Mini-Controller
ZEN

Features

Expandable Mini-Controller

- 4 different CPU units, up to 3 expansion units
- 5 different expansion units
- Real time clock and calendar function
- Backlit LCD
- Screen menus displayed in 6 languages
- Inputs: 24 VDC or 230 VAC
  Outputs: Relays, 8 A, 250 VAC,
  Transistor 24 VDC, 500 mA
- Programming software optional

Basic data

- Design conforms to
- Contact spacing 4 x 17.5 mm
- Operating temperature:
  25°C..50°C
- 2 analog inputs
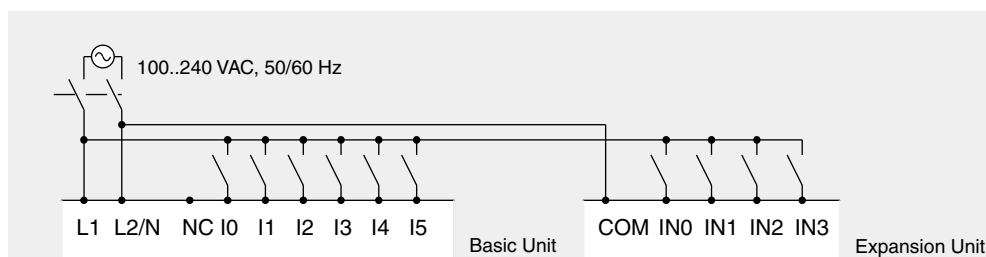 with VDC CPU unit
- Ladder programming

Order information

Basic Unit	Type	Display/Keypad	Clock/Calendar	Output Type	Supply Inputs	Product Label
6 inputs and 4 outputs	DE LUXE	yes	yes	Relay	100..240 VAC	**ZEN-10C1AR-A**
	STINO	no	no	Relay		**ZEN-10C2AR-A**
	DE LUXE	yes	yes	Relay	24 VDC, 2 inputs for analog use	**ZEN-10C1DR-D**
	STINO	no	no	Relay		**ZEN-10C2DR-D**
	DE LUXE	yes	yes	Transistor	24 VDC, 2 inputs for analog use	**ZEN-10C1DT-D**
	STINO	no	no	Transistor		**ZEN-10C2DT-D**

Expansion Units	Inputs	Outputs	Product Label
4 inputs and 4 outputs	4 x 100..240 VAC	4 x relays, 8 A, 250 VAC	**ZEN-8EAR**
4 inputs and 4 outputs	4 x 24 VDC	4 x relays, 8 A, 250 VAC	**ZEN-8EDR**
4 inputs and 4 outputs	4 x 24 VDC	Transistor 500 mA, 24 VDC	**ZEN-8EDT**
4 inputs	4 x 100..240 VAC	–	**ZEN-8EA**
4 inputs	4 x 24 VDC	–	**ZEN-8ED**
4 inputs	–	4 x relays, 8 A, 250 VAC	**ZEN-8ER**

| Accessories and Options		
	EEPROM (for data security and copying)	**ZEN-ME01**
	Battery (keeps time, date and bit values for 10 years at 25° C)	**ZEN-BAT01**
	for the programming software, RS-232C cable, 9-way 'D' connector for PC	**ZEN-CIF01**
	Support Software for WINDOWS (95/98/2000), ME and NT 4.0	**ZEN-SOFT01**

