LOGO! functions

4

LOGO! provides you with various elements in programming mode, and organizes them in the following lists:

- Connector list (Connector) (Page 115)
- ↓GF: List of the basic functions AND, OR, ... (Page 120)
- ↓SF: List of the special functions (Page 131)
- List of reusable blocks configured in the circuit program

LOGO! 0BA8 can additionally provide you with the following elements in programming mode, if you have previously configured them in your circuit program using 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

List contents

All lists show the elements available in LOGO!. Usually, this includes all connectors, basic functions, and special functions.

LOGO! does not show all elements if:

- You cannot add additional blocks.

  This occurs wthen the memory space is insufficient or when you have reached the maximum number of blocks.
- A specific block's memory space requirement (Page 109) would exceed the space available in LOGO!.
- You have created program elements in LOGO!Soft Comfort but have not downloaded the program to LOGO!.

4.1 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 266)", 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 "Maximum setup with expansion modules (Page 29)" for example setups. In programming mode, when you select the input signal of a special function that takes an analog input, LOGO! offers the analog inputs AI1 to AI8, analog flags AM1 to AM64, analog outputs AQ1 to AQ8, and the block numbers of functions with analog outputs.

Outputs

- **Digital outputs**

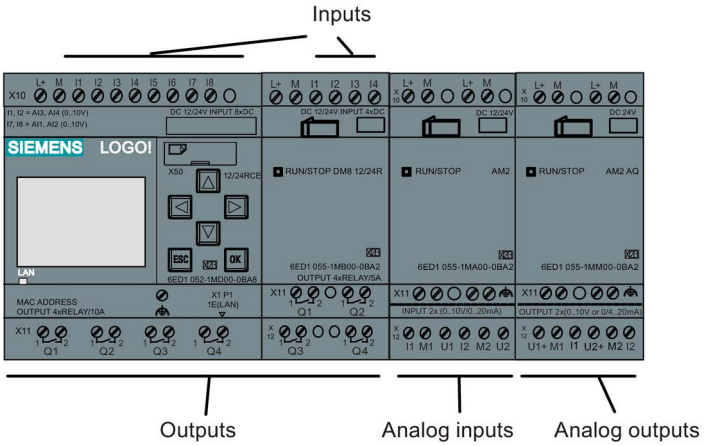
  Digital outputs begin with the letter **Q**. The output numbers (Q1, Q2, ... Q20) correspond with the numbers of the output connectors at the LOGO! Base Module and with those of the expansion modules, in their order of installation.

  LOGO! 0BA8 also provides 64 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 "Message texts" (Page 200), if only the message text is of significance to a circuit program.

- **Analog outputs**

  Analog outputs begin with the letters **AQ**. Eight analog outputs are available, namely AQ1, AQ2,... AQ8. You can only connect an analog output with the analog input of a function, an analog flag AM or an analog output connector.

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



Note

LOGO! 0BA8 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 78)".

Flag blocks

The letters **M** or **AM** identify flag blocks. These are virtual outputs, which output the value of their inputs. LOGO! 0BA8 provides 64 digital flags M1 to M64 and 64 analog flags AM1 to AM64.

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 M25, M26, M28 to M31

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

Backlight display	Flag	Remarks
White	M25	The color white means LOGO! is in RUN mode.
	M26	The color white means LOGO! TDE is in RUN mode.
Amber	M28	The color amber means LOGO! is in programming mode or parameter assignment mode.
	M30	The color amber means LOGO! TDE is in programming mode, parameter assignment mode or TDE setting mode.
Red	M29	The color red means LOGO! has a diagnosis error.
	M31	The color red means LOGO! TDE has a diagnostics error.

Note: The backlight lifetime of the LOGO! TDE is 20,000 hours.

Message text character set flag M27

The M27 flag selects between the two character sets that LOGO! uses to display message texts. State 0 corresponds to Character Set 1, and state 1 corresponds to Character Set 2. If M27=0 (low), LOGO! only displays message texts configured for Character Set 1; If M27=1 (high), LOGO! only displays message texts configured for Character Set 2. If you do not include M27 in the circuit program, message texts display in the character set 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 character sets 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 211) special function can modify shift register bit values.

Cursor keys

Up to four cursor keys are available to you, namely C ▲, C ▶, C ▼ and C ◀ ("C" = "Cursor"). Cursor keys are programmed for the circuit program in the same way as other inputs. You can program cursor keys in the corresponding display while the system is in RUN (Page 78) , and in an active message text (ESC + Key). Cursor keys can save switches and inputs, and allow operator control of the circuit program. Cursor key inputs from the LOGO! 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 keys 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.

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 64 digital network digital inputs NI1 to NI64 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 32 network analog inputs NAI1 to NAI32 available for configuration in the circuit program from LOGO!Soft Comfort.

3) Network digital outputs

The letters **NQ** identify a network digital output . There are 64 network digital outputs NQ1 to NQ64 available for configuration in the circuit program from LOGO!Soft Comfort.

4) Network analog outputs

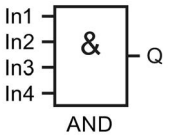
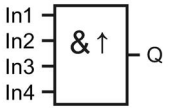
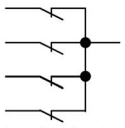
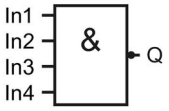
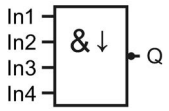
The letters **NAQ** identify a network analog output. There are 16 network analog outputs NAQ1 to NAQ16 available for configuration in the circuit program from LOGO!Soft Comfort.

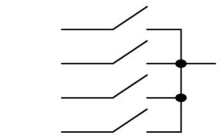
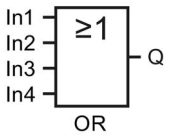
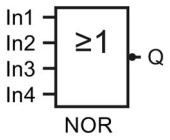
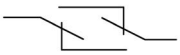
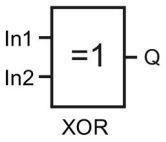
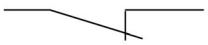
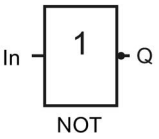
4.2 Basic functions list - GF

Basic functions represent simple logical elements of Boolean algebra.

You can invert the inputs of individual basic functions, that is, the circuit program inverts a logical "1" at a relevant input to a logical "0"; if "0" is the value at the input, the program sets a logical "1". See the programming example at Circuit program input (Page 69).

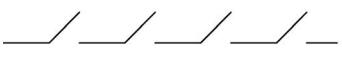
The GF list contains the basic function blocks you can use for your circuit program. The following basic functions are available:

View in the circuit diagram	View in LOGO!	Name of the basic function
 Series circuit make contact	 AND	AND (Page 121)
	 AND (Edge)	AND with edge evaluation (Page 122)
 Parallel circuit with break contacts	 NAND	NAND (Page 123) (not AND)
	 NAND (Edge)	NAND with edge evaluation (Page 123)

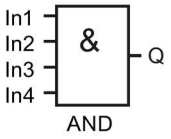
View in the circuit diagram	View in LOGO!	Name of the basic function
 Parallel circuit with make contacts		OR (Page 124)
 Series circuit with break contacts		NOR (Page 125) (not OR)
 Double changeover contact		XOR (Page 126) (exclusive OR)
 Break contact		NOT (Page 126) (negation, inverter)

4.2.1 AND

Circuit diagram of a series circuit with several make contacts:



Symbol in LOGO!:



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

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

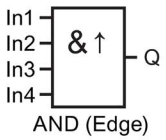
AND function logic table

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

1	2	3	4	Q
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

4.2.2 AND with edge evaluation

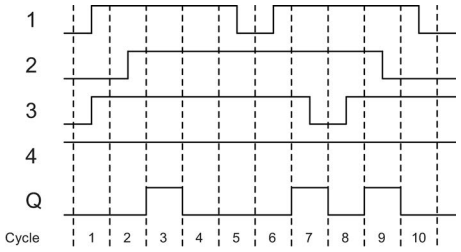
Symbol in LOGO!:



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

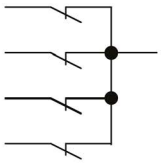
At an unused block input (x): x = 1.

Timing diagram for the AND with edge evaluation

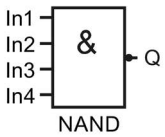


4.2.3 NAND (not AND)

Parallel circuit with multiple break contacts in the circuit diagram:



Symbol in LOGO!:



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

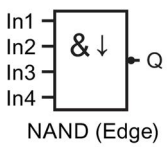
At an unused block input (x): x = 1.

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

4.2.4 NAND with edge evaluation

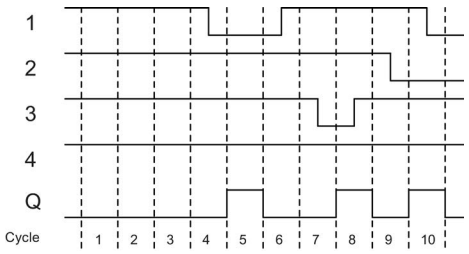
Symbol in LOGO!:



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

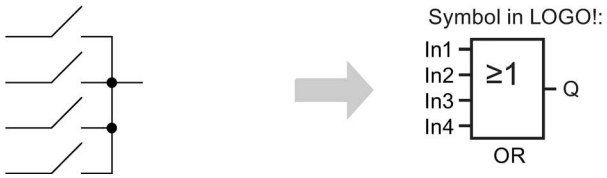
At an unused block input (x): x = 1.

Timing diagram for the NAND with edge evaluation



4.2.5 OR

Circuit diagram of a parallel circuit with several make contacts:



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

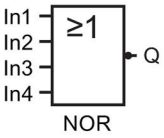
1	2	3	4	Q
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1

1	2	3	4	Q
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

4.2.6 NOR (not OR)

Circuit diagram of a series circuit with several break contacts:

Symbol in LOGO!:



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

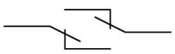
At an unused block input (x): x = 0.

NOR function logic table

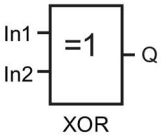
1	2	3	4	Q
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

4.2.7 XOR (exclusive OR)

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



Symbol in LOGO!:



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

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

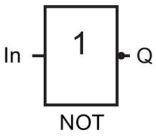
XOR function logic table

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

4.2.8 NOT (Negation, Inverter)

A break contact in the circuit diagram:

Symbol in LOGO!:



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

4.3 Special functions

Because of their different input designation, you can see right away that there is a difference between the special functions and basic functions. 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 131).

4.3.1 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:

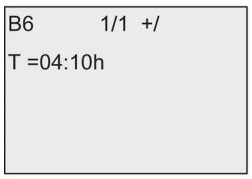
- **Par (Parameter):**
  You do no connect the Par parameter. Instead, you set the relevant blcok parameters (times, on/off thresholds etc.).
- **Priority:**
  This is an open input. Here, you define priorities and specify whether a message is to be acknowledged in RUN.

4.3.2 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



Setting a time T of 250 minutes:
Unit in hours h:

04:00 hours	240 minutes
00:10 hours	+10 minutes
=	250 minutes

The LOGO! 0BA8-specific stopwatch (Page 171) function provides an additional timebase - 10 ms.

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 136).

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.

4.3.3 Backup of the real-time clock

Because LOGO! backs up the internal real-time clock, it continues 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.

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.

4.3.4 Retentivity

You can set the switching states, counter and time values of many SF blocks (Page 131) 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:

R: The data is retentive.
/: Current data is not retentive (default). See the section in topic "Second circuit program (Page 82)" on enabling and disabling retentivity.

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

4.3.5 Parameter protection

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

+: The parameter attribute permits read/write access in parameter assignment mode (default).
-: The parameter settings are read–/write–protected in parameter assignment mode, and you can only edit them in programming mode. See the parameter protection mode example in the Second circuit program (Page 82).

Note

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

4.3.6 Calculating the gain and offset of analog values

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

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

LOGO! internally transforms a voltage of 0 V to 10 V at input AI to a range of values from 0 to 1000. LOGO! interprets an input voltage exceeding 10 V as internal value 1000.

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

Parameter	Minimum	Maximum
Input voltage (in V)	0	≥ 10
Internal value	0	1000
Gain	-10.00	+10.00
Offset	-10000	+10000

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.

Example 1:

The available thermocouples have the following technical data: -30 °C to +70 °C, 0 to 10 VDC (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

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 188)" topic.

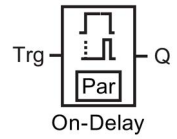
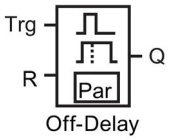
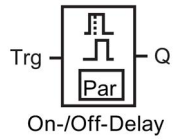
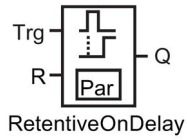
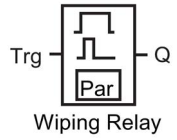
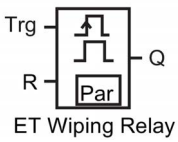
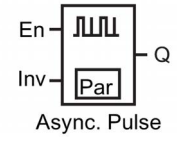
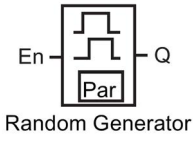
For further information on analog inputs, refer to the Constants and connectors (Page 115) topic.

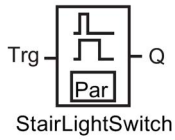
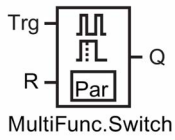
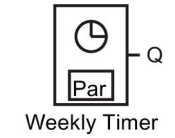
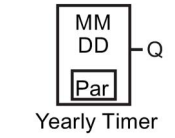
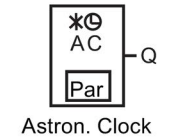
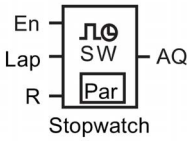
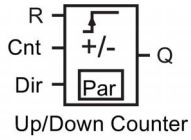
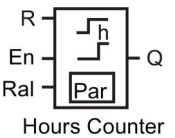
4.4 Special functions list - SF

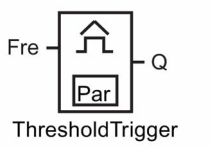
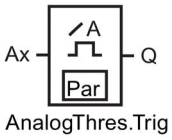
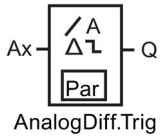
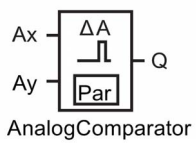
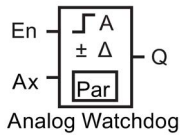
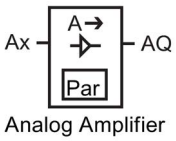
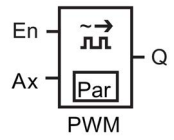
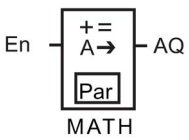
When you create your circuit program in LOGO!, you find the special function blocks in the SF list.

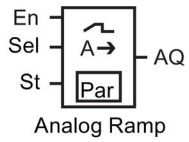
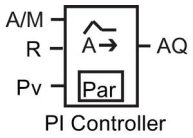
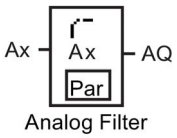
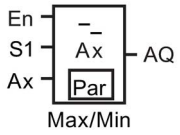
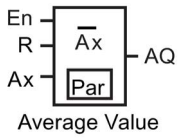
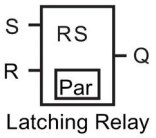
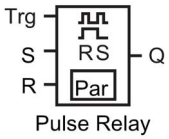
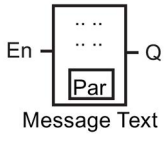
You can invert the inputs of SFs individually, that is, the circuit program converts a logical "1" at the input into a logical "0"; a logical "0" it converts into a logical "1". See the programming example in topic "Circuit program input (Page 69)".

