

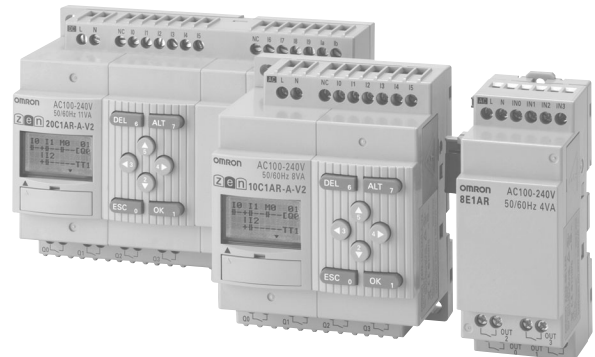
# Programmable Relay ZEN V2 Units

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments. Refer to "Warranty and Application Considerations" on page 36, and "Precautions for Safe Use" on page 34.

## Even Broader Applications with Increased Functionality and Higher Precision

- Increased functionality in a compact body (70 mm wide × 90 mm high).
- Easy programming is available using the LCD and operation buttons. (See note 1.)
- This single Unit easily provides relay, timer, counter, and time switch functions.
- Expansion is easy with Expansion I/O Units, allowing up to 44 I/O points. (See note 2.)
- Economy-type and Communications-type CPU Units have been added to series.
- Improved Weekly Timers (See note 1.)  
Increased timing accuracy with a monthly deviation of ±15 s max. Multiple-day operation and pulse output operation have been added.
- Select from two power supply options:  
100 to 240 VAC or 12 to 24 VDC.

**Note:** 1. Not supported for ZEN-□C2□□-□-V2 models.  
2. When using CPU Units with 20 I/O points.



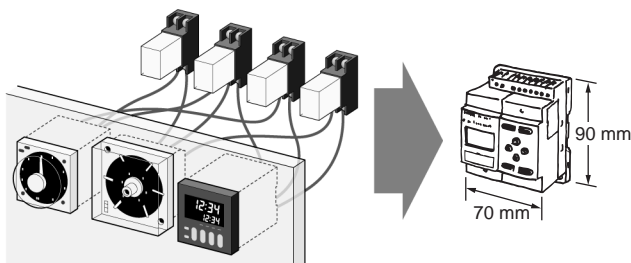
The information in this document applies to V2 Units. Refer to page 28 for details on differences with previous products.

## Features

### ■ Easy and Simple Programming for Automatic Small-scale Control

#### Saves Space, Wiring, and Installation Steps

- Versatile functionality in a compact body (70 mm wide × 90 mm high).
- This single Unit easily provides relay, timer, counter, and time switch functions. Wiring work is greatly reduced because separate wiring is not required for devices such as timers and counters.



#### Easy Programming

The LCD screen comes with 8 operation buttons on the front panel to enable programming in ladder view format. The LCD screen also has a backlight, making it easier to see when the ZEN is used in dark locations.

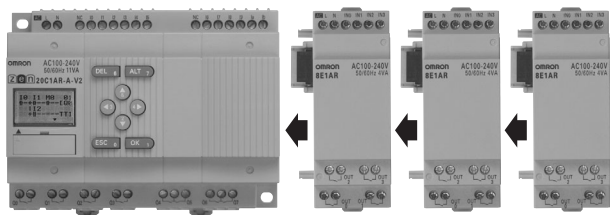
**Note:** Not supported for ZEN-□C2□□-□-V2 models.



## Flexible Expansion Enables Up to 44 I/O Points

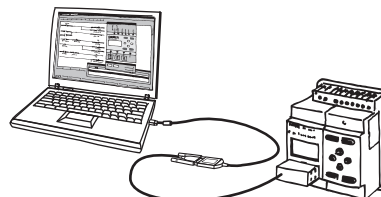
Up to three Expansion I/O Units can be connected if there are not enough I/O points. Expansion I/O Units are only 35 mm wide.

**Note:** CPU Units with 10 I/O points can be expanded to 34 I/O points. Expansion I/O Units cannot be connected to Economy-type CPU Units.



## Support Software with Simulation Function

- Programs can be easily written, saved, and monitored by personal computer.
- Programs can be simulated on the personal computer without connecting to the ZEN.