System Setting

Battery Module

Basic Unit

max. 3 expansion units

RS-232C Cable

Support Software

EEPROM Module
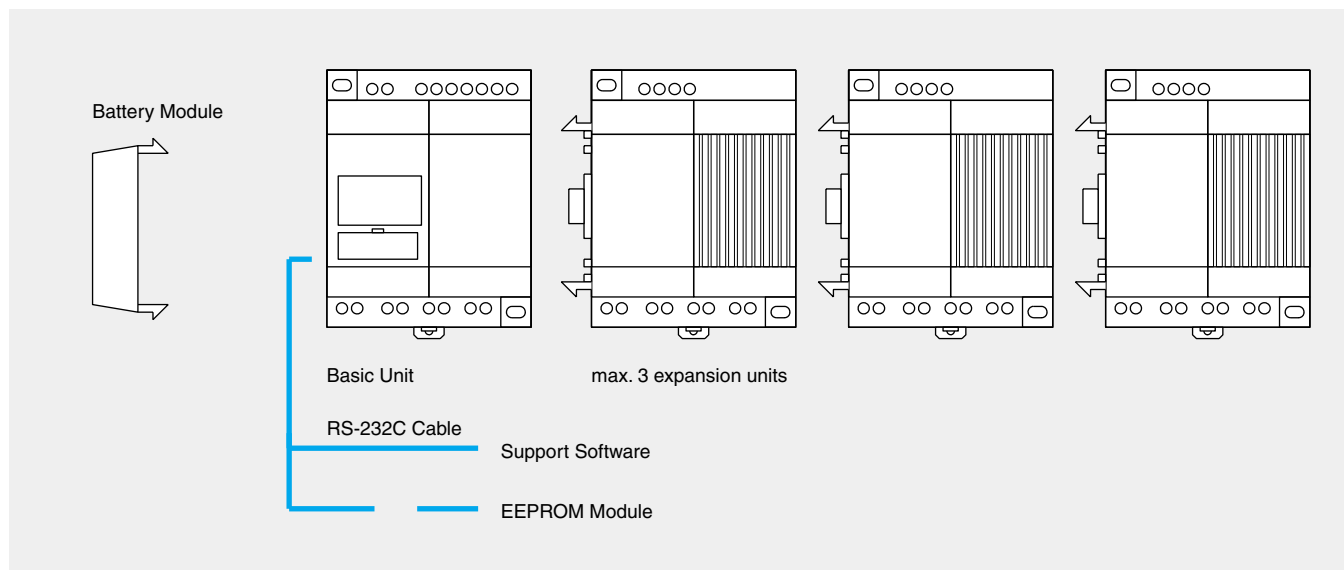
Specifications

Units with AC Inputs

100..240 VAC, 50/60 Hz

L1 L2/N NC I0 I1 I2 I3 I4 I5   Basic Unit

COM IN0 IN1 IN2 IN3   Expansion Unit

|	Basic Unit	Expansion Unit
Rated voltage	100..240 VAC	100..240 VAC
Input impedance	680 kΩ	83 kΩ
Max. switching current	0.15 mA, 100 VAC 0.35 mA, 240 VAC	1.2 mA, 100 VAC 2.9 mA, 240 VAC
ON voltage level	min. 80 VAC	min. 80 VAC
OFF voltage level	max. 25 VAC	max. 25 VAC
ON delay 100 VAC	max. 50 ms or 70 ms (selected by input filter setting)	
240 VAC	max. 100 ms or 120 ms (selected by input filter setting)	
OFF delay 100 VAC	max. 50 ms or 70 ms (selected by input filter setting)	
240 VAC	max. 100 ms or 120 ms (selected by input filter setting)	
Isolation	–	Opto coupler between input terminals and internal signal transfer

Units with DC Inputs

Basic Unit: 24V 0V NC I0 I1 I2 I3 I4 I5
Expansion Unit: COM IN0 IN1 IN2 IN3
24 VDC
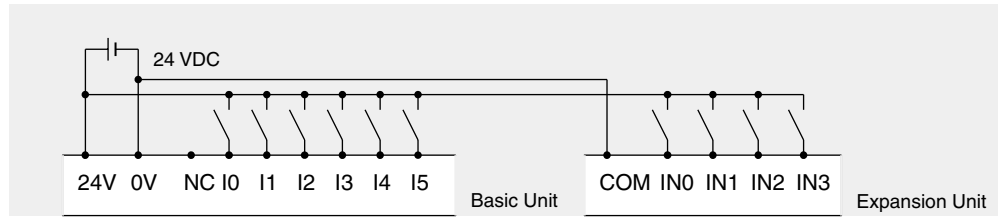
Power supply	24 VDC, +10%..-15%
Input impedance	Basic unit VDC input: 4.8 kΩ Basic unit when using analog signals: 5.0 kΩ Expansion unit: 4.7 kΩ
Input current	5 mA, typical
ON voltage level	min. 16.0 VDC
OFF voltage level	max. 5.0 VDC
ON delay	5 or 50 ms (selected by input filter setting)
OFF delay	max. 15 or 50 ms (selected by input filter setting)

DC inputs used as analog inputs

| Input range	0..10 V
Input impedance	150 kΩ
Resolution	0.1 V, 1/100 of scale range
Accuracy (at -25°..+55°C)	10% of full-scale value
A/D converter display	0..10.5 V

Units with relay outputs

Q1 Q2 Q3 Q3
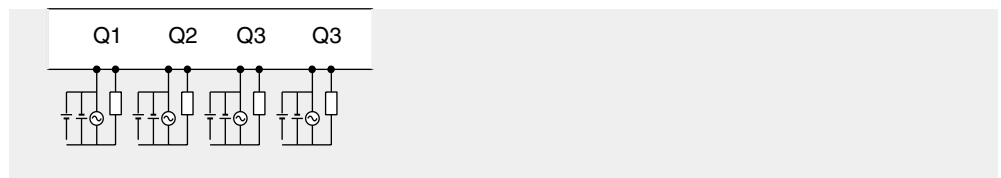
Max. switching capacitance	8 A 240 VAC and 5 A 24 VDC resistive load
Min. switching capacitance	10 mA, 5 VDC
Max. life	electrical: 50,000 operations mechanical: 10,000,000 operations
ON delay	max. 15 ms
OFF delay	max. 5 ms