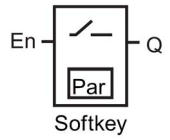
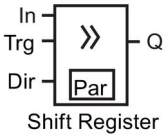
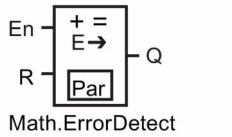
The table also specifies whether the relevant function can be set retentive (Rem). The following SFs are available:

View in LOGO!	Name of the special function	Rem
Timers		
	On-delay (Page 136)	REM
	Off-delay (Page 140)	REM
	On-/off-delay (Page 142)	REM
	Retentive on-delay (Page 144)	REM
	Wiping relay (pulse output) (Page 146)	REM
	Edge-triggered wiping relay (Page 148)	REM
	Asynchronous pulse generator (Page 150)	REM
	Random generator (Page 152)	

View in LOGO!	Name of the special function	Rem
	Stairway lighting switch (Page 154)	REM
	Multiple function switch (Page 156)	REM
	Weekly timer (Page 159)	
	Yearly timer (Page 162)	
	Astronomical clock (Page 168)	
	Stopwatch (Page 171)	
Counter		
	Up/down counter (Page 173)	REM
	Hours counter (Page 176)	REM

View in LOGO!	Name of the special function	Rem
	Threshold trigger (Page 180)	
Analog		
	Analog threshold trigger (Page 183)	
	Analog differential trigger (Page 186)	
	Analog comparator (Page 188)	
	Analog watchdog (Page 192)	
	Analog amplifier (Page 195)	
	Analog multiplexer (Page 213)	
	Pulse width modulator (PWM) (Page 224)	
	Mathematic instruction (Page 227)	

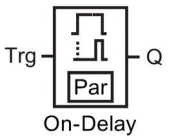
View in LOGO!	Name of the special function	Rem
	Analog ramp (Page 216)	
	PI controller (Page 220)	REM
	Analog filter (Page 232)	
	Max/Min (Page 234)	REM
	Average value (Page 237)	REM
Miscellaneous		
	Latching relay (Page 197)	REM
	Pulse relay (Page 198)	REM
	Message texts (Page 200)	

View in LOGO!	Name of the special function	Rem
	Softkey (Page 209)	REM
	Shift register (Page 211)	REM
	Mathematic instruction error detection (Page 230)	

4.4.1 On-delay

Short description

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

Symbol in LOGO!	Wiring	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 128).

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 188)(actual value Ax - Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 195)(actual value Ax)
- Analog multiplexer (Page 213)(actual value AQ)

- Analog ramp (Page 216)(actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220)(actual value AQ)
- Up/down counter (Page 173)(actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (current time Ta)
- Off-delay (Page 140)(current time Ta)
- On-/off-delay (Page 142)(current time Ta)
- Retentive on-delay (Page 144)(current time Ta)
- Wiping relay (pulse output) (Page 146)(current time Ta)
- Edge-triggered wiping relay (Page 148)(current time Ta)
- Asynchronous pulse generator (Page 150)(current time Ta)
- Stairway lighting switch (Page 154)(current time Ta)
- Multiple function switch (Page 156)(current time Ta)
- Stopwatch (Page 171)(actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

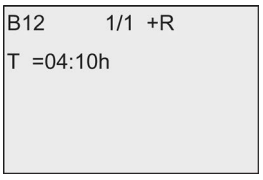
Select the required function by the block number. The timebase is configurable.

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 programming mode, for example:

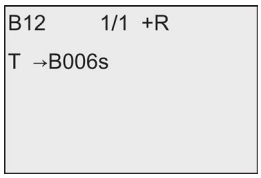


Valid ranges of the timebase

If an already-programmed function provides the value of T, the valid ranges of the timebase are as follows:

Timebase	max. value	Meaning	Accuracy
ms	99990	Number of ms	+ 10 ms
s	5999	Number of s	+ 1 s
m	5999	Number of min	+ 1 min

The LOGO! display appears as follows in programming mode, if you have, for example, set the actual value of B6 in seconds to parameter T of B12:

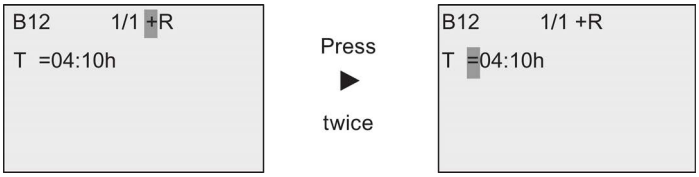


If the referenced block (B6, in the example) returns a value that lies out of the valid range, LOGO! rounds the value up or down to the next valid value.

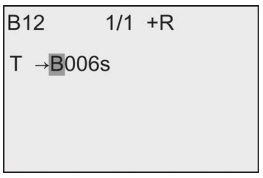
Parameter preset = Actual value of an already-programmed function

To include the actual value of an already-programmed function for parameter T, follow these steps:

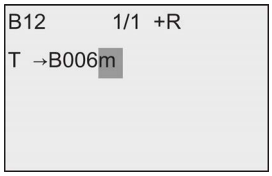
1. Press ▶ to move the cursor to the equal sign of parameter T.



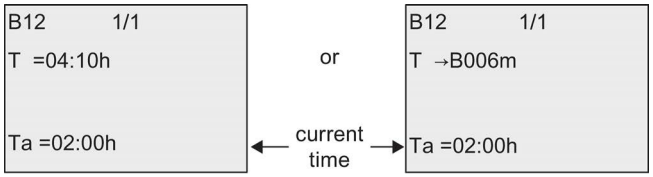
2. Press ▼ to change the equal sign into an arrow. LOGO! displays the last referenced block if it exists.



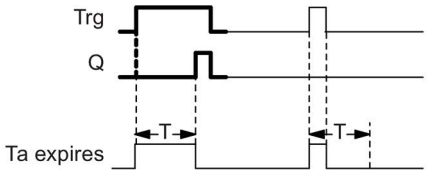
3. Press ▶ to move the cursor to the "B" of the shown block, and then press ▼ to select the required block number.
4. Press ▶ to move the cursor to the block's timebase and press ▼ to select the required timebase.



The view in parameter assignment mode appears as follows, for example:



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.

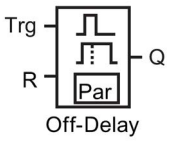
LOGO! resets the output to 0 when the signal at input Trg is 0.

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.

4.4.2 Off-delay

Short description

When an on-delay (Page 136) is set, the output is reset when the configured time has expired.

Symbol in LOGO!	Wiring	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 128).

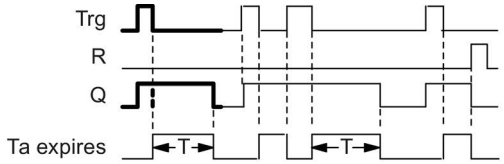
The actual value of another already-configured functions can provide the time for parameter T. You can use the actual value of the following functions:

- Analog comparator (Page 188) (actual value Ax - Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)

- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136)".

Timing diagram



The bold section of the timing diagram also appears in the off-delay symbol.

Functional description

LOGO! sets Output Q to hi immediately when the input Trg changes to hi.

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.

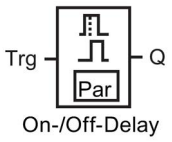
You can set input R (Reset) to reset the time T_a and the output before T_a expires.

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.

4.4.3 On-/off-delay

Short description

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

Symbol in LOGO!	Wiring	Description
 On-/Off-Delay	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 128).

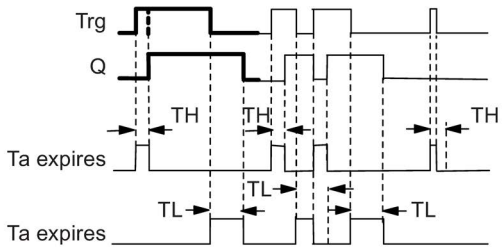
The actual value of another, already-configured function can provide the on-delay and off-delay times for parameters T_H and T_L . You can use the actual values of the following functions:

- Analog comparator (Page 188)(actual value Ax - Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 195)(actual value Ax)
- Analog multiplexer (Page 213)(actual value AQ)
- Analog ramp (Page 216)(actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220)(actual value AQ)
- Up/down counter (Page 173)(actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136)(current time Ta)
- Off-delay (Page 140)(current time Ta)

- On-/off-delay (current time Ta)
- Retentive on-delay (Page 144)(current time Ta)
- Wiping relay (pulse output) (Page 146)(current time Ta)
- Edge-triggered wiping relay (Page 148)(current time Ta)
- Asynchronous pulse generator (Page 150)(current time Ta)
- Stairway lighting switch (Page 154)(current time Ta)
- Multiple function switch (Page 156)(current time Ta)
- Stopwatch (Page 171)(actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136)".

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).

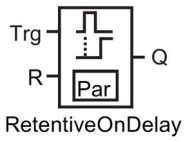
LOGO! resets the time when the signal at input Trg changes to 1 again before the time T_L expires.

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.

4.4.4 Retentive on-delay

Short description

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

Symbol in LOGO!	Wiring	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 128).

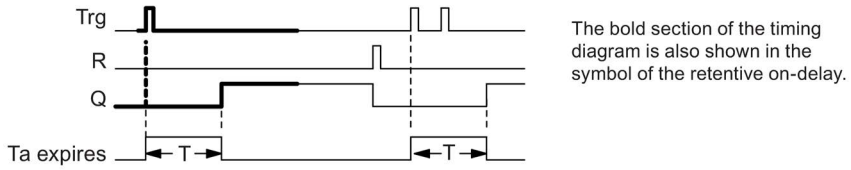
The actual value of another already-programmed function can provide the time for parameter T. You can use the actual values of the following functions:

- Analog comparator (Page 188)(actual value Ax – Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 195)(actual value Ax)
- Analog multiplexer (Page 213)(actual value AQ)
- Analog ramp (Page 216)(actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220)(actual value AQ)
- Up/down counter (Page 173)(actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136)(current time Ta)
- Off-delay (Page 140)(current time Ta)
- On-/off-delay (Page 142)(current time Ta)
- Retentive on-delay (current time Ta)
- Wiping relay (pulse output) (Page 146)(current time Ta)

- Edge-triggered wiping relay (Page 148)(current time Ta)
- Asynchronous pulse generator (Page 150)(current time Ta)
- Stairway lighting switch (Page 154)(current time Ta)
- Multiple function switch (Page 156)(current time Ta)
- Stopwatch (Page 171)(actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136)".

Timing diagram



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.

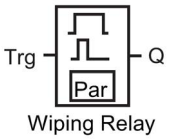
LOGO! resets the output and the time T_a with the next 1 signal at input R.

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.

4.4.5 Wiping relay (pulse output)

Short description

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

Symbol in LOGO!	Wiring	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 128).

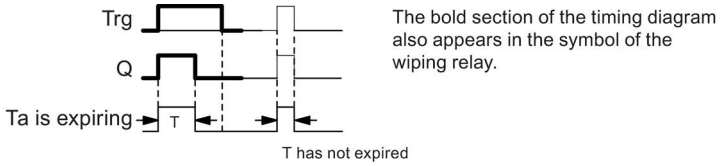
The actual value of another already-programmed function can provide the time for parameter T. You can use the actual values of the following functions:

- Analog comparator (Page 188)(actual value Ax – Ay)
- Analog threshold trigger (Page 183)(actual value Ax)
- Analog amplifier (Page 195)(actual value Ax)
- Analog multiplexer (Page 213)(actual value AQ)
- Analog ramp (Page 216)(actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220)(actual value AQ)
- Up/down counter (Page 173)(actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136)(current time Ta)
- Off-delay (Page 140)(current time Ta)
- On-/off-delay (Page 142)(current time Ta)
- Retentive on-delay (Page 144)(current time Ta)
- Wiping relay (pulse output) (current time Ta)
- Edge-triggered wiping relay (Page 148)(current time Ta)
- Asynchronous pulse generator (Page 150)(current time Ta)

- Stairway lighting switch (Page 154)(current time Ta)
- Multiple function switch (Page 156)(current time Ta)
- Stopwatch (Page 171)(actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136)".

Timing diagram



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).

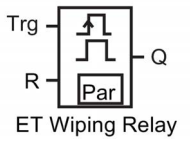
LOGO! sets the output immediately if there is a 1 to 0 transition at input Trg before the specified time expires.

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.

4.4.6 Edge-triggered wiping relay

Short description

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

Symbol in LOGO!	Wiring	Description
 ET Wiping Relay	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 128).

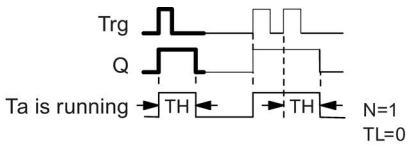
The actual value of another already-programmed function can provide the pulse width TH and the interpulse width TL. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)

- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

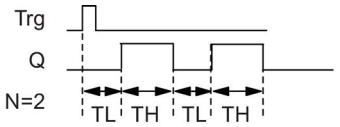
Select the required function by the block number. The timebase is configurable. For information on valid ranges and parameter defaults, refer to the On-delay (Page 136) topic.

Timing diagram A



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

Timing diagram B



Timing diagram for the sample configuration

Functional description

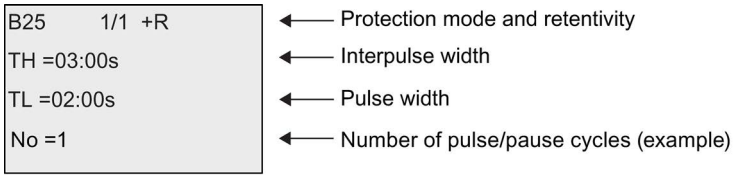
A 0 to 1 transition at input Trg triggers the time T_L (Time Low). After the time T_L has expired, output Q is set for the duration of T_H (Time High).

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.

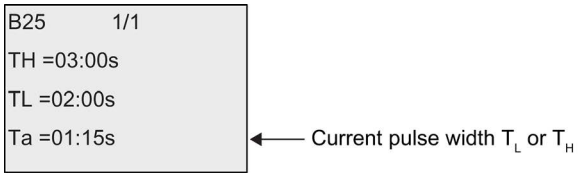
If the block is retentive, LOGO! resets output Q and the expired time to the values before a power failure; if the block is not retentive, LOGO! resets output Q and the expired time to defaults after a power failure.

Setting the Par parameter

View in programming mode (example):



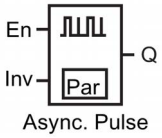
View in parameter assignment mode (example):



4.4.7 Asynchronous pulse generator

Short description

You can asynchronously output pulses with this function.

Symbol in LOGO!	Wiring	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 128)

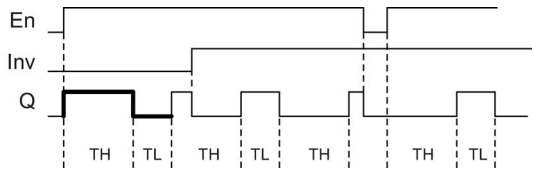
The actual value of another already-programmed function can provide the pulse width TH and the interpulse width TL. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)

- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Aysnchronous pulse generator (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136) topic.

Timing diagram



Functional description

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

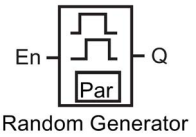
Input Inv can be used to invert the output signal, provided the block is enabled with a signal at input EN.

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.

4.4.8 Random generator

Short description

The random generator function sets an output randomly within a configured time.

Symbol in LOGO!	Wiring	Description
 Random Generator	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 128).

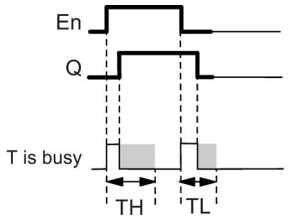
The actual value of another already-programmed function can provide the on-delay time TH and the off-delay time TL. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)

- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136) 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.

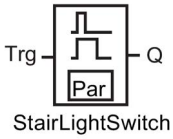
LOGO! resets the time if the signal at input En changes to 1 again before the off-delay time expires.

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.

4.4.9 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.

Symbol in LOGO!	Wiring	Description
 StairLightSwitch	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). $T_!$ determines the triggering time for the pre-warning. $T_{!L}$ 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 128).

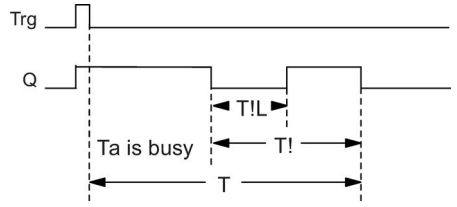
The actual value of another already-programmed function can provide the off-delay time T, the pre-warning time $T_!$ and the pre-warning period $T_{!L}$. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)

- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lightswitch (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136) 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.