**Note:** For notebook computers that do not have an RS-232C serial port, connect the computer to the ZEN by connecting an OMRON CS1W-CIF31 USB-Serial Conversion Cable to the ZEN-CIF01 Connecting Cable.

## Other Versatile Functions

- Use of a Memory Cassette makes it easy to copy and save programs.
- Equipped with two analog input channels (CPU Units with DC power supply only).
- Password function ensures security. (See note.)
- Multi-language display in six languages (English, Japanese, German, French, Spanish, Italian). (See note.)
- Display user-set messages or analog-converted values. (See note.)

**Note:** Not supported for ZEN-C2□□-□-V2 models.

## Enhanced Features of V2 CPU Units

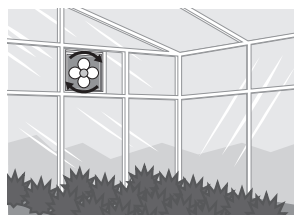
### Improved Weekly Timer and Calendar Timer Functions

**Note:** Not supported for ZEN-C2□□-□-V2 models.

- The time precision has been increased.  
Conventional model: 2-min difference/month  
↓  
-V2 models: ±15-s difference/month (at 25°C)
- Multiple-day operation and pulse-output operation are now possible.
- These improved functions are convenient for time-controlled applications such as lighting and air conditioning control.



Lighting control



Air conditioning control

### Economy-type Added to the Series

- Economy-type CPU Units with a more affordable price have been added to the series, although Expansion I/O Units cannot be added.

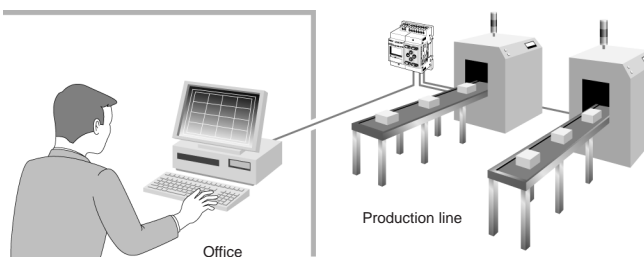
### 12 to 24 VDC Line Voltage Operation

Operation is now possible with 12 VDC.

Expansion I/O Units have been reduced to half-size (35 mm wide).

### RS-485 Communications Model Added to Series

Production line conditions can be remotely monitored by monitoring the ZEN control status.



### More Precise Analog Input

Conventional model: ± 10% FS → -V2 models: ± 1.5% FS  
DC power supply models are equipped with two analog inputs (0 to 10 V). There are four analog comparators. The increased precision makes it even easier to use the Unit in simple control applications with voltage, current, temperature, and other analog values.

### 8-digit Counter, 150-Hz Counter

- An 8-digit counter and 8-digit comparator have been added.
- The maximum count for DC power supply models is 150 Hz.

### Twin-timer Operation Added

Twin-timer operation allows you to set ON and OFF times separately, greatly simplifying intermittent operation.

# Model Number Structure

## Model Number Legend

**Note:** This model number legend includes combinations that are not available.  
Please check "List of Models" for availability.

### CPU Units

ZEN-□C□□□□-□-V2  
1 2 3 4 5

#### 1. Number of I/O points

- 10: 6 inputs and 4 outputs (See note.)
- 20: 12 inputs and 8 outputs

#### 2. Type classifier

- 1: Standard LCD type with display
- 2: LED type without display
- 3: Economy type with display  
(Expansion I/O Units cannot be connected.)
- 4: Communications type with display

**Note:** The Communications-type CPU Unit has 6 inputs and 3 outputs.

#### 3. Input type

- A: AC input
- D: DC input

#### 4. Output type

- R: Relay
- T: Transistor

#### 5. Supply voltage

- A: AC power supply
- D: DC power supply

### Expansion I/O Units

ZEN-8E1□□  
1 2 3 4

#### 1. Number of I/O points

- 8: 4 inputs and 4 outputs

#### 2. Unit version classifier

- E1: Can connect to V2 CPU Units (See note.)

#### 3. Input type

- A: AC input
- D: DC input

#### 4. Output type

- R: Relay
- T: Transistor

**Note:** Use a ZEN-8E□□/-4E□ to connect to pre-V1 and V1 CPU Units.

This data sheet is provided as a guideline for selecting products. Be sure to refer to the following user manuals for application precautions and other information required for operation before attempting to use the product.

