

# OMRON

# **Clean Sensing System**

**ZN** Series





# Is that booth really clean?

Is clean air with a filter enough to maintain a clean environment?

Clean measures are not perfect unless they are tied to quality.

Localized Continuous Clean-Monitoring Systems by OMRON provide many ways to

improve quality and enable perfect reporting of production process monitoring.



## **Applications**

Electronic Component Production Processes Multi-Clean Control



Cell Production Processes Direct Clean Control



Storage and Test Environments Storage of Precision and Optical Components

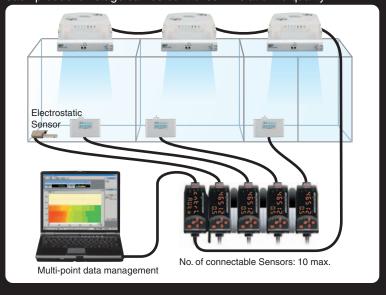


Clean-monitoring of Inspection and Measurement Environments



## **Total Sensing for Clean Booths**

OMRON provides the optimum clean environment with constant monitoring of continuously changing production environments. Sensing and control with up to 9 Air Clean Units. The degree of cleanliness in each production stage can be controlled in relation to quality.



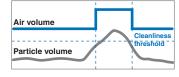
## **Continuous Sensing of Particles**



The particle volume inside booths is constantly sensed by an Air Particle Sensor. Optimum clean environments are maintained by controlling air volume based on particle volume — from rapid ventilation to energy-conserving gradational air volume control.

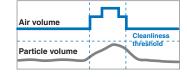
#### Rapid Feedback

The maximum and minimum air volume and feedback time can be set to any desired values. Once a cleanliness threshold has been exceeded, the level of cleanliness can be increased in a short time by applying the maximum air volume.



#### Constant Feedback

Constant feedback is provided so that the cleanliness threshold is not exceeded. A constant level of cleanliness is always maintained and energy is conserved.



#### **Ionized Clean Environments**

An Ionizer is needed to remove dust attached to particles by static electricity. OMRON provides a new style for discharging and dust removal, with the first Ionizers in the industry that can be combined with Air Clean Units.



# **Compact but High-Performance Air Clean Unit**

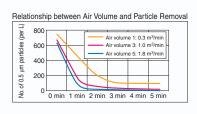


## Slimmest in the industry: 97.5 mm

# **High-Speed Dust Control**

#### **Unique Twin-fan Construction**

A unique ZNA2502 Twin-Fan construction enables both a slimmer body and a greater air volume. Downsizing is possible with a greater level of capacity than previous models.





#### **HEPA Filter with High Filtration**

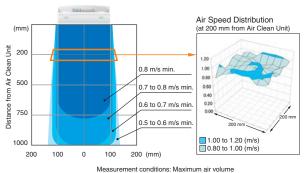
The HEPA filter used with the ZN Series has the capacity to filter 99.99% of 0.3  $\mu m$  particles.



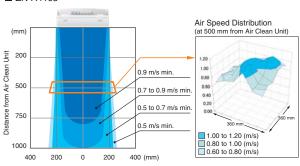
#### Laminar Airflow Design

The smaller fan section and the unique ventilation construction design provides a more uniform laminar airflow. Uniform air is provided over a wide area.









Measurement conditions: Maximum air volume

#### Airflow Switching Function

The air volume can be set to 5 different levels, from 0.3 to 1.8 m $^3$ /min for the ZN-A2502 and 1.0 to 5.0 m $^3$ /min for the ZN-A4105. The air volume can be checked with the large indicators in the middle.



#### Self-diagnosis Function

Two LED indicators indicate operation errors (e.g., stopped fans) and when HEPA filter replacement is required. Located on two corners of the Unit, the LED indicators are visible from many angles.

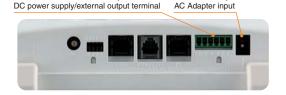


#### External I/O

An I/O interface is built in.

An AC adapter or 24-VDC input can be selected for the power supply.

An alarm signal is output if the self-diagnosis function indicates HEPA filter replacement or error operation.



#### Ultra-Easy Maintenance

HEPA filters can be replaced without tools thanks to the use of buckles. Onsite maintenance time is reduced because filters can be replaced in a one-step operation.



