact 24 V LOGO! Contact 230 V	6ED1057-4CA00-0AA0 6ED1057-4EA00-0AA0
Power modules	LOGO!POWER 1AC/DC5V/3A LOGO!POWER 1AC/DC5V/6.3A LOGO!POWER 1AC/DC12V/0.9A LOGO!POWER 1AC/DC12V/1.9A LOGO!POWER 1AC/DC12V/4.5A LOGO!POWER 1AC/DC15V/1.9A LOGO!POWER 1AC/DC15V/4A LOGO!POWER 1AC/DC24V/0.6A LOGO!POWER 1AC/DC24V/1.3A LOGO!POWER 1AC/DC24V/2.5A LOGO!POWER 1AC/DC24V/4A LOGO!POWER 1AC/DC24V/4A/EX LOGO! ICL230 1AC100-240V/5A	6EP3310-6SB00-0AY0 6EP3311-6SB00-0AY0 6EP3320-6SB00-0AY0 6EP3321-6SB00-0AY0 6EP3322-6SB00-0AY0 6EP3321-6SB10-0AY0 6EP3322-6SB10-0AY0 6EP3330-6SB00-0AY0 6EP3331-6SB00-0AY0 6EP3332-6SB00-0AY0 6EP3333-6SB00-0AY0 6EP3333-6SC00-0AY0 6EP4683-6LB00-0AY0
Ethernet switch modules	LOGO! CSM12/24	6GK7177-1MA20-0AA0
Communication module	LOGO! CMK2000 Communicative Interface Module (CIM)	6BK1700-0BA20-0AA0 6ED1055-5MC08-0BA3
TDE accessories *	LOGO! 9 TDE	6ED1057-1DA00-0BA3

* TDE accessories includes:

- mounting accessories (Page 42): mounting brackets, mounting screws
- power connector

Troubleshooting

F

This chapter provides you with tips on how to locate and troubleshoot problems.

Sending emails

Diagnostics information is displayed on LOGO! Base module through menu: Diagnostics → Email → Mail Logs. You can refer to the following table to troubleshoot the error cause and fix the error through corresponding solution.

Diagnostics	Possible cause	Possible remedy
Mail busy	Emails are sent too frequently. When the server is sending an email, another email is triggered to send.	As you cannot change the email sending frequency, modify the email sending trigger event.
Time out	• The network connection is unstable. • SMTP server response is time-out.	• Check if your network connection is interrupted. • Check if the communication with the SMTP server is normal.
Failed to parse DNS	• Network connection to DNS server is interrupted. • Some error occurs on the SMTP domain name.	• Check if the connection with the DNS server is normal. • Change DNS server. • Check if the SMTP server domain name is correct.
Failed to login	The login account or login password is incorrect in the SMTP settings.	Check the login account or password in SMTP settings. Additional application code is required for certain SMTP server login. Refer to the user manual of specified email server for detailed information.
Receiver error	• Email receiver is not configured. • Some error occurs on the configured email receiver.	• Check if the email receiving group is configured with email receivers. On how to configure email receiver, refer to *User interface -> Menu bar -> Tools menu -Transfer -> Email settings* in *LOGO!Soft Comfort online help*. • Check if the receiver email address is correct. • Check if the receiver email address is within the receiving range of the SMTP server.
Net error	The network is disconnected when the server is sending the email.	Check your network connection.
No configuration	SMTP server is not configured in LSC.	Configure SMTP in LSC. Refer to *User interface -> Menu bar -> Tools menu -Transfer -> Email settings* in *LOGO!Soft Comfort online help*.
Server error	• SMTP server rejects the email sending request. • SMTP server response doesn't meet with the SMTP specifications.	Check if error occurs on the SMTP server or the SMTP server login email account.
Failed to verify certificate	The SMTP server certificate is invalid.	• Upload valid certificate in SMTP configuration. • Check if the BM time is correct. Incorrect BM time makes it fail to verify certificate.

Cloud connection

Diagnostics information is displayed on LOGO! Base module through menu: Diagnostics → Cloud → Connection Status. You can refer to the following table to troubleshoot the error cause and possible solution.

Diagnostics	Possible cause	Possible remedy
Failed to parse DNS	• DNS server is not available. • Error occurs when parsing IP address from DNS server.	• Check your network connection. • Check if the gateway configuration is correct. • Check if the broker URL is correct.
Server connection timeout	• No response from server when LOGO! is establishing TCP/TLS connection with it. • Server is not accessible	• Check your network connection. • Check if the broker URL is correct. • Contact server technical support.
Server connection error	Error occurs when LOGO! is establishing TCP/TLS connection with server.	Check connection parameters, for example, port, authentication mode, key, certificate.
No reply from MQTT broker	Server's MQTT service is unavailable.	Contact server technical support.
Failed to send data to MQTT broker	Cloud connection with MQTT broker is interrupted when LOGO! is sending data.	Check your network connection.
Failed to receive data from MQTT broker	• Cloud connection with MQTT broker is interrupted when LOGO! is receiving data. • Received data is invalid, for example, packet format error, unrecognizable packet type.	• Check your network connection. • Check server configuration.
Unacceptable protocol version	The server does not support the level of the MQTT protocol requested by the client.	Check if the server supports MQTT 3.1/3.1.1 protocol.
Identifier rejected	The client identifier is UTF-8 which is not supported by the server.	Contact server technical support.
Server unavailable	The network is connected but MQTT services is unavailable.	Contact server technical support.
Bad user name or password	The data in the user name or password is malformed.	• Check if user name and password are correct. • Contact server technical support.
Not authorized	The client is not authorized to connect.	Check if user name and password are provided.
Data from MQTT broker is too long	Data received from the server is malformed or too long.	• Check if data sent from the server is valid. • Contact server technical support.

Abbreviations

G

AM	Analog module
B1	Block number B1
C	LOGO! device designation: integrated clock
Cnt	Count = Counter input
Dir	Direction (of count, for example)
DM	Digital Module
E	LOGO! device designation: integrated Ethernet interface
En	Enable = switching on (for example, clock generators)
Fre	Input for frequency signals to be analyzed
GF	Basic Functions
Inv	Input for inverting the output signal
DL	Data Log
NAI	Network analog input
NAQ	Network analog output
NFAI	Network float analog input
NFAQ	Network float analog output
NI	Network input
No	Cam (parameter of the timer)
NQ	Network output
o	In LOGO! designations: with**o**ut display
Par	Parameter
R	Reset input
R	In LOGO! designations: Relay outputs
Ral	Reset all = Input for resetting all internal values
S	Set (latching relay, for example)
SF	Special functions
T	Time = parameter
TDE	Text Display with Ethernet interfaces
Trg	Trigger (parameter)
UDF	User-Defined Function
UDW	User Defined Web Page

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