Units with Transistor Outputs
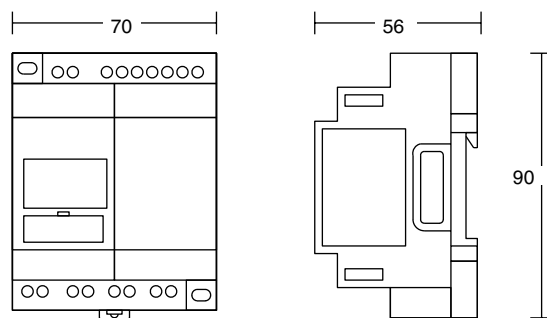
Output Circuit Wiring

0 1 2 3   OUT0 OUT1 OUT2 OUT3
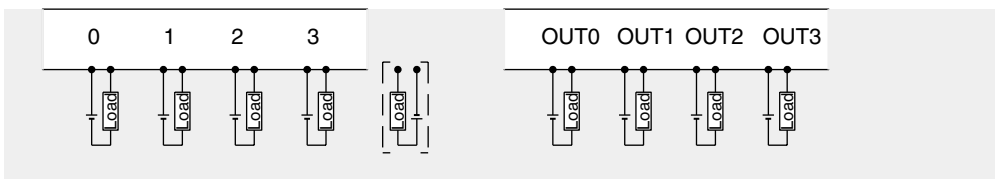
Transistor Output Type

Item	Specifications	Circuit drawing
Maximum switching capacity	24 VDC +10%, -15%, 500 mA	Each Circuit is composed of an independent common circuit
Leakage current	0.1 mA max.	
Residual voltage	1.5V max.	
ON response time	1 ms max.	
OFF response time	1 ms max.	

Internal circuit — OUT / COM or

Progr. Relays

General Data

	ZEN-10C_AR-A	ZEN-10C_DR-D
Rated voltage	100..240 VAC	24 VDC
Operational voltage	85..264 VAC	20.4..26.3 VDC
Power consumption	max. 30 VA	max. 6.5 W
Starting current	max. 40 A	max. 20 A
Insulation resistance	between external AC supply and input terminals and relay output terminals: min. 20 MΩ (at 500 VDC)	
Dielectric test voltage	between external AC supply and input terminals and relay output terminals: 2,300 VAC, 50/60Hz for one minute with a leakage current of 1 mA max.	
EMC	conforms to IEC 61000-4-4, 2 kV (power supply units)	
Vibration resistance	conforms to JIS C0040, 10..57 Hz, 0.075 mm amplitude; 57..1,500 Hz Acceleration: 9.8 m/s2; 80 minutes on X, Y and Z axis (vibration time: 8 min x10 = 80 min)	
Shock resistance	Conforms to JIS C0041, 147 m/s 3x each on X, Y and Z axis	
Ambient temperature	DE LUXE type: 0..55°C STINO type: -25..55°C	
Storage temperature	DE LUXE type: -20..75°C STINO type: -40..75°C	
Environmental conditions	no corrosive fumes	
Ambient humidity	10..90% (with no hoar frost)	

| Control system	programmable
I/O processing	cyclical processing
Programming type	ladder
Program size	96 lines with 3 input and one output condition each
Max. I/O configuration	34 inputs/outputs (basic unit with 6 inputs/outputs and 3 expansion units with 8 inputs/outputs each)
LCD display (DE LUXE type only)	12 alpha/numerical characters in 4 lines, backlit
Command and programming keys (DE LUXE type only)	8 (4 direction and 4 command keys)
Memory protection	- internal EEPROM (or optional EEPROM module), program, parameter settings - internal RAM capacitor-buffered (or optional battery module), holding flag, holding timer and counter positions internal capacitor (or optional battery module), calendar and clock
Timer function (DE LUXE type only)	Real time clock, accuracy: 1..2 min/month (at +25°C)
Terminals	Elevator terminals (for fine or solid wire)
Holding time after power supply failure	ZEN-10C_AR-A: min. 10 ms ZEN-10C_DR-D: min. 2 ms
Weight	max. 300 g

Dimensions (mm)

These dimensions apply for all units.