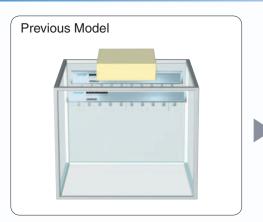
# **Unique and Easy Ionizer for Air Clean Unit**



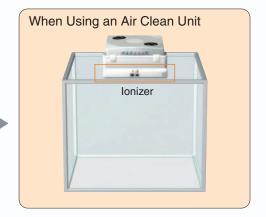
## **Industry First**

#### Patent pending

## Ionizer That Can be Combined with Air Clean Units



Laminar airflow can be disrupted with bar-type lonizers, depending on where the lonizer is installed, and too much installation work is required.



The Ionizer can be mounted directly to the Air Clean Unit.

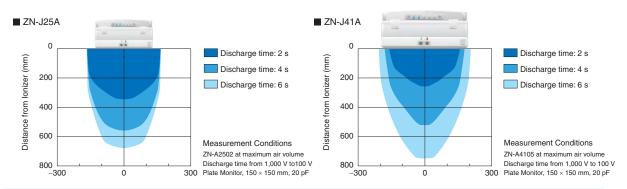
#### **Opening Constructed Not to Obstruct Laminar Airflow**

The opening does not obstruct the airflow from the Air Clean Unit eliminating worries about disrupting the laminar airflow.



#### Wide Discharge Area by Adopting Variable DC Ionization Method

Variable DC ionization is used to discharge over a wide area.



#### Automatic Ion Balance

Two Sensors provide constant feedback on the ion balance to maintain uniform discharging.



#### Self-diagnosis and **Display Functions**

LED indicators and external outputs provide notification when discharge needles require cleaning or discharge errors occur. Cleaning outputs are made at two levels: warnings and alarms.



#### Ozone Buildup Prevention Patent Pending

Discharging is stopped when a signal indicating that the Air Clean Unit fan has stopped is received. This function prevents ozone from remaining due to discharging.



#### Simple Mounting and Wiring

The Ionizer can be installed easily by inserting it between the Air Clean Unit and the top of the Clean Booth and securing it with screws. Wiring work is greatly reduced by the connectors used for connection to the Air Clean Unit.





#### Simple Maintenance

Discharge needles are modular and can be easily replaced.



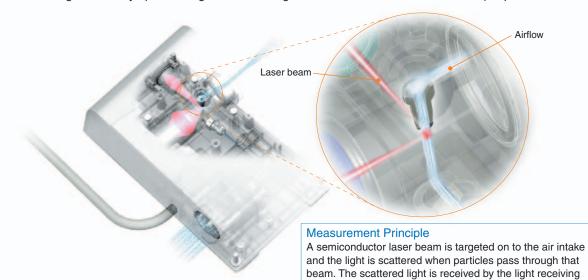
# **Small Size, Continuous Measurement In-line Air Particle Sensor**



### Smallest in the Industry

#### Air Particle Sensor for In-line Measurement

A high-performance fan for external air suction enables constant measuring over long periods. Semiconductor lasers and high-sensitivity optical design in the sensing section enable measurement of 0.3-µm particles.



#### **Particle Trend Indicator**

The sensing section has a particle trend display for quick visual confirmation of the degree of cleanliness. The Amplifier provides numeric indication of the number of 0.3-, 0.5-, and 1.0- $\mu$ m particles.

A signal can be output at any level of particles if a threshold has been set.



element and converted to an electrical signal.

# Clean Sensing System

#### On-screen Indication and Data Logging of Particle Amount

Measurement values can be easily logged on a personal computer by using the Interface Unit and special software (sold separately).

Data from sequential sensing of particles can be used to improve quality.



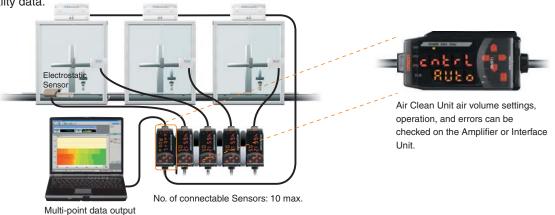
#### Realtime Clean Air Monitor

A variety of displays (including color graphs for visual confirmation by color of particle densities, indication of the number of particles, and trend graphs) can be set. Particle Sensors and Interface Units can also be set from the personal computer. Measurement data is logged in realtime and can be manipulated in CSV-format files using spreadsheet software.