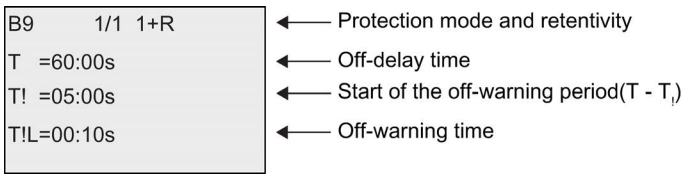
Setting the Par parameter

Note the defaults specified in topic Time response (Page 128).

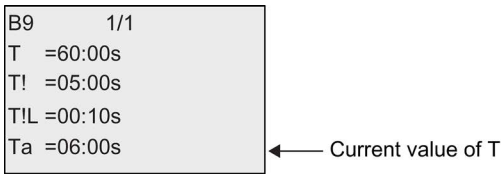
Note

All times must have the same timebase.

View in programming mode (example):



View in parameter assignment mode (example):

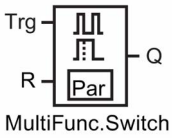


4.4.10 Multiple function switch

Short description

The multiple function switch provides two different functions:

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

Symbol in LOGO!	Wiring	Description
 MultiFunc.Switch	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_{IL}

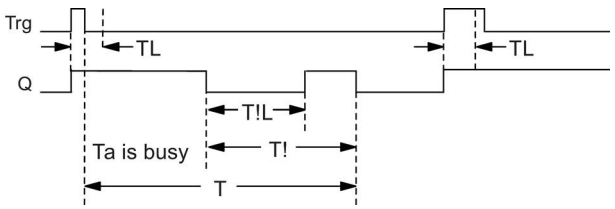
Note the defaults of the T parameters listed in topic Time response (Page 128).

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_{IL}. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136) 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.

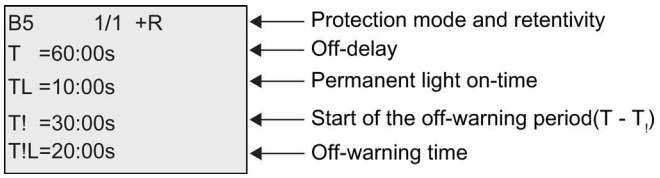
Setting the Par parameter

Note the defaults specified in the topic "Time response (Page 128)".

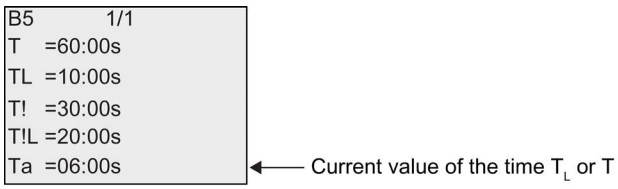
Note

T, $T_!$ and $T_{!L}$ must all have the same timebase.

View in programming mode (example):



View in parameter assignment mode (example):



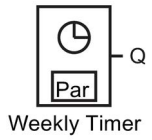
4.4.11 Weekly timer

Short description

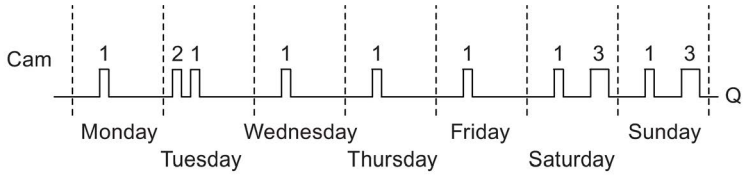
The weekly timer controls an output by means of a configurable on/off date. The function supports any combination of weekdays. You select the active weekdays by hiding the inactive days.

Note

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

Symbol in LOGO!	Wiring	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

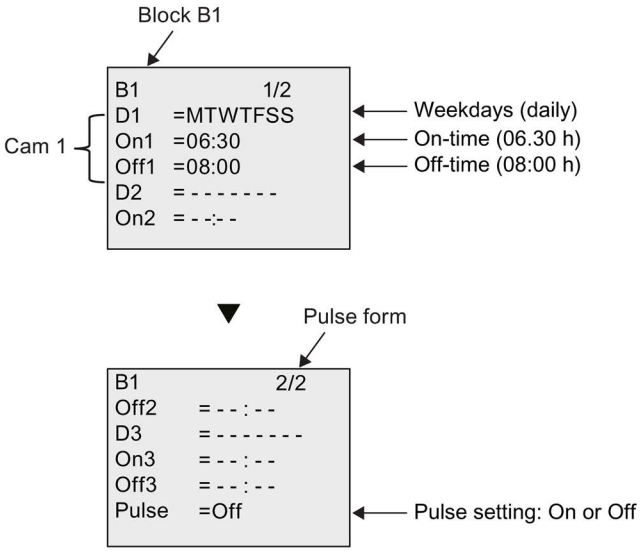
2	1:10h	1:50h
3	1:20h	1:40h

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 assignment screen form

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



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.

Setting the weekly timer

To set the on-/off-times:

1. Move the cursor to one of the Cam parameters of the timer (for example, No1).
2. Press **OK**. The cursor is positioned on the day of the week.
3. Press ▲ and ▼ to select one or several days of the week.
4. Press ▶ to move the cursor to the first position of the on-time.
5. Set the on-time.
   Modify the value at the respective position, using the keys ▲ and ▼. Move to the cursor to the various positions, using the keys ◀ and ▶. At the first position, you can only select the value - -:- -
   (- -:- - means: No on-/off-times set).
6. Press ▶ to move the cursor to the first position of the off-time.
7. Set the off-time (in same way as in Step 5).
8. Confirm your entries with **OK**.

   To configure Cam2, press ▶. The cursor is now positioned on the No2 parameter (Cam2) and you can continue with Steps 1 to 8.

Note

For information on timer accuracy, refer to the technical data and to the topic "Time response (Page 128)".

Weekly timer: Example

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

This requires three cams.

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

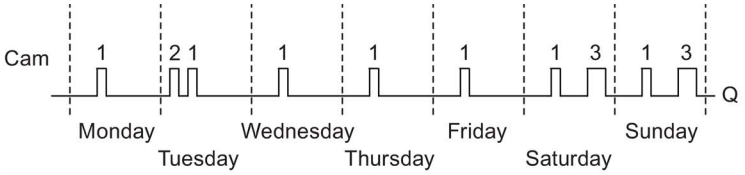
- Cam No1 must set the output of the weekly timer daily from 06:30 h to 08:00 h.
- Cam No2 must set the output of the weekly timer every Tuesday from 03:10 h to 04:15 h.
- Cam No3 must set the output of the weekly timer switch every Saturday and Sunday from 16:30 h to 23:10 h.

Views in LOGO!:

B1	1/2
D1	=MTWTFSS
On1	=06:30
Off1	=08:00
D2	= -T- - - - -
On2	= 03:10

B1	2/2
Off2	=04:15
D3	=- - - - -SS
On3	=16:30
Off3	=23:10
Pulse	=Off

Result



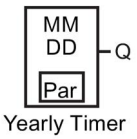
4.4.12 Yearly timer

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.

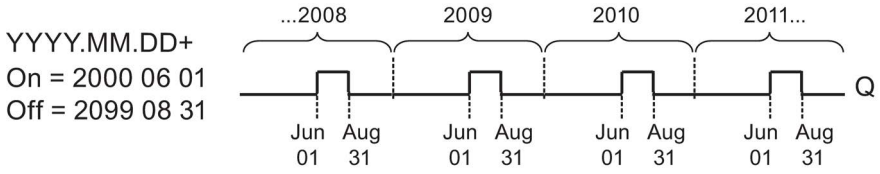
Note

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

Symbol in LOGO!	Wiring	Description
 Yearly Timer	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.

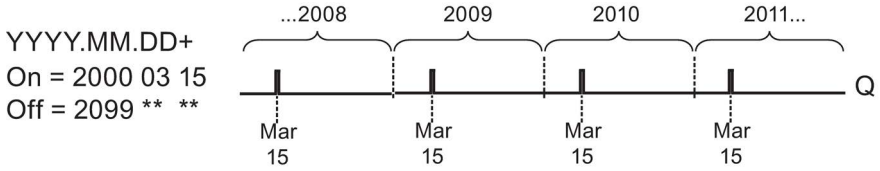
Timing diagrams

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.



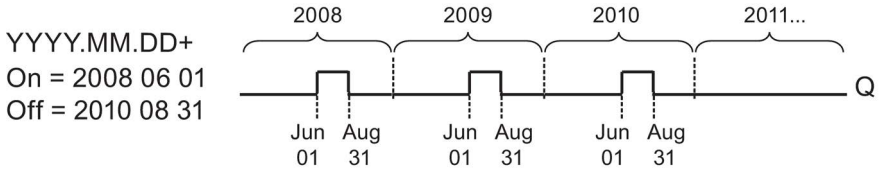
B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =Off	2000-06-01	2099-08-31

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.



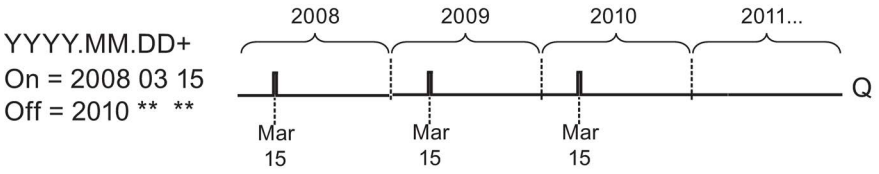
B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =On	2000-03-15	2099-**-**

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.



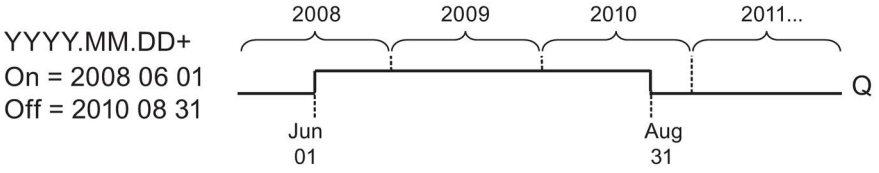
B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =Off	2008-06-01	2010-08-31

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.



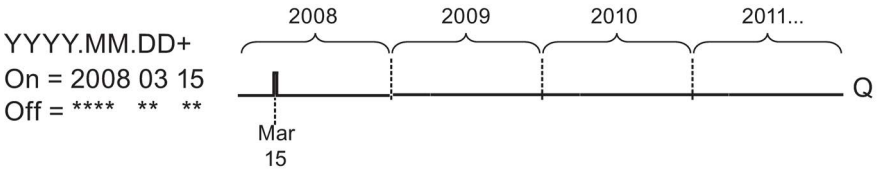
B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =On	2008-03-15	2010-**-**

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.



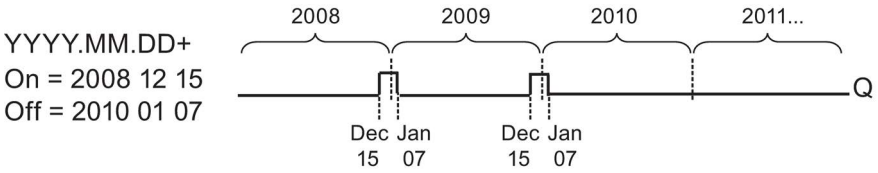
B6 1/3	B6 2/3	B6 3/3
Yearly =Off	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =Off	2008-06-01	2010-08-31

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.



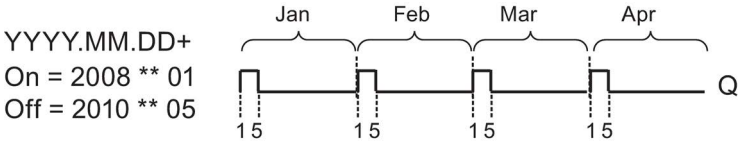
B6 1/3	B6 2/3	B6 3/3
Yearly =Off	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =On	2008-03-15	****-**-**

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.



B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =Off	YYYY-MM-DD	YYYY-MM-DD
Pulse =Off	2008-12-15	2010-01-07

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.



B6 1/3	B6 2/3	B6 3/3
Yearly =On	On Date	Off Date
Monthly =On	YYYY-MM-DD	YYYY-MM-DD
Pulse =Off	2008-**-01	2010-**-05

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

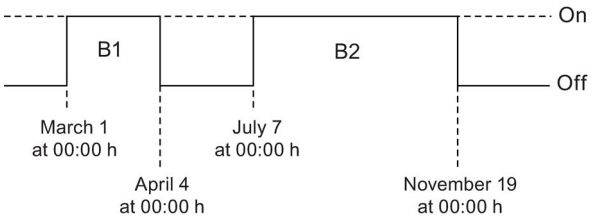
The internal real-time clock of LOGO! is buffered against power failure. The buffering time is influenced by the surrounding temperature, and is typically 80 hours at a surrounding temperature of 25°C.

Sample configuration

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

B1 1/3 Yearly =On Monthly =Off Pulse =Off	Yearly Timer 1 On-time Mar 1 Off-time Apr 4	B2 1/3 Yearly =On Monthly =Off Pulse =Off	Yearly Timer 2 On-time Jul 7 Off-time Nov 19
B1 2/3 On Date YYYY-MM-DD 2000-03-01		B2 2/3 On Date YYYY-MM-DD 2000-07-07	
B1 3/3 Off Date YYYY-MM-DD 2099-04-04		B2 3/3 Off Date YYYY-MM-DD 2099-11-19	

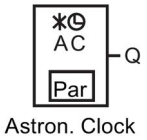
Result



4.4.13 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.

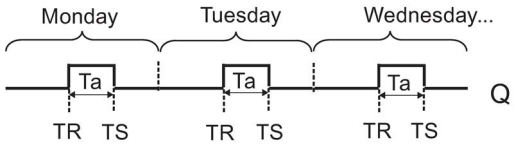
Symbol in LOGO!	Wiring	Description
 Astron. Clock	Parameter	You specify the longitude, altitude, time zone, sunrise time offset and sunset time offset: **Longitude:** Direction settings: EAST or WEST Range of values: 0 ° to 180 ° (degrees) 0 ' to 59 ' (minutes) 0 " to 59 " (seconds) **Latitude**: Direction settings: NORTH or SOUTH Range of values: 0 ° to 90 ° (degrees) 0 ' to 59 ' (minutes) 0 " to 59 "(seconds) **Zone**: 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 V8.0, 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:



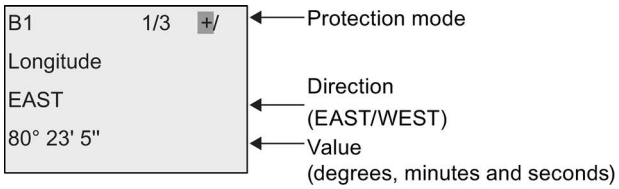
Functional description

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.

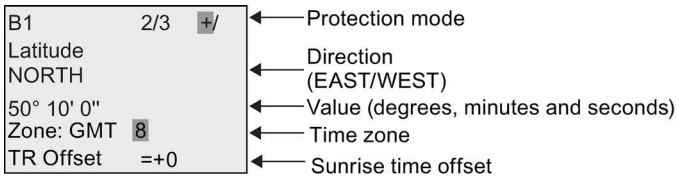
If automatic summertime/wintertime conversion (see the topic Summertime/wintertime conversion (Page 93) for details) is enabled, the function takes the configured time difference into consideration when calculating the TR and TS values.