Bit Functions

|	Symbol	Bit Address	Number	Function	
Basic inputs	I	I0..I5	6	Transfer the external input signals present at the basic units.	
Expansion inputs	X	X0..Xb	12	Transfer the external input signals present at the expansion units.	
Basic outputs	Q	Q0..Q3	4	Transfer the logical circuit states to the output terminals of the basic unit.	
Expansion outputs	Y	Y1..YB	12	Transfer the logical circuit states to the output terminals of the expansion unit.	
Flags	M	M0..Mf	16	For internal program-logic bit processing only.	
Holding flags	H	H0..Hf	16	For internal program-logic bit processing only, but the status (on/off) is stored in the event of a power supply failure	
timers	T	T0..T7	8	X: pickup delay ■: release delay ○: passing make contact F: clock generator	Functions selected in the display that allows parameter setting
Holding timers	#	#0..#3	4	Holds the last intermediate time before the power supply failure or the release of the start signal. The time continues to run towards the setpoint when the power supply or start signal returns.	
Counters	C	C0..C7	8	Up/down counter	
Weekly timer	@	@0..@7	8	Switches on certain days and at certain times.	
Calendar	*	*0..*7	8	Switches independently of the date.	
Display function	D	D0..D7	8	Displays any desired character strings with time and counter actual values or AD-converted data.	
Analog comparator	A	A0..A4	4	The analog value is evaluated with these bits in the comparator (ZEN-10C_DR-D only).	
Timer/counter comparator	P	P0..P1	16	Compares the actual values of timers (T), holding timers (#) and counters (C) with each other or with a constant.	
Command keys	B	B0..B7	8	In RUN mode the integral command keys generate an "ON" signal in the program (DE LUXE type only).	

Description of Functions

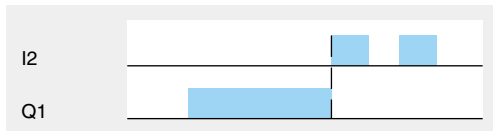**[: normal**

I0
—| |—— [Q0
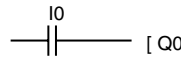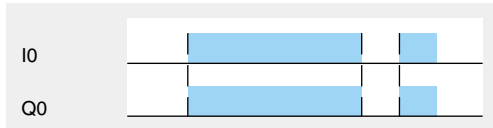
Q0 switches to ON or OFF depending on the status of I0.

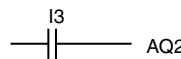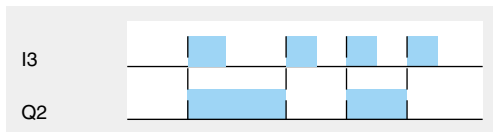**S: set**

I1
—| |—— SQ1
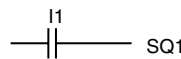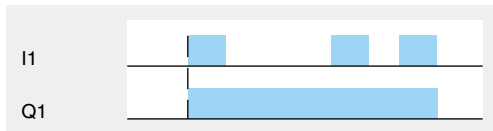
Q1 is set to ON when I1 switches to ON. A reset signal is required to switch Q1 off.

R: reset

I2
—| |—— RQ1
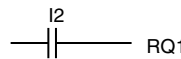
Q1 is set to OFF when I2 switches to ON.

A: alternative

I3
—| |—— AQ2
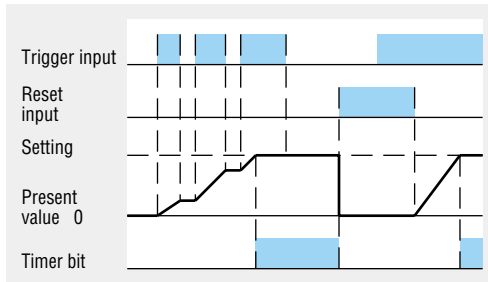
Q2 changes its status at the leading edge of the I3 signal (ON).

Use of the timer and holding timer

Holding timer (#0..#3)

| Trigger input |
| Reset input |
| Setting |
| Present value 0 |
| Timer bit |

X:
Pickup delay only
Switches ON when the trigger signal is applied and the setting is reached. If the trigger signal is interrupted the present value is saved, then timing out resumes when the signal returns.
Application:
For time delays (e.g.: mixing and metering operations)

Timers (T0..T7)

| Trigger input |
| Reset input |
| Setting |
| Present value 0 |
| Timer bit |
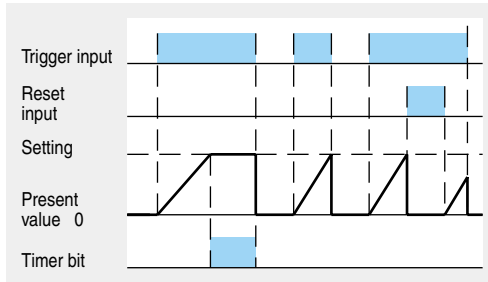
X:
Pickup delay
Switches ON when the trigger signal is applied and the setting is reached. The timer is reset when the trigger signal is interrupted.
Application:
For time delays (e.g.: automatic doors or locks)