ZEN Operation Manual (Cat. No. Z211)

ZEN Communications Manual (Cat. No. Z212)

ZEN Support Software Operation Manual (Cat. No. Z184-E1-03)

The PDF versions of these manuals can be downloaded from the following website.

ZEN Website <http://www.zen.omron.co.jp/eng/index.html>

# Ordering Information

## ■ List of Models

### CPU Units and Expansion I/O Units

Unit	Name	No. of I/O points	LCD display	Power supply voltage	Inputs		Outputs		Buttons, calendar, and clock	Analog input	Model
CPU Units	Standard LCD type	10	Yes	100 to 240 VAC	6	100 to 240 VAC	4	Relays	Yes	No	ZEN-10C1AR-A-V2
				12 to 24 VDC		12 to 24 VDC		Transistors		Yes	ZEN-10C1DR-D-V2
											ZEN-10C1DT-D-V2
		20		100 to 240 VAC	12	100 to 240 VAC	8	Relays		No	ZEN-20C1AR-A-V2
				12 to 24 VDC		12 to 24 VDC		Transistors		Yes	ZEN-20C1DR-D-V2
											ZEN-20C1DT-D-V2
	LED type without display (See note 1.)	10	No	100 to 240 VAC	6	100 to 240 VAC	4	Relays	No	No	ZEN-10C2AR-A-V2
				12 to 24 VDC		12 to 24 VDC		Transistors		Yes	ZEN-10C2DR-D-V2
											ZEN-10C2DT-D-V2
		20		100 to 240 VAC	12	100 to 240V AC	8	Relays		No	ZEN-20C2AR-A-V2
				12 to 24 VDC		12 to 24 VDC		Transistors		Yes	ZEN-20C2DR-D-V2
											ZEN-20C2DT-D-V2
Economy type (Expansion I/O Units cannot be connected)	10	Yes	100 to 240 VAC	6	100 to 240 VAC	4	Relays	Yes	No	ZEN-10C3AR-A-V2	
			12 to 24 VDC		12 to 24 VDC				Yes	ZEN-10C3DR-D-V2	
	20		100 to 240 VAC	12	100 to 240 VAC	8	Relays		No	ZEN-20C3AR-A-V2	
			12 to 24 VDC		12 to 24 VDC				Yes	ZEN-20C3DR-D-V2	
Communications type	9		100 to 240 VAC	6	100 to 240 VAC	3	Relays		No	ZEN-10C4AR-A-V2	
			12 to 24 VDC		12 to 24 VDC				Yes	ZEN-10C4DR-D-V2	
ZEN Kit		Set containing CPU Unit (ZEN-10C1AR-A-V2), Connecting Cable, ZEN Support Software, and manual.									ZEN-STARTER01-V2
		Set containing CPU Unit (ZEN-10C1DR-D-V2), Connecting Cable, ZEN Support Software, and manual.									ZEN-STARTER02-V2
Expansion I/O Units	8	---	100 to 240 VAC	4	100 to 240 VAC	4	Relays	---			ZEN-8E1AR (See notes 2, 3.)
			12 to 24 VDC		12 to 24 VDC						ZEN-8E1DR (See note 2.)
			---				Transistors				ZEN-8E1DT (See note 2.)

- Note:**
1. Programming is not possible using only the CPU in the LED-type CPU Unit. ZEN Support Software or a Memory Cassette is required.
  2. Cannot be connected to pre-V1 and V1 CPU Units.
  3. The ZEN-8E1AR cannot be connected to a CPU Unit with DC power supply.

### Power Supply Unit

Power ratings	Input voltage	Output voltage	Output current	Model
30 W	100 to 240 VAC	24 VDC	1.3 A	ZEN-PA03024