Setting the Par parameter

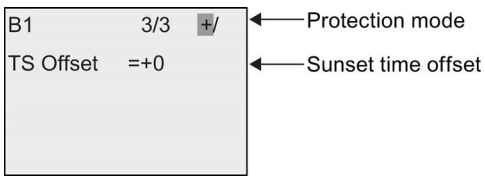
View in programming mode (example):



Press ▶

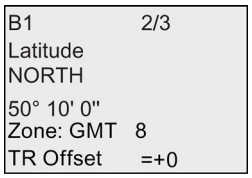


Press ▶

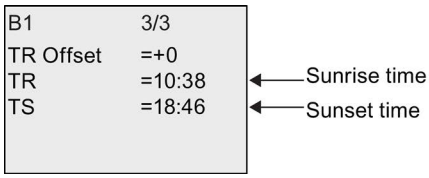


View in parameter assignment mode (example):

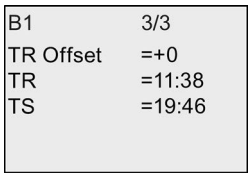
Press ▼



If automatic summertime/wintertime conversion is disabled, press ▼ and LOGO! shows the following view in parameter assignment mode (example):



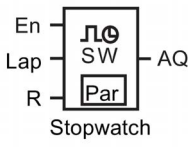
If automatic summertime/wintertime conversion is enabled and set to "EU" (for example), press ▼ and LOGO! shows the following view in parameter assignment mode (example):



4.4.14 Stopwatch

Short description

The stopwatch function counts the elapsed time between a start stopwatch signal and a stop stopwatch signal.

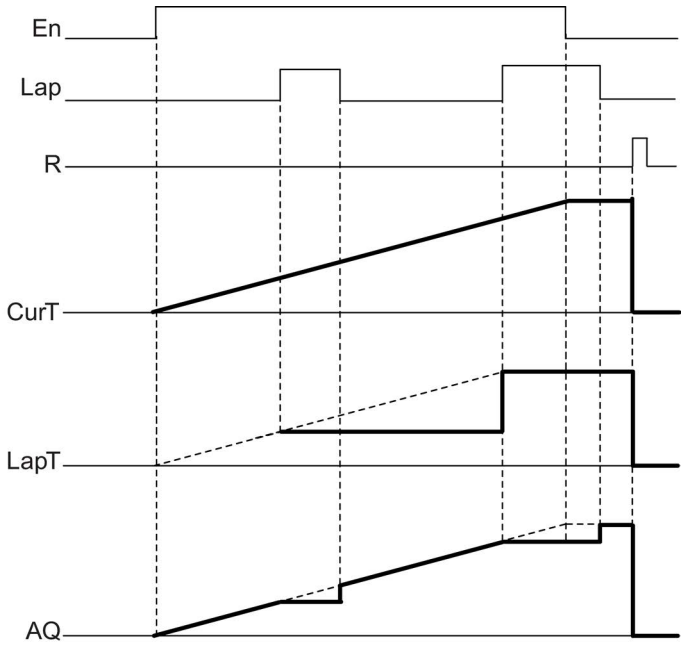
Symbol in LOGO!	Wiring	Description
	En	A signal at input En begins counting elapsed time at analog output AQ.
	Lap	A positive edge (0 to 1 transition) at input Lap pauses the stopwatch. A negative edge (1 to 0 transition) at input Lap resumes the stopwatch.
	R	A signal at input R resets the elapsed time.
	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

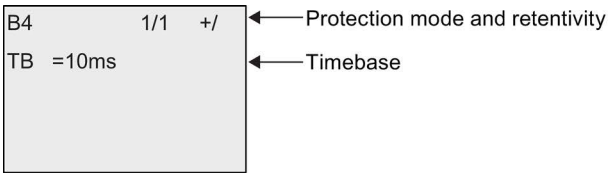


Functional description

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.

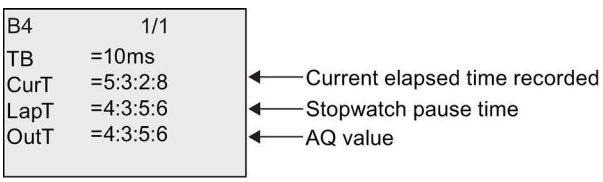
Setting the Par parameter

View in programming mode (example):



To change the timebase, press ▶ to move the cursor to "10ms". Press **OK** and now the timebase can be selected. Press ▲ or ▼ to select another timebase. To confirm your selection, press **OK**.

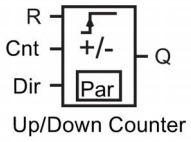
View in parameter assignment mode (example):



4.4.15 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.

Symbol in LOGO!	Wiring	Description
 Up/Down Counter	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

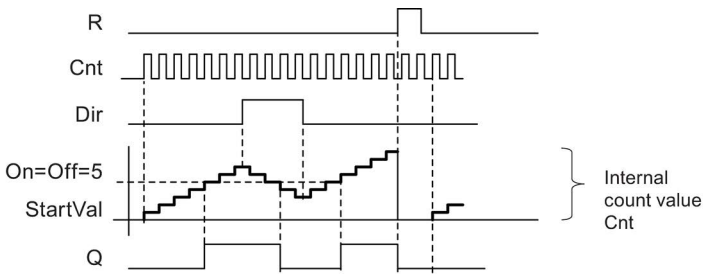
The actual value of another already-programmed function can provide the on threshold On and the off threshold Off. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)

- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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.

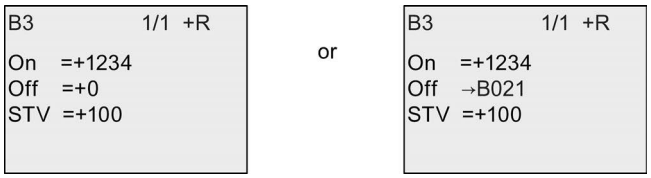
Note

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.

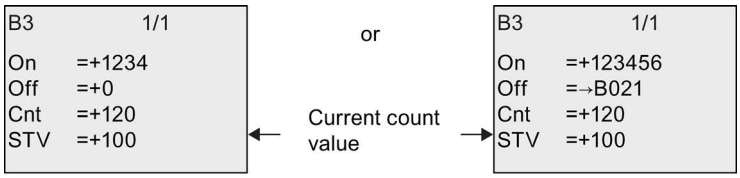
Example: Up to 100 pulses per cycle can be counted; 900 pulses have been counted so far. On = 950; Off = 10000. The output is set in the next cycle, after the value has reached 1000. (The output would not be set at all if the value Off = 980).

View in programming mode (example):



If the referenced block (B021, in the example) returns a value that lies out of the valid range, the value is rounded to the next valid value.

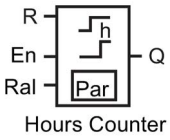
The view in parameter assignment mode (example):



4.4.16 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.

Symbol in LOGO!	Wiring	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 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.

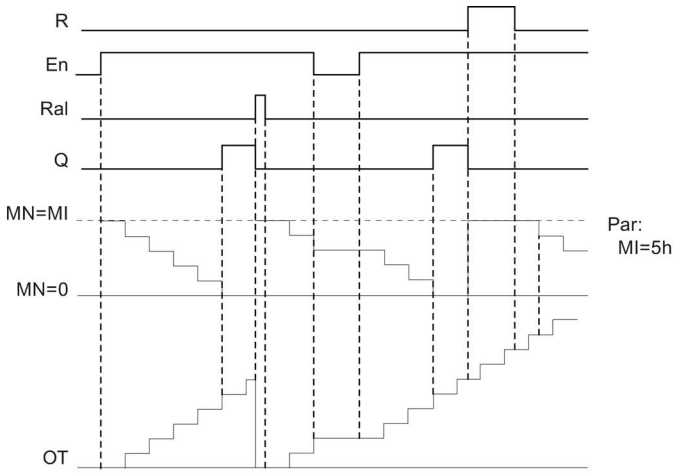
Parameter MI

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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (current time Ta)

Select the required function by the block number.

Timing diagram



MI = Configured time interval
MN = Time-to-go
OT = Total time expired since the last hi signal at input Ral

Functional description

The hours counter monitors input En. When En = 1, LOGO! computes the time expired and the time-to-go MN. LOGO! shows these times in parameter assignment mode. Output Q is set when the time-to-go MN = 0.

A signal at reset input R resets output Q and sets the preset value of MI at the counter for the duration of MN. The hours counter OT is not affected.

With a signal at the reset input Ral, you reset output Q and set the preset value of MI at the counter for the duration of MN. The hours counter OT is reset to zero.

Depending on your configuration of parameter Q, the output is either reset with a signal at input R or Ral ("Q→0:R"), or when a reset signal is set hi, or the En signal is set lo ("Q→0:R+En").

Viewing the MI, MN and OT values

- LOGO! Basic: You can open the parameter assignment mode when the system is in RUN to view the actual values of MI, MN and OT.
- LOGO! Pure: In LOGO!Soft Comfort, you can use the Online Test to read these values. For further information, see chapter "LOGO! software (Page 283)".
- 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.

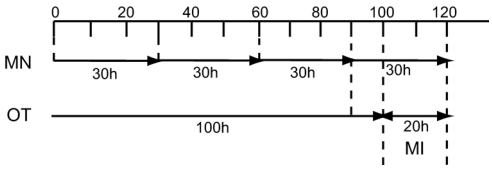
Example:

MI = 30h, OT = 100h

MN = 30 - (100 % 30)

MN = 30 -10

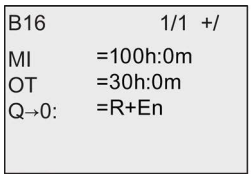
MN = 20h

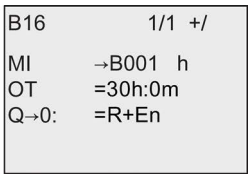


In runtime mode, the value OT can not be preset. If the value for MI is changed, there would be no calculation for the MN. MN would take on the value of MI.

Setting the Par parameter

View in programming mode:

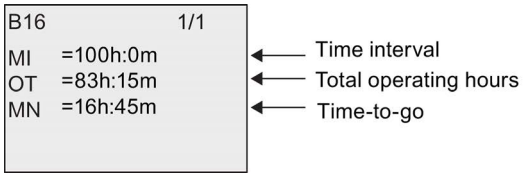




MI is the configurable time interval. The permissible range of values is 0 to 9999 hours.

For information on how to assign the actual value of another already-programmed function to a parameter, see the On-delay (Page 136) topic.

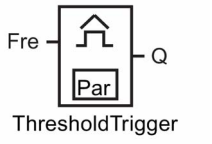
View in parameter assignment mode:



4.4.17 Threshold trigger

Short description

The output is set and reset with two configurable threshold triggers.

Symbol in LOGO!	Wiring	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): max. 5 kHz, if the fast input is directly connected to the threshold trigger function block • any other input or circuit component for counting low frequency signals (typically 4 Hz)
	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

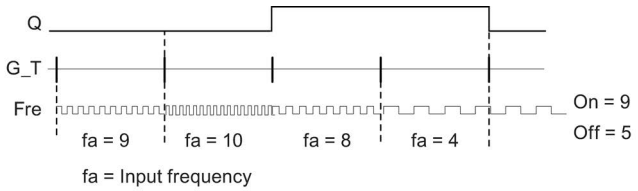
The gate time G_T can be provided by the actual value of another already-programmed function. You can use the actual values of the following functions:

- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)

- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay(pulse output) (Page 146) (current time Ta)
- Edge triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway light switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (actual value Fre)

Select the required function by the block number.

Timing diagram



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

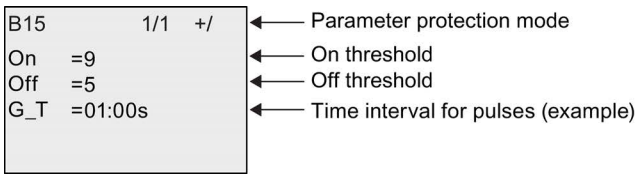
- If the On threshold ≥ Off threshold, then Q = 1, if f_a > On or Q = 0, if f_a ≤ Off.
- If the On threshold < Off threshold, then Q = 1 if On ≤ f_a < Off.

Setting the Par parameter

Note

The system scans the counter limit value once per interval G_T.

View in programming mode (example):

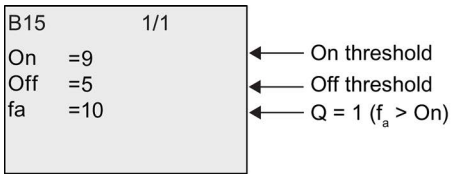


Note

The "seconds" timebase is here set as permanent default.

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

View in parameter assignment mode (example):



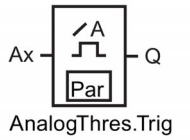
Note

f_a always represents the total pulses measured per time unit G_T.

4.4.18 Analog threshold trigger

Short description

The output is set and reset at two configurable thresholds.

Symbol in LOGO!	Wiring	Description
	Input Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	A: gain Range of values: -10.00 to 10.00 B: zero offset Range of values: -10,000 to 10,000 On: on threshold Range of values: -20,000 to 20,000 Off: off threshold Range of values: -20,000 to 20,000 p: number of decimals Range of values: 0, 1, 2, 3
	Output Q	Q is set or reset by the threshold triggers.
* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).		

Gain and offset parameters

Please note the information on gain and offset parameters in topic "Calculating the gain and offset of analog values (Page 130)".

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 188) (actual value Ax – Ay)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)

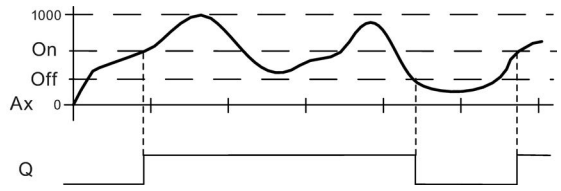
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Analog threshold trigger (actual value Ax)
- Threshold trigger (Page 180) (actual value Fre)

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.

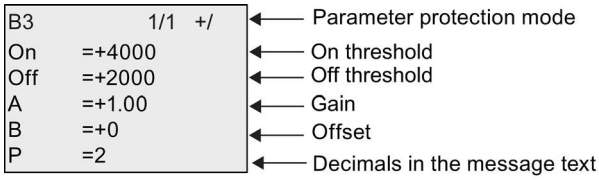
Calculation rule

- 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.

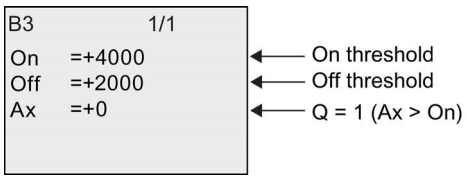
Setting the Par parameter

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

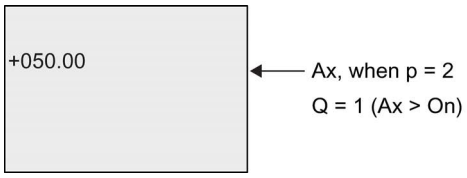
View in programming mode (example):



View in parameter assignment mode (example):



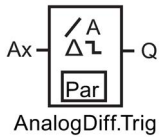
View in the message text (example):



4.4.19 Analog differential trigger

Short description

The output is set and reset depending on a configurable threshold and a differential value.

Symbol in LOGO!	Wiring	Description
 AnalogDiff.Trig	Input Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	A: gain Range of values: -10.00 to 10.00 B: zero offset Range of values: -10,000 to 10,000 On: On/Off threshold Range of values: -20,000 to 20,000 Δ: differential value for calculating the off parameter Range of values: -20,000 to 20,000 p: Number of decimals Range of values: 0, 1, 2, 3
	Output Q	Q is set or reset, depending on the threshold and difference values.
* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).		

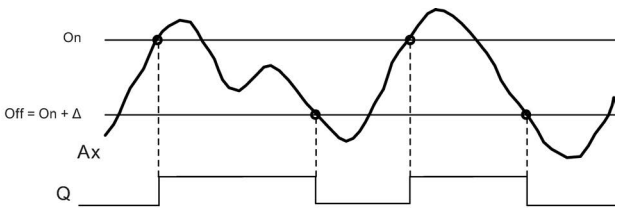
Gain and offset parameters

Please note the information on gain and offset parameters in topic "Calculating the gain and offset of analog values (Page 130)".

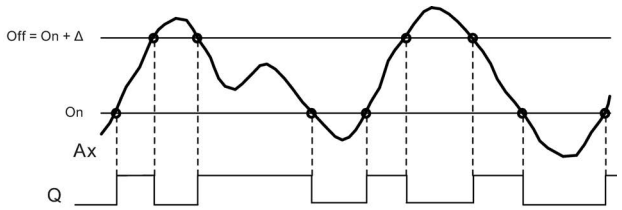
Parameter p (number of decimals)

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.