Timers (T0..T7)

| Trigger input |
| Reset input |
| Setting |
| Present value 0 |
| Timer bit |
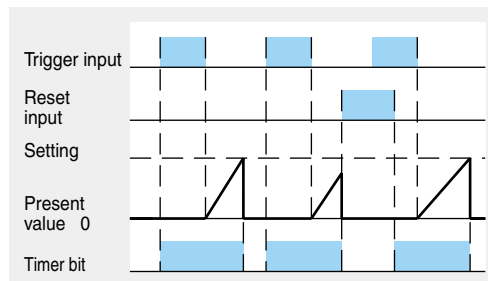
■:
Release delay (RV)
Switches ON at the leading edge of the trigger signal and OFF when the setting is reached.
Application:
For OFF delays (e.g.: lights, fans)

Timers (T0..T7)

| Trigger input |
| Reset input |
| Setting |
| Present value 0 |
| Timer bit |
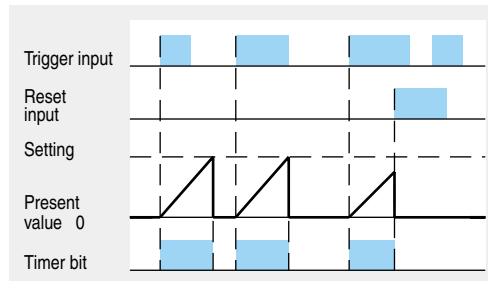
○:
Passing make contact (EW)
The leading edge of the trigger signal switches the timer bit ON; it switches OFF again when the preset time has timed out whether or not the trigger signal is present.
Application:
For starting and stopping operations (e.g.: motors, lights)

Timers (T0..T7)

| Trigger input |
| Reset input |
| Setting |
| Present value 0 |
| Timer bit |
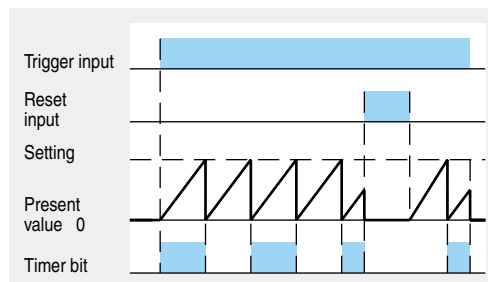
F:
Clock generator, starts on space (TP)
When the trigger signal is applied the timer is switched ON and OFF according to the preset time (mark-to-space ratio 1:1)
Application:
For visual or audible signalling
(f. e.: emergencies, faults)

Counter functions

| I0, Up/Down Input |
| I1, Count input |
| I2, Reset input |
| Setting |
| Present value 0000 |
| C0, Counter timer bit |
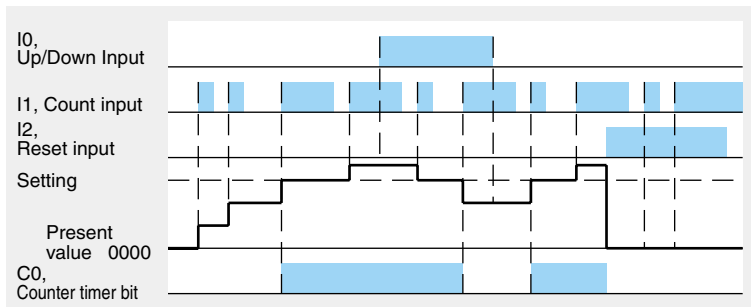
The counter's timer bit switches ON (C0) when the counter has reached the setting. Applying the reset signal suppresses counting pulses and the present value is set to "ZERO". The count is saved if the supply fails or is isolated.

Weekly timer

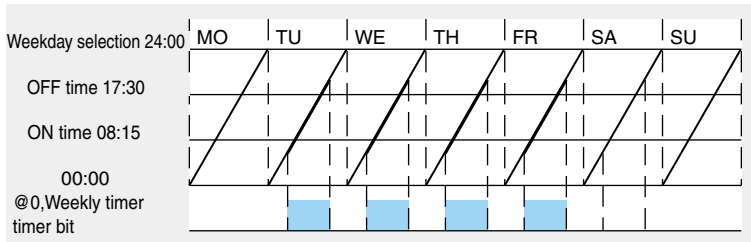| Weekday selection 24:00 | MO | TU | WE | TH | FR | SA | SU |
| OFF time 17:30 |
| ON time 08:15 |
| 00:00 |
| @0,Weekly timer timer bit |

Timer bit @0 switches ON between 08:15 and 17:30, every week Th to Fr.