**Note:** Refer to the *ZEN-PA03024 Datasheet* (Cat. No. L103) for detailed specifications.

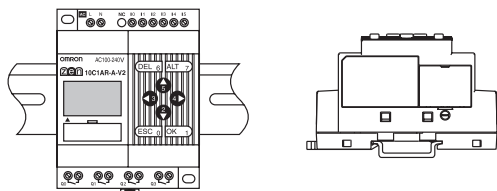
# Specifications

## ■ Ratings

Item	Specification	
	ZEN-□C□AR-A-V2/ZEN-8E1AR	ZEN-□C□D□-D-V2/ZEN-8E1D□
<b>Rated supply voltage</b>	100 to 240 VAC, 50/60 Hz	12 to 24 VDC (DC ripple rate: 5% max.)
<b>Operating voltage range</b>	85 to 264 VAC	10.8 to 28.8 VDC
<b>Power consumption</b>	<p>CPU Units without Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-10C1AR-A-V2/ZEN-10C2AR-A-V2/ ZEN-10C3AR-A-V2 100 V AC: 5 VA max. 240 V AC: 7 VA max.</li> <li>• ZEN-10C4AR-A-V2 100 V AC: 6 VA max. 240 V AC: 8 VA max.</li> <li>• ZEN-20C□AR-A-V2 100 V AC: 7 VA max. 240 V AC: 10 VA max.</li> </ul> <p>CPU Units with three Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-10C1AR-A-V2/ZEN-10C2AR-A-V2 100 V AC: 6 VA max. 240 V AC: 8 VA max.</li> <li>• ZEN-10C4AR-A-V2 100 V AC: 7 VA max. 240 V AC: 9 VA max.</li> <li>• ZEN-20C□AR-A-V2 100 V AC: 8 VA max. 240 V AC: 11 VA max.</li> </ul> <p>Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-8E1AR 100 V AC: 3 VA max. 240 V AC: 4 VA max.</li> </ul>	<p>CPU Units without Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-10C□DR-D-V2 12/24 V DC: 3 W max. (ZEN-10C3DR-D-V2: 2.8 W max.)</li> <li>• ZEN-10C□DT-D-V2 12/24 V DC: 2 W max.</li> <li>• ZEN-20C□DR-D-V2 12/24 V DC: 4 W max.</li> <li>• ZEN-20C□DT-D-V2 12/24 V DC: 2 W max.</li> </ul> <p>CPU Units with three Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-10C□DR-D-V2 12/24 V DC: 4 W max.</li> <li>• ZEN-10C□DT-D-V2 12/24 V DC: 3 W max.</li> <li>• ZEN-20C□DR-D-V2 12/24 V DC: 5 W max.</li> <li>• ZEN-20C□DT-D-V2 12/24 V DC: 3 W max.</li> </ul> <p>Expansion I/O Units</p> <ul style="list-style-type: none"> <li>• ZEN-8E1DR 12/24 V DC: 2 W max.</li> </ul>
<b>Inrush current</b>	<p>ZEN-10C□AR-A-V2: 4.5 A max. ZEN-20C□AR-A-V2: 4.5 A max. ZEN-8E1AR: 4 A max.</p>	<p>ZEN-10C□D□-D-V2: 30 A max. ZEN-20C□D□-D-V2: 30 A max. ZEN-8E1DR: 15 A max.</p>
<b>Ambient temperature</b>	0 to 55°C (-25 to 55°C for ZEN-□C2□□-□-V2 models)	
<b>Ambient storage temperature</b>	-20 to 75°C (-40 to 75°C for ZEN-□C2□□-□-V2 models)	
<b>Ambient humidity</b>	10% to 90% (with no condensation)	
<b>Ambient conditions</b>	No corrosive gases	
<b>Mounting method</b>	Surface mounting, DIN track mounting (standard (vertical) installation and horizontal installation) (See notes 1 and 2.)	
<b>Terminal block</b>	Solid-line terminal block (use solid wire or fine-stranded wire)	
<b>Terminal screw tightening torque</b>	0.565 to 0.6 N·m (5 to 5.3 in·lb)	
<b>Degree of protection</b>	IP20 (Mounted inside a control panel)	