Setting the Par parameter

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

View in programming mode (example):

B3	1/1 +/	← Parameter protection mode
On	=+4000	← On/off threshold
Δ	=-2000	← Differential value for the on/off threshold
A	=+1.00	← Gain
B	=+0	← Offset
P	=2	← Decimals in the message text

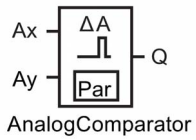
View in parameter assignment mode (example):

B3	1/1	
On	=+4000	← On threshold
Δ	=-2000	← Differential value for the off threshold
Off	=+2000	← Off threshold
Ax	=+5000	← Q = 1 (A_x > On)

4.4.20 Analog comparator

Short description

The output is set and reset depending on the difference Ax - Ay and on two configurable thresholds.

Symbol in LOGO!	Wiring	Description
	Inputs Ax and Ay	Inputs Ax and Ay are one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	A: gain Range of values: -10.00 to 10.00 B: ero offset Range of values: -10,000 to 10,000 On: on threshold Range of values: -20,000 to 20,000 Off: off threshold Range of values: -20,000 to 20,000 p: number of decimals Range of values: 0, 1, 2, 3
	Output Q	Q is set or reset, depending on the difference Ax - Ay and the set thresholds..
* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).		

Gain and offset parameters

For more information on the gain and offset parameters, refer to topic "Calculating the gain and offset of analog values (Page 130)".

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 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)

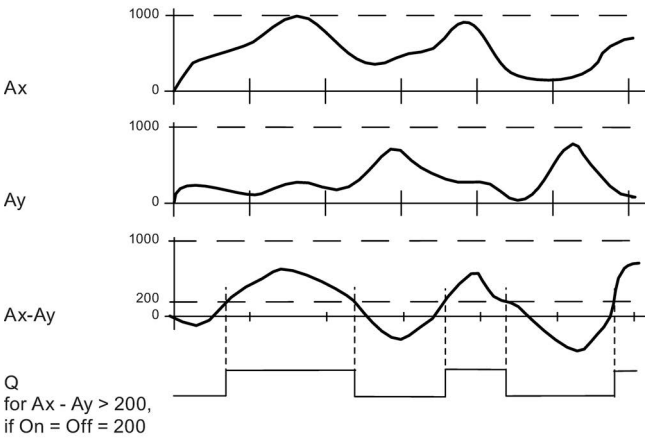
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Analog comparator (actual value Ax - Ay)
- Threshold trigger (Page 180) (actual value Fre)

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.

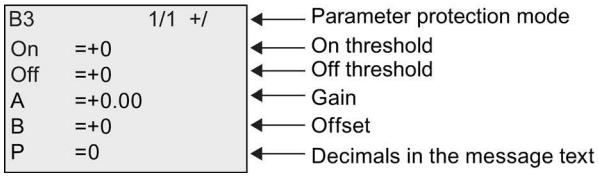
Calculation rule

- 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.

View in programming mode:



Example

In a heating control system, the supply T_v and return line temperatures T_r are to be compared, for example with a sensor at AI2.

A control signal is to be triggered (for example "heater On") when the difference between the supply and return line temperatures is greater than 15 °C. The control signal is reset when the difference is less than 5 °C.

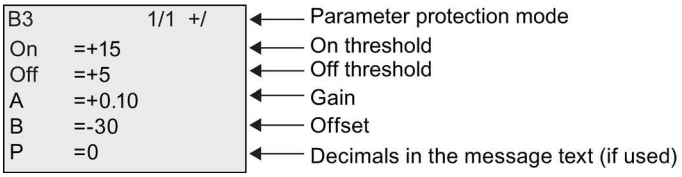
The process variable of the temperature is to be shown in parameter assignment mode.

The thermocouples available have the following technical data: -30 °C to +70 °C, 0 VDC to 10 VDC.

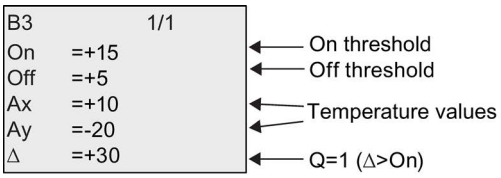
Application	Internal mapping
-30 °C to 70 °C = 0 VDC to 10 VDC	0 to 1000
0 °C	300 → Offset = -30

Application	Internal mapping
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 130) ".	

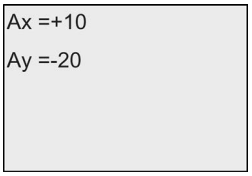
Configuration (example):



View in parameter assignment mode (example):



View in the message text (example):

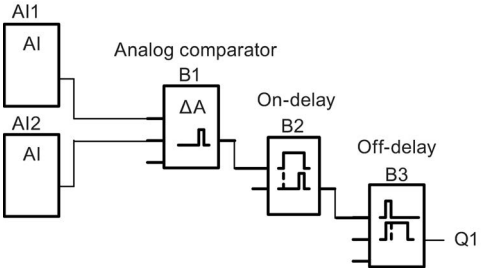


Reducing the input response of the analog comparator

You can selectively delay the output of an analog comparator by means of the "On-delay" and "Off-delay" special functions. With on-delay, output Q is only set if the pulse width of the triggering signal at input Trg (=analog comparator output) is longer than the on-delay time.

Using this method, you will obtain a virtual hysteresis and reduce the input response to short signals.

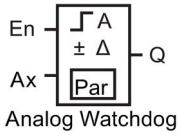
Function block diagram



4.4.21 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.

Symbol in LOGO!	Wiring	Description
 Analog Watchdog	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 - Δ_2 to Aen+ Δ_1
	Input Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	A: gain Range of values: -10.00 to 10.00 B: zero offset Range of values: -10,000 to 10,000 Δ_1: difference value above Aen: on/off threshold Range of values: 0 to 20,000 Δ_2: difference value below Aen: on/off threshold Range of values: 0 to 20,000 p: number of decimals Range of values: 0, 1, 2, 3 Retentivity: / = no retentivity R = the status is retentive in memory
	Output Q	Q is set/reset, depending on the stored analog value and the offset.
* AI1...AI8: 0...10 V corresponds with 0...1000 (internal value).		

Gain and offset parameters

For more information on gain and offset parameters, refer to topic "Calculating the gain and offset of analog values (Page 130)".

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:

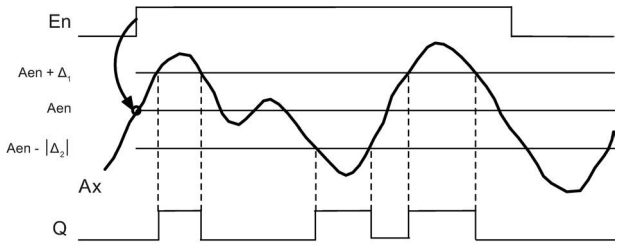
- Analog comparator (Page 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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.

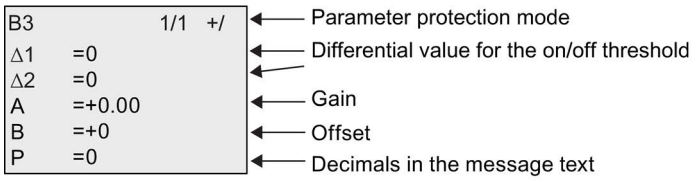
Output Q is set when the signal at input En = 1 and if the actual value at input Ax is out of range of Aen - Δ_2 to Aen + Δ_1 .

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.

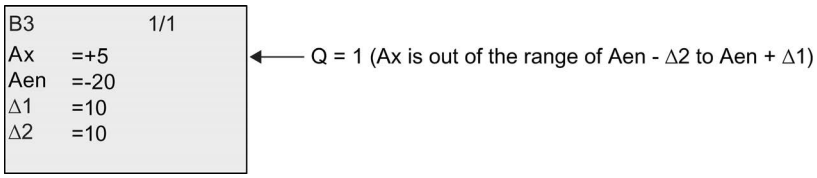
Setting the Par parameter

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

View in programming mode:



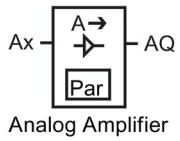
View in parameter assignment mode (example):



4.4.22 Analog amplifier

Short description

This special function amplifies the value of an analog input and outputs the result at an analog output.

Symbol in LOGO!	Wiring	Description
 Analog Amplifier	Input Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	A: gain Range of values: -10.00 to 10.00 B: zero offset Range of values: -10,000 to 10,000 p: number of decimals Range of values: 0, 1, 2, 3
	Output AQ	This special function has an analog output. This output can only be connected with analog inputs, analog flags, analog outputs or network analog outputs. Range of values for AQ: -32767 to 32767
* AI1...AI8: 0 V to 10 V corresponds with 0 to 1000 (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 130).

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.

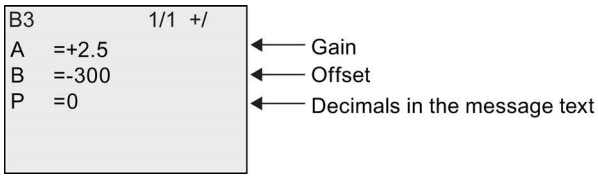
- Scale the analog value at the analog amplifier for further use.
- Connect, for example, the time base for parameter T of a time function (e.g. On-/Off-delay (Page 142)) or the on and/or off limit specification of an up/down counter (Page 173) to the scaled analog value.

For more information with programming examples refer to the Online Help for LOGO!Soft Comfort.

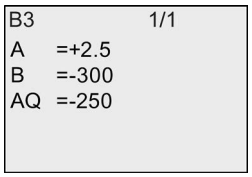
Setting the Par parameter

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

View in programming mode (example):



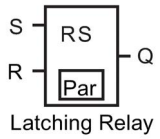
View in parameter assignment mode (example):



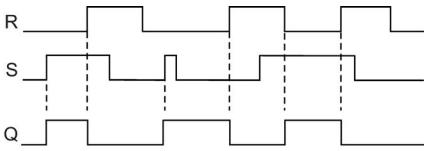
4.4.23 Latching relay

Short description

Input S sets output Q, input R resets output Q again.

Symbol in LOGO!	Wiring	Description
 Latching Relay	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:

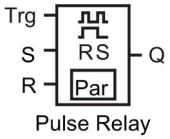
S_n	R_n	Q	Comment
0	0	x	The status is retentive
0	1	0	Reset
1	0	1	Set
1	1	0	Reset (takes priority over Set)

When retentivity is enabled, the current status of the output signal is retained after a power failure.

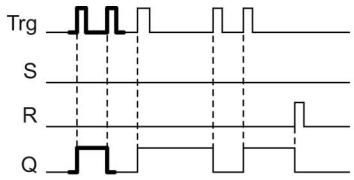
4.4.24 Pulse relay

Short description

A short pulse at the input sets and resets the output.

Symbol in LOGO!	Wiring	Description
 Pulse Relay	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
*	0	0	1	0 ->1	0

Par	Q_{n-1}	S	R	Trg	Q_n
*	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

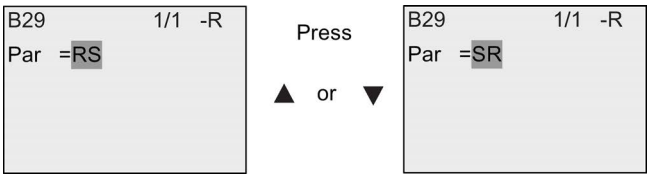
*: RS or SR

**: 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 programming mode:



This special function is not available in parameter assignment mode.

Note

If Trg = 0 and Par = RS, the special function "Pulse relay" corresponds with the special function "Latching relay (Page 197)".

4.4.25 Message texts

Short description

With the message text function block, you can configure a message that includes text and other parameters for LOGO! to display in RUN mode.

You can configure simple message texts from the LOGO! onboard display. LOGO!Soft Comfort provides an extended set of features for message texts: bar graph representation of data, names for digital I/O states and more. Refer to the LOGO!Soft Comfort documentation for information on these features.

Global message text settings

You configure global parameters that apply to all message texts on the programming menu:

- Analog time: refresh rate in milliseconds that specifies how frequently analog inputs in message texts are updated
- Tick time: frequency at which message texts scroll on and off the display
  There are two ways that a message text can tick on and off the screen: line by line, or character by character, which are described in more detail below. A line of a text message, or each character of a text message in turn will tick on and off the LOGO! onboard display based on the tick time. For a message that ticks line by line, the actual tick time is ten times the configured tick time. For messages that tick character by character, the actual tick time is the configured tick time.
- Current character set: which character set is selected for the display of message texts. Options Set1 and Set2 can be any of the supported character sets forLOGO!:

Character set in LOGO!	Common name	Supported languages	Internet reference
ISO8859-1	Latin-1	English, German, Italian, Spanish (partly), Dutch (partly)	http://en.wikipedia.org/wiki/ISO/IEC_8859-1
ISO8859-5	Cyrillic	Russian	http://en.wikipedia.org/wiki/ISO/IEC_8859-5
ISO8859-9	Latin-5	Turkish	http://en.wikipedia.org/wiki/ISO/IEC_8859-9
ISO8859-16	Latin-10	French	http://en.wikipedia.org/wiki/ISO/IEC_8859-16
GB-2312	Chinese	Chinese	http://en.wikipedia.org/wiki/GB2312
Shift-JIS	Japanese	Japanese	http://en.wikipedia.org/wiki/Shift-jis

Of the 50 possible message texts that you can configure, you can select any number of them to be from the first language and any number from the second language. For example, you could configure 50 message text function blocks that have a single message text for Character Set 1. Alternatively, you could configure twenty-five message text function blocks, each of which has two message texts: one for Character Set 1 and one for Character Set 2. Any combination is valid such that the total does not exceed 50.

Within a single message text, the text must be from one character set. You can edit message texts in any of the supported character sets from LOGO!Soft Comfort. From LOGO! Basic, you can only edit text using characters from the ISO8859-1 character set.

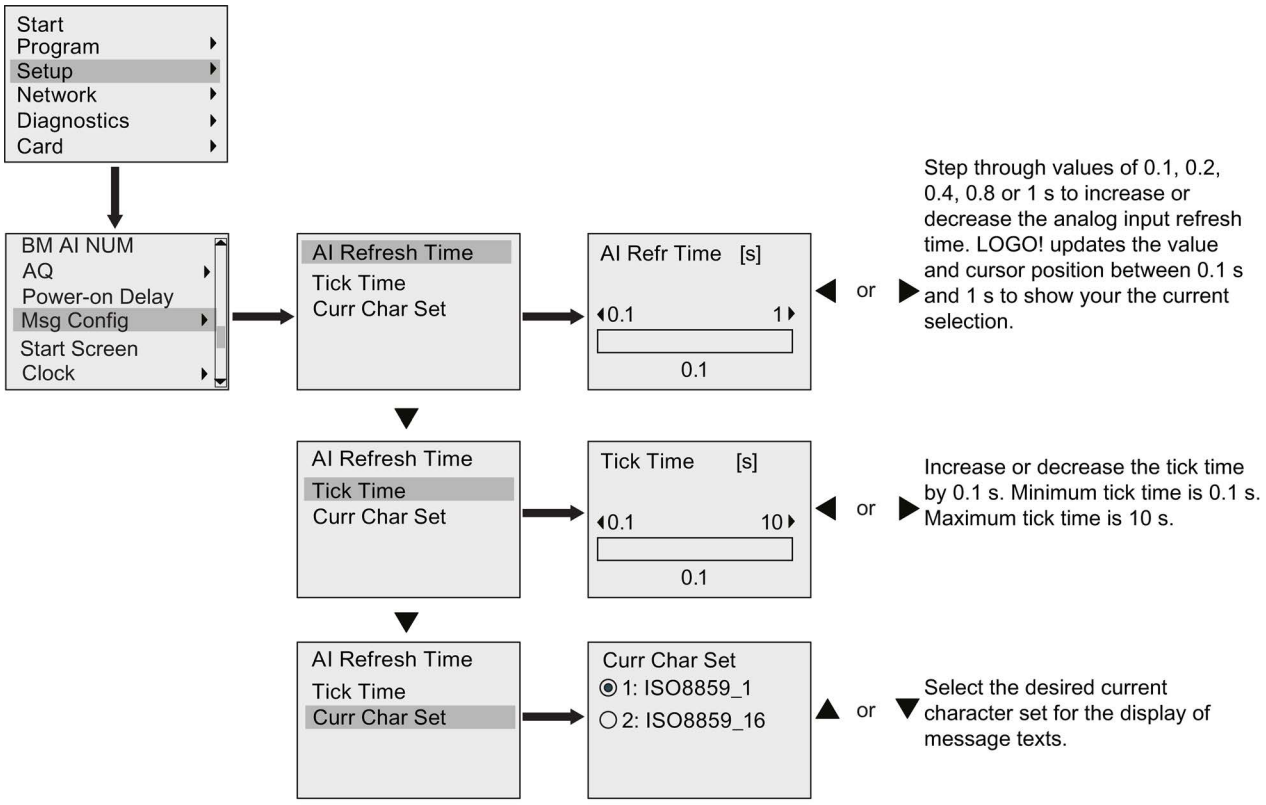
The language and therefore character set of a message text is independent of the language setting for menus on the LOGO! onboard display. They can be different.