Calendar

| 31 Dec. |
| 31 Aug. |
| 01 April |
| 01 Jan. |
| *0, Calendar timer bit |
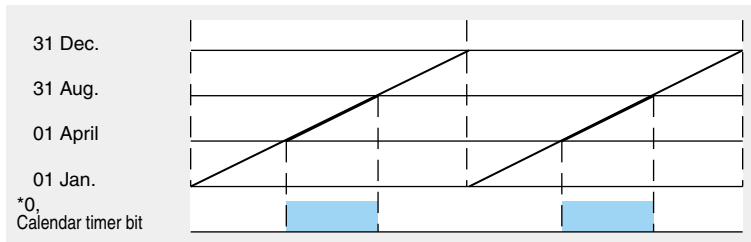
Timer bit *0 switches ON between 1 April and 31 August.

Example of analog comparator

a) Setting 10,0 / 5,2 / 0,0 — Input 1 — 0,0 10.0 V Input Voltage — A0 bit

b) Setting 10,0 / 0,0 — Input 1 Input 2 — A1 bit — Time
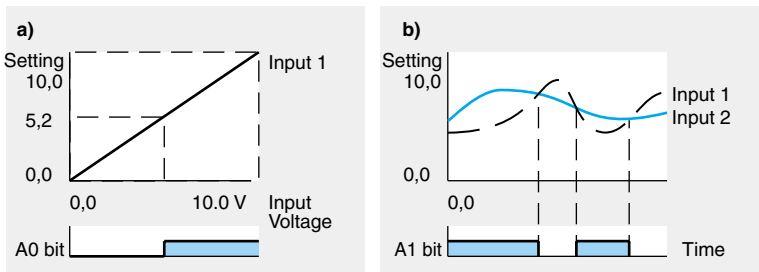
a) When input 1 ≥5.2 V (I4, converted display)
b) When input 1 ≤ input 2
   Input 1 (I4, converted display)
   Input 2 (I5, converted display)

Timer/counter comparator

a) Setting 99.99 / 12.20 / 00.00 — 12 min 20 s — A0 bit — Process value

b) Setting 9999 / 0000 / 0,0 — Counter 1 Counter 2 — P1 bit
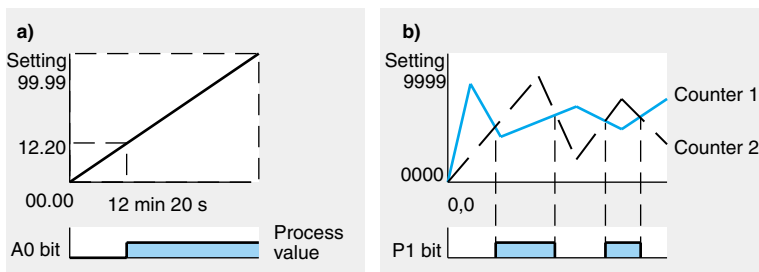
a) When timer 0 (T0) ≥12 min 20 s
b) When counter 1 (C1) ≤ counter 2 (C2)