**Note:** 1. Can be mounted to 35-mm DIN Track.

2. Standard (Vertical) installation      Horizontal installation



## ■ Characteristics

Item	Specification
Control method	Stored program control
I/O control method	Cyclic scan
Programming language	Ladder diagram
Program capacity	96 lines (3 input conditions and 1 output per line)
Max. No. of control I/O points	44 points (See note 1.) CPU Units with 20 I/O points: 12 inputs and 8 outputs Expansion I/O Units: 4 inputs and 4 outputs each, up to 3 Units.
LCD display (See note 2.)	12 characters × 4 lines, with backlight
Operation buttons (See note 2.)	8 (4 cursor buttons and 4 operation buttons)
User program backup	Internal EEPROM, Memory Cassette (optional)
Power interruption hold	Internal holding bit status, holding timer/counter present values, calendar and clock (year, month, day of month, day of week, time) • Super capacitor backup time: 2 days min. (25°C) • Life of optional battery: 10 years min. (25°C)
Calendar and clock function (See note 2.)	Accuracy: ±15 s/month (at 25°C)
Timer accuracy	0.01 s unit: -0.05% -10 ms max. (rate for set value) min/s unit: -0.05% -1 s max. (rate for set value) h/min unit: -0.05% -1 min max. (rate for set value)
Maximum counting speed	150 Hz: 8-Digit counter (F) set to high-speed operations (CPU Units with DC power supplies only) (The counting speed may be less than 150 Hz depending on the cycle time of the program. See page 21.)
Insulation resistance	20 MΩ (at 500 VDC) min.: Between power supply terminals and all output terminals. Between terminals of different output circuits. Between all terminals of CPU Unit and all terminals of Expansion I/O Unit.
Insulation	<ul style="list-style-type: none"> <li>Reinforced insulation Between power supply or input terminals and output terminals. Between terminals of different output circuits. Between all terminals of CPU Unit and all terminals of Expansion I/O Unit.</li> <li>No separation Between power supply and input terminals of the same unit. Between power supply terminals of CPU Unit and computer connector, Battery Unit connector, or all Expansion Unit connectors (all interfaces are live parts).</li> </ul>
Dielectric strength	2,300 VAC, 50/60 Hz for 1 min (leakage current 1 mA max.): Between power supply terminals and all output terminals. Between terminals of different output circuit. Between all terminals of CPU Unit and all terminals of Expansion I/O Unit.
Vibration resistance	Conforms to IEC60068-2-6, 5 to 9 Hz with 3.5-mm single amplitude, 9 to 150 Hz acceleration 9.8 m/s <sup>2</sup> , 10 sweeps each in X, Y, and Z directions (1 octave/min)
Shock resistance	Conforms to IEC60068-2-27, 147 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions.
Weight	CPU Unit with 10 I/O points: Approx. 300 g max. CPU Unit with 20 I/O points: Approx. 350 g max. Expansion I/O Unit: Approx. 120 g max.

**Note:** 1. Up to 34 points for CPU Units with 10 I/O points. With Communications-type CPU Units, however, the CPU Unit has 6 inputs and 3 outputs, for a maximum of 33 I/O points.  
2. Not provided for LED-type CPU Unit without display (i.e., ZEN-□C2□□-□-□V2 models).

## ■ Communications Specifications (Communications-type CPU Units)

Item	ZEN-10C4□R-□-□V2
Communications	RS-485 (two-wire, half duplex)
Synchronization method	Start-stop synchronization
Baud rate	4800, 9600, or 19200 bps
Transmission code	ASCII
Data bit length	7 or 8 bits
Stop bit length	1 or 2 bits
Error detection	Vertical parity (none, even, odd), Block check character (BCC)
Flow control	None
Interface	RS-485
Retry function	None
Node number	0 to 99 (default: 1), XX (broadcasting)

## ■ Approved Standards

Item	Specification		
<b>Safety standards</b>	cULus: UL508/CSA C22.2 No.142 Class I Div2 Conforms to EN/IEC 61131-2 clause 11, excluding 11.7.2.2 (Overvoltage category 2 and Pollution degree II conforms to IEC 60664-1)		
<b>EMC (See note.)</b>	Radiation Field Emission	CISPR11	Class A, Group 1
	Noise Terminal Voltage Emission	CISPR11	Class A, Group 1
	Electrostatic Discharge Immunity	IEC61000-4-2	In air: 8 kV, In contact: 6 kV
	Electromagnetic Field Immunity	IEC61000-4-3	10 V/m
	Electrical Fast Transient/Burst Immunity	IEC61000-4-4	Power line AC I/O: 2 kV DC I/O: 1 kV
	Surge Immunity	IEC61000-4-5	Normal Noise AC power supply, AC I/O: 1 kV DC power supply, DC I/O: 0.5 kV Common Noise AC power supply, AC I/O: 2 kV DC power supply: 1 kV DC I/O: 0.5 kV
	Immunity to Conducted Disturbances Induced by Radio-frequency Fields	IEC61000-4-6	3 V
	Momentary Power Interruption Immunity	IEC61131-2	CPU Units with AC Power Supplies: 10 ms max. CPU Units with DC Power Supplies: 2 ms max. (level: PS1)