Chinese character set

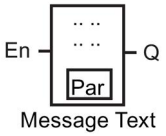
LOGO! Basic and the LOGO! TDE support the Chinese character set (GB-2312) for the People's Republic of China. The devices use Microsoft Windows encoding for this character set. The Windows encoding allows the devices to display the same characters as shown in the LOGO!Soft Comfort message text editor when you are using a Chinese emulator or a Chinese version of Microsoft Windows.

The Chinese character set requires a Chinese version of Windows or a Chinese emulator to properly display Chinese characters in the LOGO!Soft Comfort message text editor. You must start the Chinese emulator before you open the the message text function block in LOGO!Soft Comfort.

Programming global message text parameters



Message text function block

Symbol in LOGO!	Wiring	Description
	Input En	A 0 to 1 transition at input En (Enable) starts the output of the message text.
	Parameter	Ack: acknowledgment of the message text Msg Text: input of the message text Priority: priority of the message text Range of values: 0 to 127 Tick Type: • C-C: tick message character by character • L-L: tick message line by line Msg. Dst: message destination (BM, TDE or Both) Web Show: show LOGO! Basic on Web server Line tick settings (to define whether a line ticks): • Line1 Tick • Line2 Tick • Line3 Tick • Line4 Tick • Line5 Tick • Line6 Tick **Note:** You can only edit the Text parameter of the message from LOGO! Basic. ISO8859-1 is the only available character set for editing text. You can edit all other parameters, and other languages for the Text parameter from LOGO!Soft Comfort. For configuration details, refer to the Online Help for LOGO!Soft Comfort.
	Output Q	Q remains set as long as the message text is set.

Restriction

A maximum of 50 message text blocks are available.

Functional description

When LOGO! is in RUN mode, LOGO! displays the message text that you have configured along with its parameter values upon a 0 to 1 transition of the signal at input En.

Based on your setting for the message destination, the message text displays on the LOGO! onboard display, the LOGO! TDE, or both.

If you use flag M27 in your circuit program, then if M27=0 (low) then LOGO! displays the message text only if it is from the primary character set (Character Set 1). If M27=1 (high), then LOGO! displays the message text only if it is from the secondary character set (Character Set 2). (See the M27 flag description in topic Constants and connectors (Page 115)).

If you have configured message ticking, the message will tick on and off the display according to your specifications, either a character at a time, or a line at a time.

If acknowledgment is disabled (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.

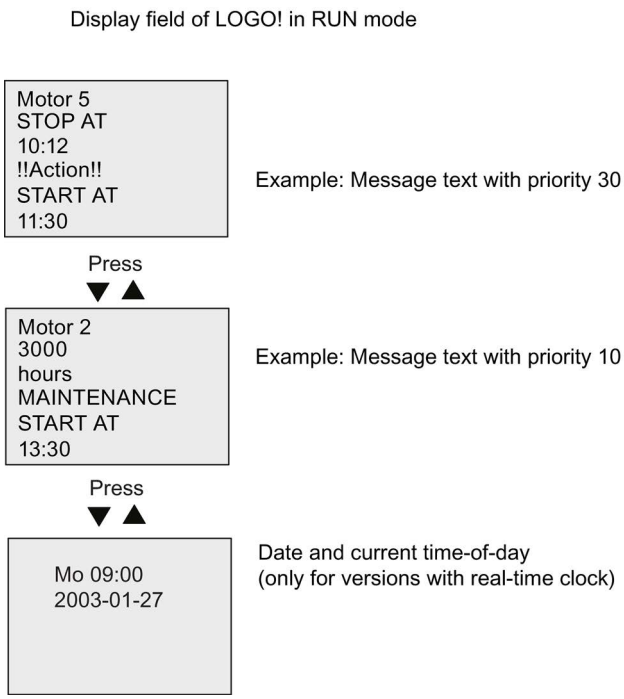
When multiple message text functions are triggered with En=1, LOGO! displays the message text with the highest priority (0 = lowest, 127 = highest). This also means that LOGO! displays a newly activated message text only if its priority is higher than that of previously activated message texts.

After a message text is disabled or acknowledged, the function automatically shows the previously active message text that takes the highest priority.

You can press the ▲ and ▼ keys to step through multiple active message texts.

Example

This is how two message texts could be shown:



Message ticking

You can configure message text lines to tick or not tick. Two types of message ticking exist:

- Character by character
- Line by line

Messages that tick character by character scroll off the characters of the message line one character at a time to the left with the additional characters scrolling in one at a time from the right. The time interval for the tick is specified by the TickTime message text setting.

Messages that tick line by line scroll one half of the message off the display to the left with the second half of the message scrolling in from the right. The time interval for the tick is ten times the TickTime parameter. The two halves of the message simply alternate on the LOGO! onboard display or LOGO! TDE.

Example: tick message character by character

The following illustration shows a one-line, 24-character message text:

X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}	X_{22}	X_{23}	X_{24}

If you set this message to tick "character by character" with a tick interval of 0.1 seconds, then the initial appearance of this message line on the LOGO! onboard display or LOGO! TDE is as shown in this illustration:

After 0.1 second, one character of the message line ticks. The message appears as follows on the LOGO! onboard display or LOGO! TDE:

Example: tick message line by line

The following example uses the same message configuration as the previous example:

X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}	X_{20}	X_{21}	X_{22}	X_{23}	X_{24}

If you set this message to tick "line by line" with a tick interval of 0.1 seconds, then the initial appearance of this message on the LOGO! onboard display or LOGO! TDE is the left half of the message as shown in this illustration:

After 1 second (10 x 0.1 second), the message ticks to show the right half of the message as shown in this illustration:

X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23	X24	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12

The screen display alternates between the two message halves every second.

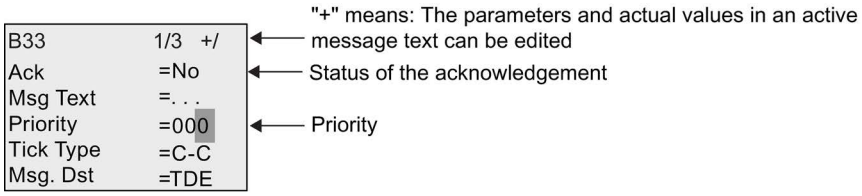
You can configure each individual line of a message text to tick or not tick. The "character by character" or "line by line" setting applies to all lines that you configure to tick.

Setting the Par parameter

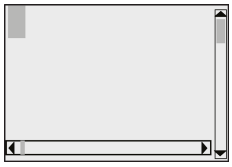
From the input P, you configure the following characteristics of the message text:

- Priority
- Acknowledgement
- Message destination
- Tick type, and tick setting for each line

View in programming mode:



1. Press ▶ to position the cursor on the "ACK" line.
2. Press **OK.** Enable "Ack": Press ▲ or ▼
3. Position the cursor on the "Msg Text" line by pressing ▶. Press **OK** twice. To select a line for the message text, press ▲ and ▼. LOGO! shows as follows:



4. Press ▲ and ▼ to select the letter to be displayed in the text. To move the cursor from one position to another, press ◀ and ▶.

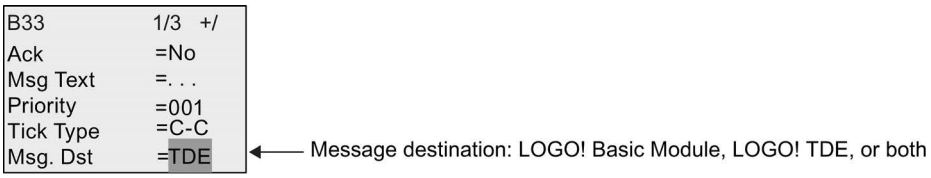
Note

The list of available characters is the same as for the circuit program name. The character set is found in topic Circuit program input (Page 69). When you enter message text from LOGO! Basic, you can only enter characters from the ISO8859-1 character set. To enter text from another language, you must enter the text in LOGO!Soft Comfort.

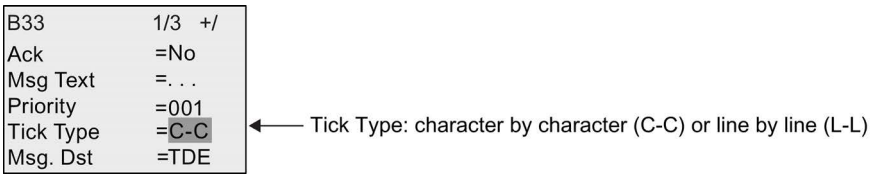
Note that the number of characters per line of message text can be greater than the number of character positions on the LOGO! onboard display.

5. Confirm your entries with **OK**.
6. Press ▶ to position the cursor on the "Priority" line.

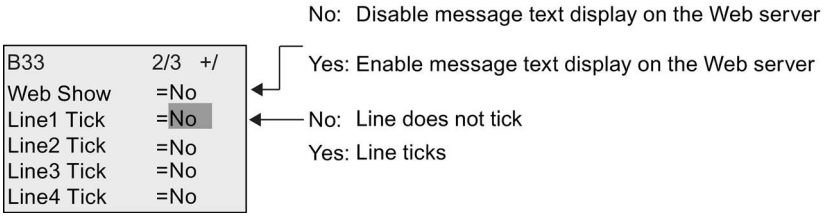
7. Increase the priority by pressing ▲.
8. Press ▶ to position the cursor on the "Msg. Dst" line.



9. Press ▲ or ▼ to toggle through the three choices for message destination: BM, TDE, or Both.
10. Press ◀ to position the cursor on the "Tick Type" line.



11. Press ▲ or ▼ to select either "C-C" or "L-L" for the "Tick Type".
12. Enable or disable ticking for each line of the message text by pressing ▶. LOGO! displays as follows:



13. To choose between "No" and "Yes" to define whether Line 1 ticks, press ▲ or ▼
14. Press ▶ to move the cursor to the second line, and press ▲ or ▼ to choose between "No" and "Yes" for Line 2. Configure line ticking for lines 3, 4, 5 and 6 in the same way as for lines 1 and 2.
15. Position the cursor on the "Web Show" line by pressing ▶. Press ▲ or ▼ to select between "No" and "Yes" for "Web Show".
16. Press **OK** to confirm the complete message text configuration.

Visible parameters or process variables

The following parameters or process variables can be displayed in a message text, as either numerical values or bar-graph representations of values:

Special function	Parameter or process variable visible in a message text
Timers	
On-delay	T, T_a
Off-delay	T, T_a

Special function	Parameter or process variable visible in a message text
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/day
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
Analog differential trigger	On, n, A, B, Ax, Off
Analog comparator	On, Off, A, B, Ax, Ay, nA
Analog watchdog	n, A, B, Ax, Aen
Analog amplifier	A, B, Ax
Analog multiplexer	V1, V2, V3, V4, AQ
Analog ramp	L1, L2, MaxL, StSp, Rate, A, B, AQ
PI controller	SP, Mq, KC, TI, Min, Max, A, B, PV, AQ
Mathematic instruction	V1, V2, V3, V4, AQ
PWM (Pulse Width Modulator)	A, B, T, Ax amplified
Miscellaneous	
Latching relay	-
Pulse relay	-
Message texts	-
Softkey	On/Off
Shift register	-
Analog filter	Sn, Ax, AQ
Max/Min	Mode, Min, Max, Ax, AQ
Average value	Ax, St, Sn, AQ

For timers, a message text can also display the remaining time. "Remaining time" refers to how much time of the parameter setting remains.

Bar graphs can be either horizontal or vertical representations of the current or actual value scaled between the minimum and maximum value. For more information on configuring and displaying bar graphs in message texts, refer to the Online Help for LOGO!Soft Comfort.

Editing message texts

You can only edit simple message texts from LOGO! Basic. You cannot edit message texts that contain features such as bar graphs, I/O status names, and others from LOGO! Basic. You can only edit these types of message texts from LOGO!Soft Comfort.

Also, you **cannot** edit message texts from LOGO! Basic that contain any of the following parameters:

- Par
- Time
- Date
- EnTime
- EnDate
- Analog input
- Digital I/O status
- Special characters (for example: ±, €)

You can only edit such message texts from LOGO!Soft Comfort.

Changing parameters in the active message text

When the message text is active, press **ESC** to select the editing mode.

Note

You must keep the **ESC** key pressed for at least one second.

Press ◀ and ▶ to select the relevant parameter. Press **OK** to change the parameter. Use the ▲ and ▼ keys to edit a parameter.

Confirm your changes with **OK**. You can now edit further parameters in the message text (if any exist). Press **ESC** to exit editing mode.

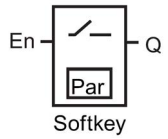
Key input simulation in the active message text

You can enable the four cursor keys C ▲, C ▼, C ◀ and C ▶ in an active message text by pressing **ESC** plus the relevant cursor key.

4.4.26 Softkey

Short description

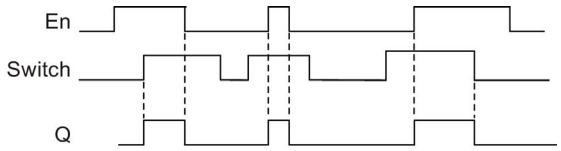
This special function has the effect of a mechanical pushbutton or switch.

Symbol in LOGO!	Wiring	Description
 Softkey	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	Programming mode: Selecting the function for pushbutton action for the duration of one cycle, or for switching action. Start: on or off state, initialized at the first start of the program if retentivity is disabled. Retentivity: / = no retentivity R = the status is retentive. Parameter assignment mode (RUN mode): Switch: switches the momentary pushbutton (switch) on or off.
	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

In parameter assignment mode, the output is set with a signal at input En, if the "Switch" parameter is set to "On" and confirmed with **OK**. Whether the function was configured for pushbutton or switching action is of no concern here.

The output is reset to "0" in the following three cases:

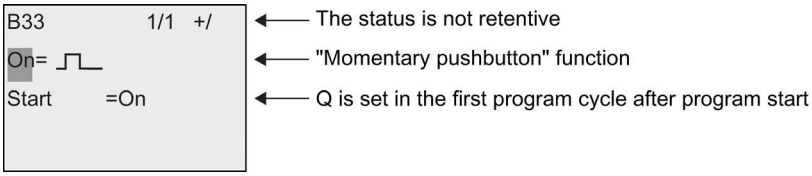
- After a 1 to 0 transition at input En
- When the function was configured for momentary pushbutton action, and one cycle has expired since it was switched on
- When the position "Off" was selected at the "Switch" parameter and confirmed with **OK** in parameter assignment mode

If retentivity is not set, output Q is initialized after a power failure according to your configuration at the "Start" parameter.

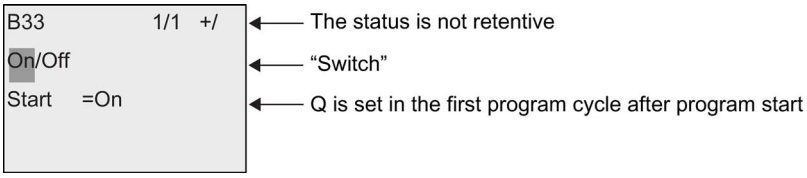
Setting the Par parameter

View in programming mode (example):

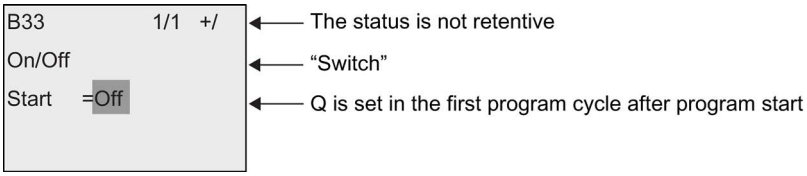
1. Position the cursor on "Par". Press **OK.**
2. Press ▶ to position the cursor on the "On" line.