Display Symbology

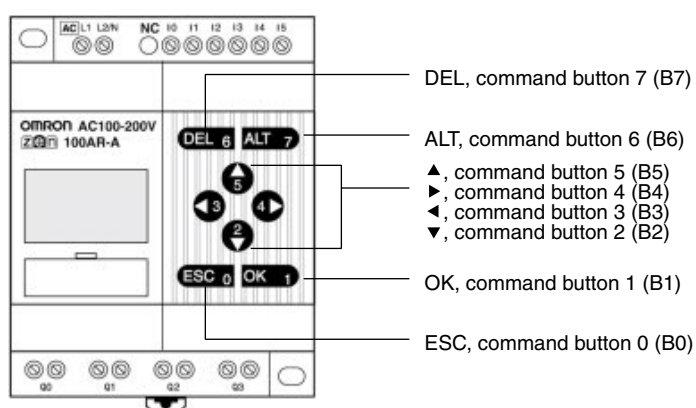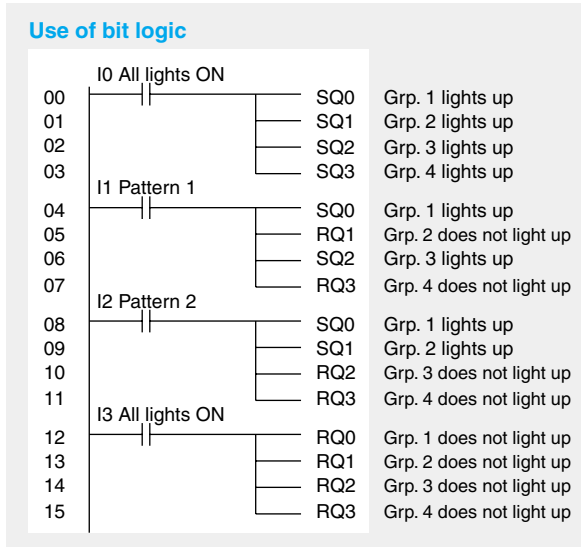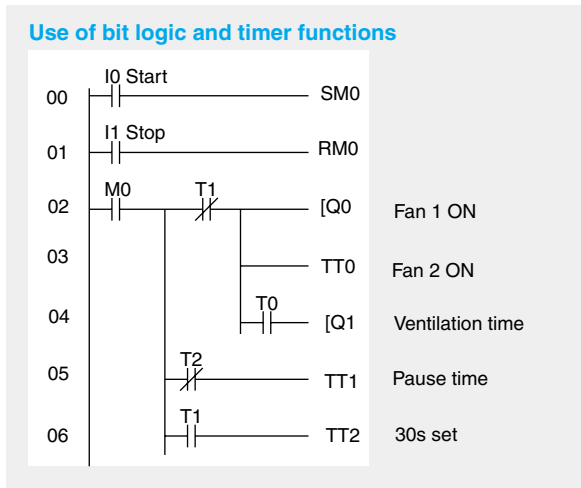| Setting of the backlighting	L0: Backlighting stays OFF / automatic display OFF L1: Backlighting switches ON / automatic display OFF L2: Backlight stays OFF / automatic display ON L3: Backlighting switches ON / automatic display ON	
Start position display	X (digit) 00..11 Y (line) 0..3	
Display options	CHR	Character (up to 12 alpha/numerical characters and symbols)
	DAT	Month/day (5 digits [transfer characters from original])
	CLK	Hour/minute (5 digits [transfer characters from original])
	I14..I15	A/D-converted values (4 digits [transfer characters from original])
	T0..Tf	Timer actual value (5 digits [transfer characters from original])
	#0..#7	Holding timer actual value (5 digits [transfer characters from original])
	C0..C1	Counter actual value (4 digits [transfer characters from original])
Monitoring	A: Online data are displayed D: Online data are not displayed	

Bit Assignment of Buttons

DEL, command button 7 (B7)

ALT, command button 6 (B6)

▲, command button 5 (B5)
▶, command button 4 (B4)
◀, command button 3 (B3)
▼, command button 2 (B2)

OK, command button 1 (B1)

ESC, command button 0 (B0)

Applications

Switching On and Off of lighting and lighting groups

Use of bit logic

	I0 All lights ON	
00	⊣├ ── SQ0	Grp. 1 lights up
01	── SQ1	Grp. 2 lights up
02	── SQ2	Grp. 3 lights up
03	── SQ3	Grp. 4 lights up
	I1 Pattern 1	
04	⊣├ ── SQ0	Grp. 1 lights up
05	── RQ1	Grp. 2 does not light up
06	── SQ2	Grp. 3 lights up
07	── RQ3	Grp. 4 does not light up
	I2 Pattern 2	
08	⊣├ ── SQ0	Grp. 1 lights up
09	── SQ1	Grp. 2 lights up
10	── RQ2	Grp. 3 does not light up
11	── RQ3	Grp. 4 does not light up
	I3 All lights ON	
12	⊣├ ── RQ0	Grp. 1 does not light up
13	── RQ1	Grp. 2 does not light up
14	── RQ2	Grp. 3 does not light up
15	── RQ3	Grp. 4 does not light up

Adapts lighting to prevailing lighting conditions; light adaption saves energy.
Switch 1 (I0) is ON,
- All lights light up
Switch 2 (I1) is ON,
- Lighting groups 1 and 3 are on
Switch 3 (I2) is ON,
- Lighting groups 1 and 2 are on
Switch 4 (I3) is ON,
- All lights go out

Controlling air circulation in greenhouses

Use of bit logic and timer functions

	I0 Start	
00	⊣├ ── SM0	
	I1 Stop	
01	⊣├ ── RM0	
	M0 T1	
02	⊣├──┤/├ ── [Q0	Fan 1 ON
03	── TT0	Fan 2 ON
	T0	
04	┤├ ── [Q1	Ventilation time
	T2	
05	┤/├ ── TT1	Pause time
	T1	
06	┤├ ── TT2	30s set

ZEN being used to circulate carbon dioxide or warm air. Two fans operate at preset intervals. The starting current for the fans can be reduced by staggered starting. When START is operated, Fan 1 starts first followed 30 seconds later by Fan 2. A repeat cycle of 1 hour air circulation and 1½ hour pause starts.