**Note:** EMC conforms to EN 61131-2 clause 8 except in the following cases.

- When Expansion I/O Units with DC inputs are connected to a CPU Unit with an AC power supply, the burst immunity between power supplies will be 1 kv.
- When the signal wire for transistor outputs exceeds 10 m, the surge immunity of DC output signal lines will not conform.

## ■ Input Specifications

### CPU Units

#### AC Inputs (Not Isolated)

Item	Specifications	Circuit drawing
<b>Input voltage</b>	100 to 240 VAC +10%, -15%, 50/60 Hz	
<b>Input impedance</b>	680 kΩ	
<b>Input current</b>	0.15 mA/100 VAC, 0.35 mA/240 VAC	
<b>ON voltage</b>	80 VAC min.	
<b>OFF voltage</b>	25 VAC max.	
<b>ON response time</b>	50 ms or 70 ms at 100 VAC (See note.)	
<b>OFF response time</b>	100 ms or 120 ms at 240 VAC (See note.)	

**Note:** Can be selected using the filter settings.

#### DC Inputs: I0 to I3 for Units with 10 I/O points, I0 to I9 for Units with 20 I/O Points (Not Isolated)

Item	Specifications	Circuit drawing
<b>Input voltage</b>	12 to 24 VDC +20%, -10%	
<b>Input impedance</b>	5.3 kΩ	
<b>Input current</b>	4.5 mA (typ.)/24 VDC	
<b>ON voltage</b>	8 VDC min.	
<b>OFF voltage</b>	5 VDC max.	
<b>ON response time</b>	15 ms or 50 ms (See note.)	
<b>OFF response time</b>		

**Note:** Can be selected using the input filter settings, except when I0 is being used for an 8-digit counter with a high-speed input.



### DC Inputs: I4 and I5 for Units with 10 I/O points, Ia and Ib for Units with 20 I/O Points (Not Isolated)

Item		Specifications	Circuit drawing
DC Inputs	Input voltage	12 to 24 VDC +20%, -10%	
	Input impedance	PNP: 5.5 kΩ/14 VDC min. 100 kΩ/14 VDC max. NPN: 5.2 kΩ	
	Input current	PNP: 4.3 mA (typ.)/24 VDC NPN: 4.6 mA (typ.)/24 VDC	
	ON voltage	8 VDC min.	
	OFF voltage	3 VDC max.	
	ON response time	15 ms or 50 ms (See note.)	
	OFF response time		
Analog Inputs	Input range	0 to 10 V	
	External input impedance	100 kΩ min.	
	Resolution	0.1 V (1/100 FS)	
	Accuracy	±1.5% FS (at ambient operating temperature within rated range)	
	AD conversion data	0 to 10.5 V (in increments of 0.1 V)	

Note: Can be selected using the input filter settings.

### Expansion I/O Units

#### AC Inputs (Not Isolated)

Item	Specifications	Circuit drawing
Input voltage	100 to 240 VAC +10%, -15%, 50/60 Hz	
Input impedance	680 kΩ	
Input current	0.15 mA/100 VAC, 0.35 mA/240 VAC	
ON voltage	80 VAC min.	
OFF voltage	25 VAC max.	
ON response time	50 ms or 70 ms at 100 VAC (See note.)	
Off response time	100 ms or 120 ms at 240 VAC (See note.)	

Note: Can be selected using the input filter settings.

#### DC Inputs (ZEN-8E1DR: Not Isolated, ZEN-8E1DT: Photocoupler Isolated)

Item	Specifications	Circuit drawing
Input voltage	12 to 24 VDC +20%, -10%	
Input impedance	6.5 kΩ	
Input current	3.7 mA (typ.)/24 VDC	
ON voltage	8 VDC min.	
OFF voltage	5 VDC max.	
ON response time	15 ms or 50 ms (See note 1.)	
OFF response time		

Note: 1. Can be selected using the input filter settings.

2. The ZEN-8E1DT has no +/- terminals. There is no need to supply power.