3. Press **OK**. Select "Momentary pushbutton" or "Switch": Press ▲ or ▼.



4. Press ▶ to move the cursor to "Start" line.
5. To change the "Start" state: Press ▲ or ▼.



6. Confirm your entries with **OK.**

View in parameter assignment mode (example):

Here, you can set or reset the "Switch" parameter (On/Off). When in RUN, LOGO! shows the following display:

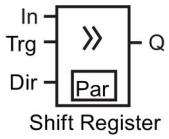
Let us assume you want to set "Switch" (On).

1. Press **OK** (the cursor is now positioned on "Off").
2. To change from "Off" to "On": Press ▲ or ▼.
3. Confirm your entries with **OK.**

4.4.27 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.

Symbol in LOGO!	Wiring	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)
	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.

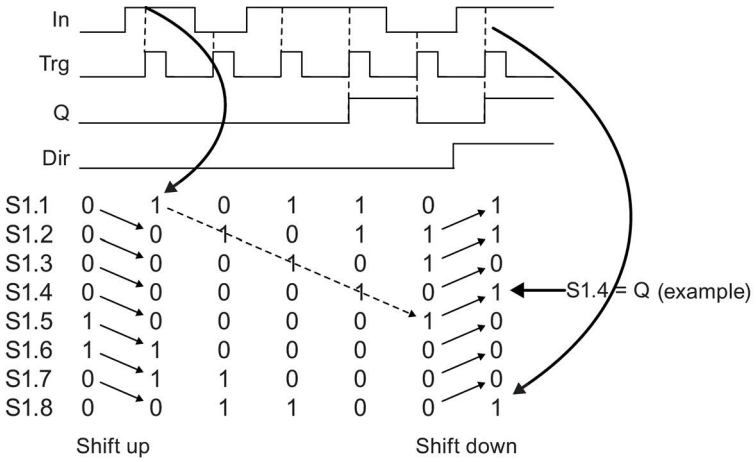
If retentivity is disabled, the shift function restarts at Sx.1 or Sx.8 after a power failure. When enabled, retentivity always applies to all shift register bits.

Note

There are a maximum of four shift register function blocks available for use in the circuit program in LOGO!.

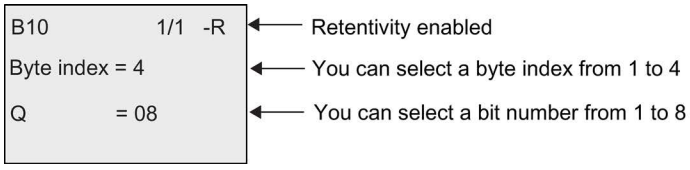
Timing diagram

The timing diagram example for the shift register in LOGO! is shown as follows:



Setting the Par parameter

View in programming mode (example):



The view above indicates that the configured shift register bit is S4.8.

This special function is not available in parameter assignment mode.

4.4.28 Analog multiplexer

Short description

This special function outputs one of four predefined analog values or 0 at the analog output.

Symbol in LOGO!	Wiring	Description
 Analog MUX	Input En	A change in status from 0 to 1 at input En (Enable) switches a parameterized analog value to the output AQ, depending on the value of S1 and S2.
	Inputs S1 and S2	S1 and S2 (selectors) for selecting the analog value to be issued. • S1 = 0 and S2 = 0: value 1 is issued. • S1 = 0 and S2 = 1: value 2 is issued. • S1 = 1 and S2 = 0: value 3 is issued. • S1 = 1 and S2 = 1: value 4 is issued.
	Parameter	V1 to V4: analog values that will be issued. Range of values: -32768 to 32767 p: number of decimals Range of values: 0, 1, 2, 3
	Output AQ	This special function has an analog output. This output can only be connected with analog inputs, analog flags, analog outputs or network analog outputs. Range of values for AQ: -32768 to 32767

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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog multiplexer (actual value AQ)
- Analog filter (Page 232) (actual value AQ)

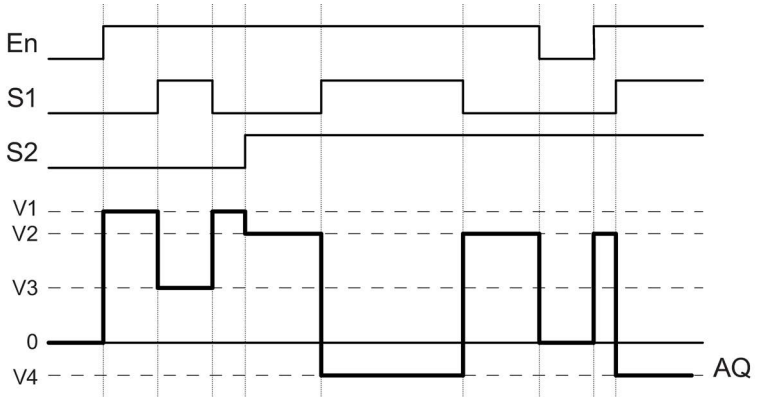
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 136) 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.

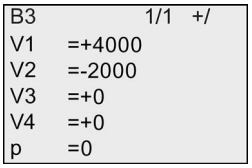
If the input En is not set, then the function issues the analog value 0 at output AQ.

Analog output

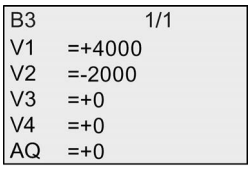
If you interconnect this special function with a real analog output, note that the analog output can only process values between 0 and 1000. To do this, you may need to connect an additional amplifier between the analog output of the special function and the real analog output. Using this amplifier, you standardize the output range of the special function to a value range of 0 to 1000.

Setting the Par parameter

View in programming mode (example):



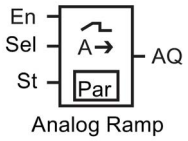
View in parameter assignment mode:



4.4.29 Analog ramp

Short description

This function allows the output to be changed from the current level to the selected level at a specified rate.

Symbol in LOGO!	Wiring	Description
 Analog Ramp	Input En	A change in the status from 0 to 1 at input En (Enable) 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: level 1 is selected. Sel = 1: level 2 is selected. A change in status of Sel causes the current level to start changing to the selected level at the specified rate.
	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.

Symbol in LOGO!	Wiring	Description
	Parameter	Level 1 and Level 2: levels to be reached Range of values for each level: -10000 to 20000 MaxL: maximum value that must not be exceeded under any circumstances. Range of values: -10000 to 20000 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". Range of values: 0 to 20000 Rate: acceleration with which level 1, level 2 or Offset is reached. Steps/seconds are issued. Range of values: 1 to 10000 A: gain Range of values: 0 to 10.00 B: offset Range of values: -10000 to 10000 p: number of decimals Range of values: 0, 1, 2, 3
	Output AQ	Range of values for AQ: 0 to 32767 (Current Level - Offset "B") / Gain "A" Range of values: 0 to 32767 **Note**: When AQ is displayed in parameter mode or message mode, it is displayed as a scaled value, both on the LOGO! Base Module and LOGO!Soft Comfort (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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)

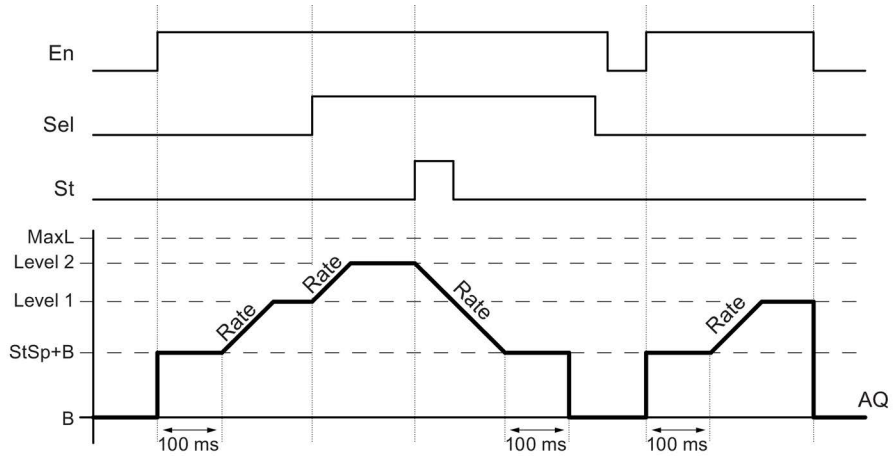
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Analog ramp (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 136) 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



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:

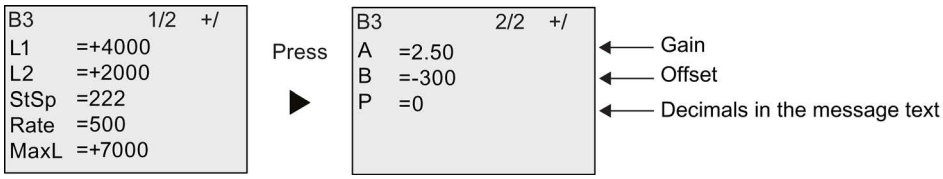
Output AQ = (current level - Offset "B") / Gain "A"

Note

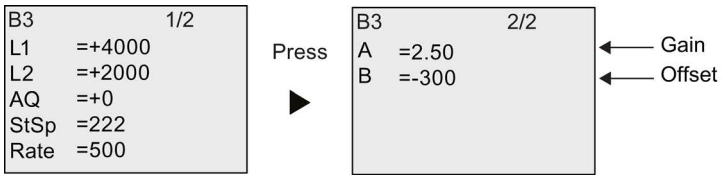
For further information on analog value processing, please refer to the Online Help for LOGO!Soft Comfort.

Setting the Par parameter

View in programming mode (example):



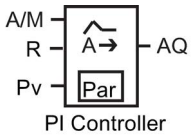
View in parameter assignment mode:



4.4.30 PI controller

Short description

Proportional-action and integral-action controllers. You can use both types of controller individually or combined.

Symbol in LOGO!	Wiring	Description
 PI Controller	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. Output AQ is set to 0.
	Input PV	Analog value: process variable, influences the output
	Parameter	SP: set-value assignment Range of values: -10,000 to 20,000 KC: gain Range of values: 00.00 to 99.99 TI: integral time Range of values: 00:01m to 99:59 m Dir: action direction of the controller Range of values: + or - Mq: value from AQ with manual mode Range of values: 0 to 1,000 Min: minimum value for PV Range of values: -10,000 to 20,000 Max: maximum value for PV Range of values: -10,000 to 20,000 A: gain Range of values: -10.00 to 10.00 B: offset Range of values: -10,000 to 10,000 p: number of decimals Range of values: 0, 1, 2, 3
	Output AQ	This special function has an analog output (= manipulated variable). This output can only be connected with analog inputs, analog flags, analog outputs or network analog outputs. Range of values for AQ: 0 to 1,000

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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- PI controller (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 136) topic.

Parameters KC, TI

Please note the following circumstances:

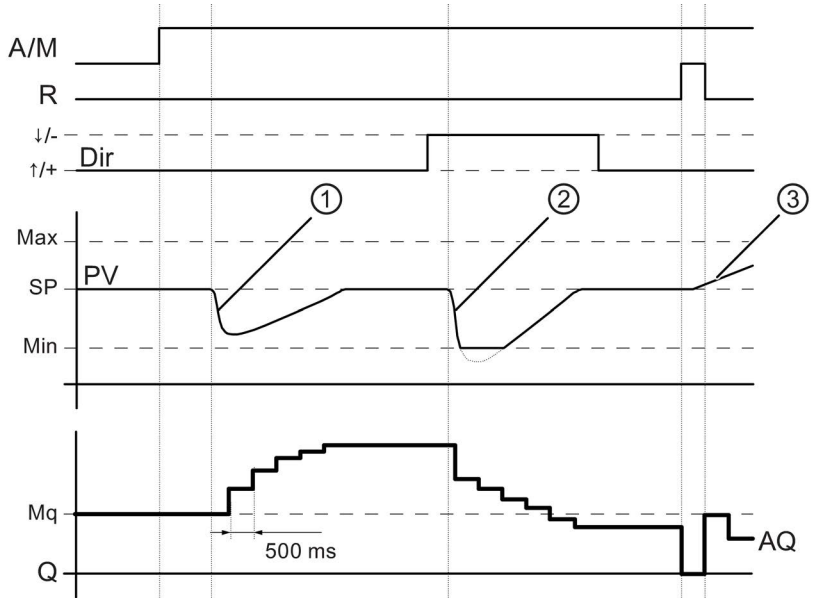
- If parameter KC has value 0, the "P" function (proportional control) will not be executed.
- If parameter TI has value 99:59 m, the "I" function (integral-action control) will not be executed.

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

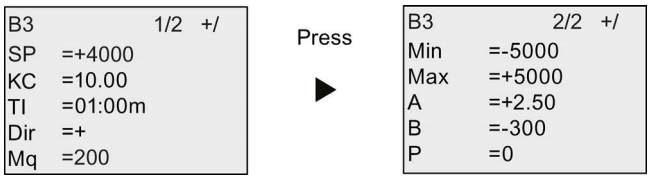
The sampling time is fixed at 500 ms.

Parameter sets

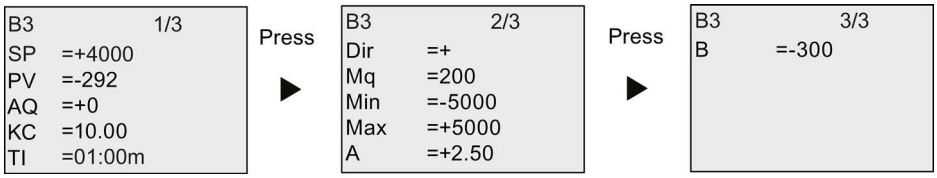
For more information and application examples with application-related parameter sets for KC, TI and Dir, refer to the Online Help for LOGO!Soft Comfort.

Setting the Par parameter

View in programming mode (example):



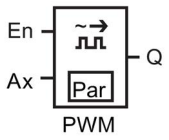
View in parameter assignment mode:



4.4.31 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.

Symbol in LOGO!	Wiring	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.
	Parameter	A: gain Range of values: -10.00 to 10.00 B: zero offset Range of values: 10,000 to 10,000 T: periodic time over which the digital output is modulated p: number of decimals Range of values: 0, 1, 2, 3 Min: Range of values: -20,000 to 20,000 Max: Range of values: -20,000 to 20,000
	Output Q	Q is set or reset for the proportion of each time period according to the proportion of the standardized value Ax to the analog value range.

Parameter T

Note the defaults of the T parameters listed in topic Time response (Page 128).

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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)

- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

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 136) 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

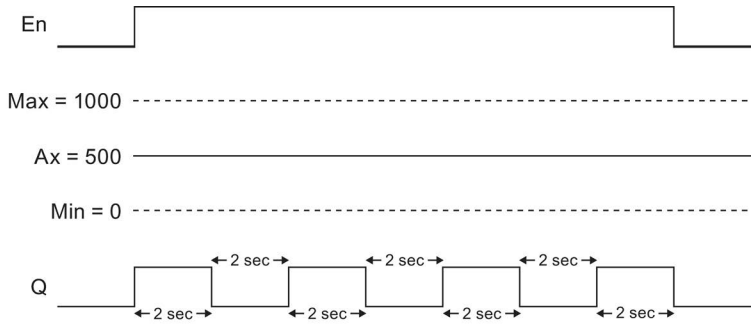
The following examples show how the PWM instruction modulates a digital output signal from the analog input value:

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.