Parameter Settings

Start time setting T0

T0	X	S	A
TRO			
RES		30.00	

30 secs set

Ventilation time setting T1

T0	X	H : M	A
TRO			
RES		01.00	

1 hr set

Pause duration setting T2

T0	X	H : M	A
TRO			
RES		01.30	

1½ hrs set

Coin-operated car wash

Use of bit logic and timer functions
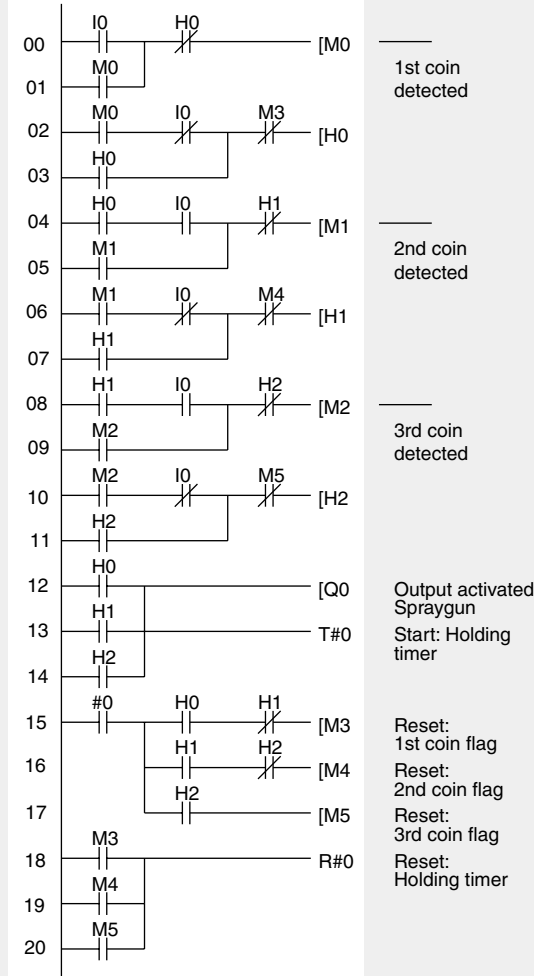
The running time can be varied according to the number of coins. When the holding timers (#) are used with the holding flags (H), the residual spray time is not reset if the supply is unexpectedly interrupted.
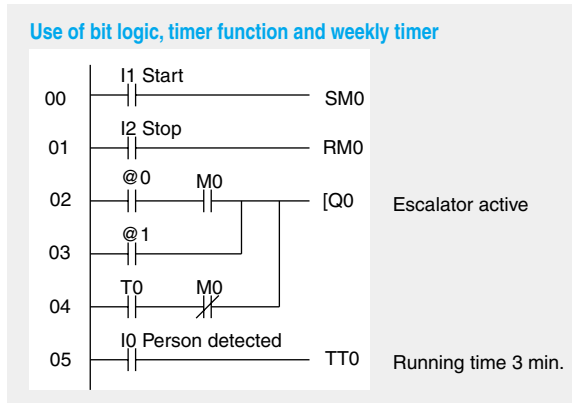
- The spray function operates for 3 minutes per coin

Parameter Settings

Holding timer #0

#0	X	M : S	A
TRG			
RES		03 : 00	

3 min. set

Escalator

Use of bit logic, timer function and weekly timer

00	I1 Start ⊣ ⊢	SM0
01	I2 Stop ⊣ ⊢	RM0
02	@0 M0 ⊣ ⊢ ⊣ ⊢	[Q0 Escalator active
03	@1 ⊣ ⊢	
04	T0 M0 ⊣ ⊢ ⊣/⊢	
05	I0 Person detected ⊣ ⊢	TT0 Running time 3 min.

An escalator can be operated at certain times and on certain days. To save energy, the escalator can be set in motion by a sensor detecting a passenger.
2 weekly timers can run an escalator on working days between 07:00-10:00 h and 17:00-22:00 h.
Outside these times the escalator is run for three minutes when a passenger is detected.

Parameter Settings

Weekly timer @0
(Mo-Fr: 07:00 - 10:00 h)

#0	MO-FR	A
	ON	07 : 00
RES	OFF	10 : 00

Weekly timer @1
(Mo-Fr: 17:00 - 22:00 h)

#1	MO-FR	A
	ON	17 : 00
RES	OFF	22 : 00

OFF delay
Timer T0

T0	n	M : S	A
TRG			
RES		03.00	

Other applications

Automatic door and gate opening
For automatic opening and closing at certain times/on certain days.

Illumination for dispensers
Continuous illumination of the dispensers at certain times or according to use.

Monitoring and control of levels in water tanks
ZEN monitors the water level depending on a capacitive measuring system.

Automatic pre-heating of soldering machines
Soldering can commence as soon as the shift starts, so no working time is wasted.