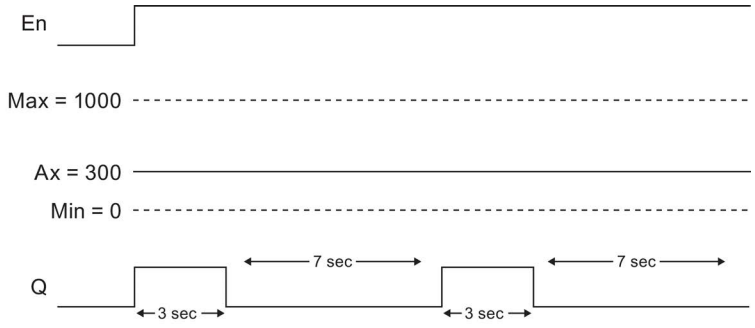


Example 2

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.



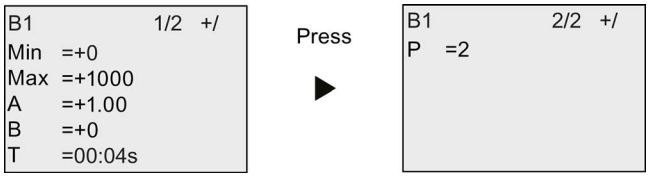
Calculation rule

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.

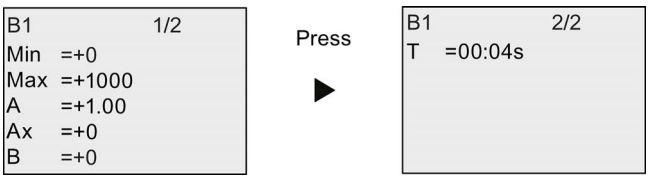
Note: Ax in this calculation refers to the actual value Ax as calculated using the Gain and Offset.

Setting the Par Parameter

The following illustration shows the view in programming mode that corresponds to the first example:



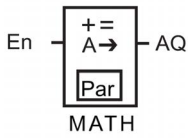
View in parameter assignment mode:



4.4.32 Mathematic instruction

Short description

The mathematic instruction block calculates the value AQ of an equation formed from the user-defined operands and operators.

Symbol in LOGO!	Wiring	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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)

- Analog ramp (Page 216) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- Max/Min (Page 234) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Mathematic instruction (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

Select the required function by the block number. For information on parameter defaults, refer to the On-delay (Page 136) 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

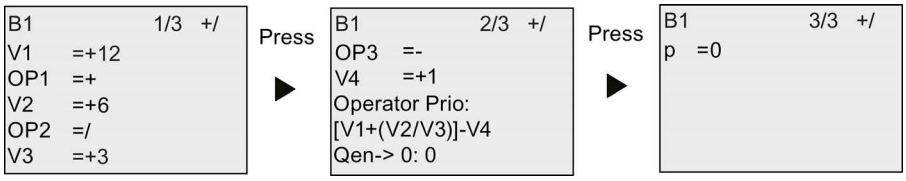
V1	Op1 (Priority)	V2	Op2 (Priority)	V3	Op3 (Priority)	V4
100	(-)	25	/	2	[+]	1

Equation: (100 - 25) / [2 + 1]

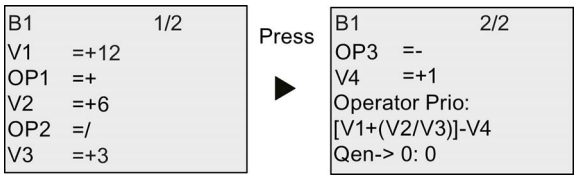
Result: 25

Setting the Par parameter

The following illustration shows the view in programming mode that corresponds to the first example [12 + (6 / 3)] - 1:



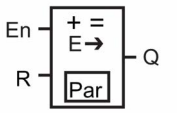
View in parameter assignment mode:



4.4.33 Mathematic instruction error detection

Short description

The mathematic instruction error detection block sets an output if an error has occurred in the referenced Mathematic instruction (Page 227) function block.

Symbol in LOGO!	Wiring	Description
 Math.ErrorDetect	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 Err: ZD: divide by 0 error OF: overflow error ZD/OF: (divide by 0 error) OR (overflow 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. The ZD/OF Err parameter represents the logical OR of the zero division bit and overflow 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.

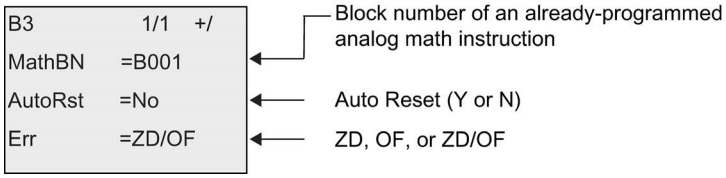
Err	ZD	OF	Q
ZD	1	x	1
ZD	0	x	0
OF	x	1	1
OF	x	0	0
ZD/OF	1	0	1
ZD/OF	0	1	1
ZD/OF	1	1	1
ZD/OF	0	0	0

If the MathBN parameter is null, then the output Q is always 0.

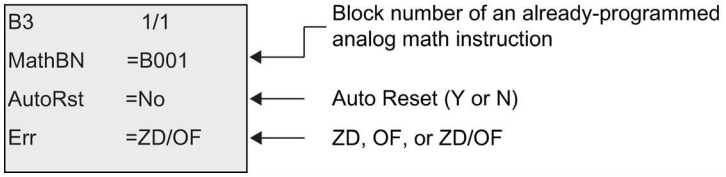
Setting the Par parameter

The parameters MathBN, AutoRst, and Err can be set in programming mode or parameter assignment mode.

View in programming mode (example):



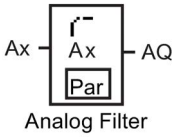
View in parameter assignment mode (example):



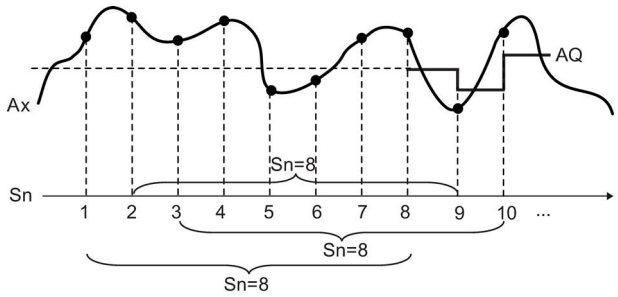
4.4.34 Analog filter

Short description

The analog filter function smooths the analog input signal.

Symbol in LOGO!	Wiring	Description
	Ax	Input Ax is the analog input signal to be smoothed. Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	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 is the average value of input Ax over the current number of samples.
* AI1 to AI8: 0 V to 10 V corresponds with 0 to 1000 (internal value).		

Timing diagram (example)



Functional description

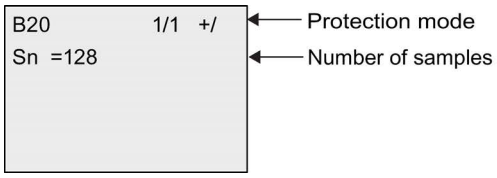
The function fetches the analog signal at input Ax based on the set number of samples (Sn) and outputs the average value.

Note

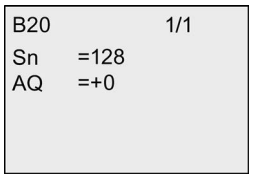
There are a maximum of eight analog filter function blocks available for use in the circuit program in LOGO!.

Setting the Par parameter

View in programming mode (example):



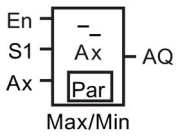
View in parameter assignment mode (example):



4.4.35 Max/Min

Short description

The Max/Min function records the maximum or minimum value of Ax.

Symbol in LOGO!	Wiring	Description
 Max/Min	En	A signal at input En (Enable) outputs an analog value to AQ, depending on the settings of parameters ERst and Mode.
	S1	S1 functions only when the parameter Mode is set to 2. If Mode is set to 2, a change in status from 0 to 1 at input S1 (selector) outputs the maximum value to AQ. If Mode is set to 2, a change in status from 1 to 0 at S1 outputs the minimum value to AQ.
	Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	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: AQ = Actual value of Ax **ERst** (Enable Reset): Possible settings: ERst = 0: disable reset ERst = 1: enable reset Retentivity: / = no retentivity R = the status is retentive
	Output AQ	The function issues a minimum, maximum, or current value at AQ, depending on your configuration.
* AI1 to AI8: 0 V to 10 V corresponds with 0 to 1000 (internal value).		

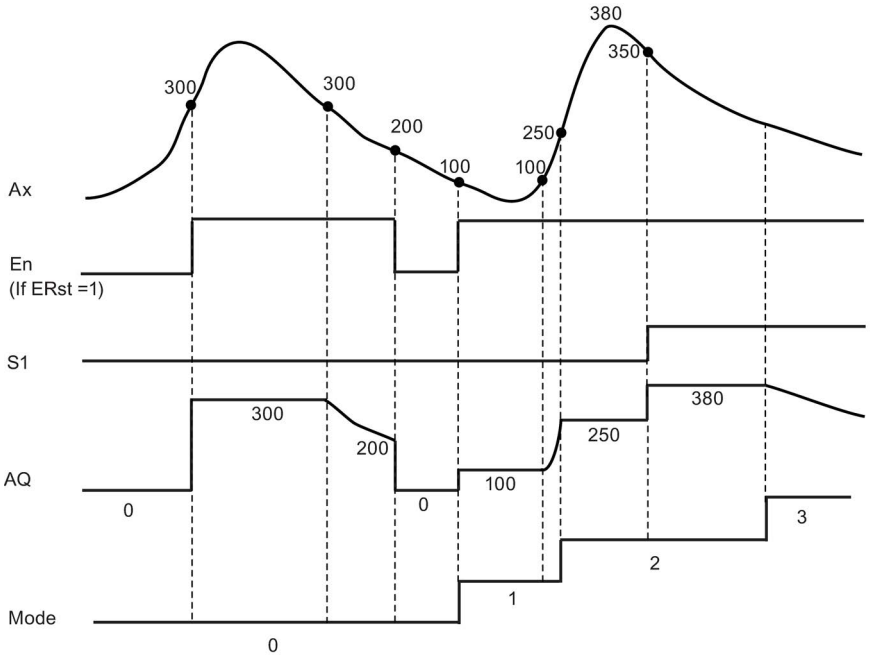
Parameter Mode

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 188) (actual value Ax – Ay)
- Analog threshold trigger (Page 183) (actual value Ax)
- Analog amplifier (Page 195) (actual value Ax)
- Analog multiplexer (Page 213) (actual value AQ)
- Analog ramp (Page 216) (actual value AQ)
- Mathematic instruction (Page 227) (actual value AQ)
- PI controller (Page 220) (actual value AQ)
- Up/down counter (Page 173) (actual value Cnt)
- Analog filter (Page 232) (actual value AQ)
- Average value (Page 237) (actual value AQ)
- On-delay (Page 136) (current time Ta)
- Off-delay (Page 140) (current time Ta)
- On-/off-delay (Page 142) (current time Ta)
- Retentive on-delay (Page 144) (current time Ta)
- Wiping relay (pulse output) (Page 146) (current time Ta)
- Edge-triggered wiping relay (Page 148) (current time Ta)
- Asynchronous pulse generator (Page 150) (current time Ta)
- Stairway lighting switch (Page 154) (current time Ta)
- Multiple function switch (Page 156) (current time Ta)
- Stopwatch (Page 171) (actual value AQ)
- Max/Min (actual value AQ)
- Threshold trigger (Page 180) (actual value Fre)

Select the required function by the block number.

Timing diagram (example)

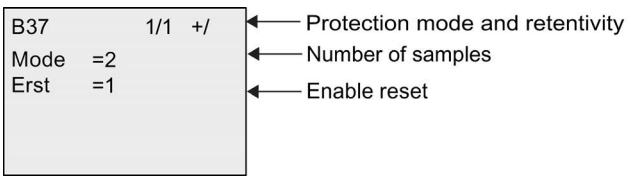


Functional description

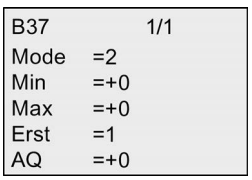
ERst = 1 and En = 0: the function sets the AQ value to 0.
ERst = 1 and En = 1: the function outputs a value at AQ, depending on the settings of Mode and S1.
ERst = 0 and En = 0: the function holds the value of AQ at the current value.
ERst = 0 and En = 1: the function outputs a value at AQ, depending 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.

Setting the Par parameter

View in programming mode (example)



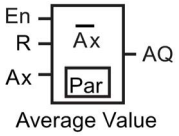
View in parameter assignment mode (example)



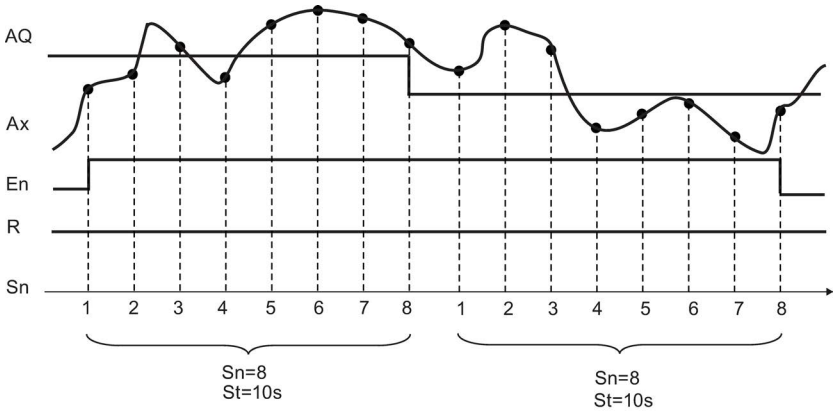
4.4.36 Average value

Short description

The average value function calculates the average value of an analog input over a configured time period.

Symbol in LOGO!	Wiring	Description
 Average Value	En	A change in status from 0 to 1 transition at input En starts the average value function. A change in status from 1 to 0 at input En holds the analog output value.
	R	A signal at input R clears the analog output value.
	Ax	Input Ax is one of the following analog signals: • AI1 to AI8 (*) • AM1 to AM64 • NAI1 to NAI32 • AQ1 to AQ8 • NAQ1 to NAQ16 • Block number of a function with analog output
	Parameter	**St** (Sampling time): you can set the timebase to s (seconds), d (days), h (hours), or m (minutes). Range of values: St = s: 1 to 59 St = d: 1 to 365 St = h: 1 to 23 St = m: 1 to 59 **Sn** (Number of samples): Range of values: St = s: 1 to St*100 St = d: 1 to 32767 St = h: 1 to 32767 St = m and St ≤ 5 minutes: 1 to St*6000 St = m and St ≥ 6 minutes: 1 to 32767 Retentivity: / = no retentivity R = retentivity
	Output AQ	Outputs the average value of input Ax over configured time sampling period.
* AI1 to AI8: 0 V to 10 V corresponds with 0 to 1000 (internal value).		

Timing diagram (example)

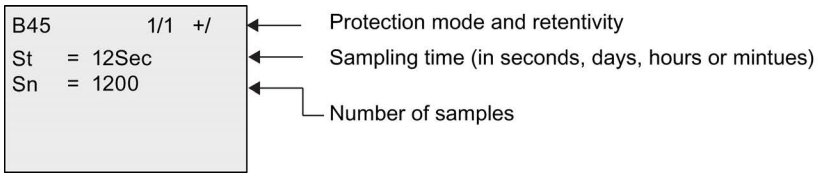


Functional description

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.

Setting the Par parameter

View in programming mode (example):



Web server

5

LOGO! 0BA8 has a built-in Web server which enables you to operate the LOGO! Base Module or the LOGO! TDE from a traditional PC or a mobile device.

In this approach, you can access the LOGO! Base Module or the LOGO! TDE using a connected device (conventional 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! 0BA8 also provides access security control over the Web server. For more information, see section Network access security (Page 279).

5.1 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 user access in LOGO!Soft Comfort according to instructions in the user profile settings of the Online Help for LOGO!Soft Comfort.

Supported network explorers

The LOGO! Web server supports the following Web browsers:

- Microsoft Internet Explorer with minimum version 8.0
- Mozilla Firefox with minimum version 11.0
- Google Chrome with minimum version 16.0
- Apple Safari with minimum version 5.0
- Opera with minimum version 12.0

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