#### Quality Control with Multi-point Measurement Patent Pending

Up to ten Particle Sensors and up to nine Air Clean Units can be controlled through one Interface Unit and Real Time Clean Air Monitor. There are no time-consuming restrictions, such as the order that power is turned ON. The level of cleanliness can be controlled for each process and constant monitoring is possible in relation to quality data.



#### For In-line Applications

Installation is simple with DIN Track mounting.
The In-line Air Particle Sensor was developed for in-line applications, with a 24-VDC power supply.
External outputs can be at two levels: warnings and alarms. Suitable for in-line trend management applications.

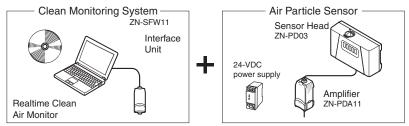


# **System Connection Diagram**

There are four ways of using the In-line Air Particle Sensor, depending on the application.

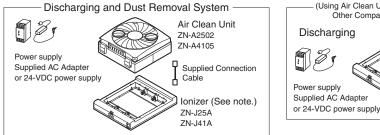
#### Measurement and Logging of Particle Volumes

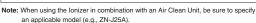
• Particle volumes are logged and warnings or alarms are output for set thresholds.



#### Clean Air Supply and Discharging

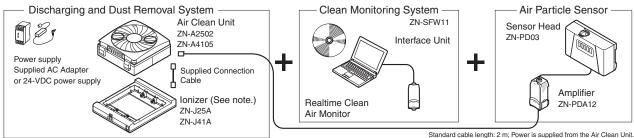
• Discharging can be performed with the downflow from the Air Clean Unit.





#### Direct Clean Sensing Systems

• The air volume of the Air Clean Unit is automatically adjusted while the particle volume is measured and logged.



(Using Air Clean Units from

Other Companies)

Discharging

ZN-J25

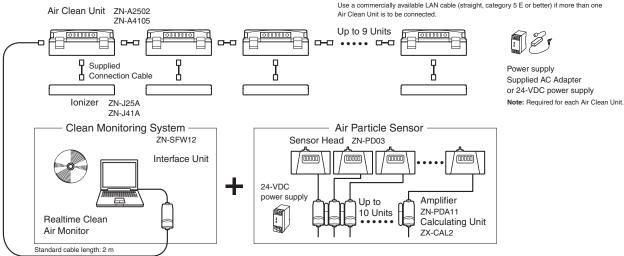
ZN-J41

Note: When using the lonizer in combination with an Air Clean Unit, be sure to specify an applicable model (e.g., ZN-J25A)

To extend, use commercially available LAN connectors (female-female, straight) and LAN cable (straight, category 5 E

#### Multi-Clean Sensing Systems

- The air volume of the Air Clean Unit is automatically adjusted while the particle volume is measured and logged.
- The level of cleanliness can be managed and feedback controlled for more than one production process.



To extend, use commercially available LAN connectors (female-female, straight) and LAN cable (straight, category 5E or better).

# **Ordering Information**

#### Air Clean Units

#### Air Clean Units

Appearance	Application	Power supply	Model
E .	250 × 250 mm	24 VDC	ZN-A2502
			ZN-A2502D (See note.)
	410 × 410 mm	24 VDC	ZN-A4105
			ZN-A4105 (See note.)

Use a commercially available LAN cable (straight, category 5E or better) if more than one Air Clean Unit is to be connected to make a system.

#### Note: Without AC adapter.

#### Ionizers

#### Ionizers

Appearance	Application	Power supply	Model
	250 × 250 mm	Supplied from the Air Clean Unit.  50 mm  24 VDC	ZN-J25A (See note.)
Mark Mary	410 × 410 mm		ZN-J41A (See note.)
	250 × 250 mm		ZN-J25
	410 × 410 mm		ZN-J41

Note: Connection Cable to the Air Clean Unit is provided.

When using the lonizer in combination with an Air Clean Unit, be sure to specify this model.

(Air Clean Units should be ordered separately.)

# Accessories

Accessories

Replacement HEPA Filters

Replacement Pre-filters

	Model	Qty.
Replacement Discharge Needles	ZN9-JH04	4 per pack

Application

For 250 × 250 mm

For 250  $\times$  250 mm

For 410 × 410 mm

Model

ZN9-AHP25

ZN9-AHP41

ZN9-APF25

ZN9-APF41

Qty.

## Single-sided Connector Cables (for DC power supply or I/O connection)

Cable length	Model	Qty.
5 m	ZN9-JC05	1
10 m	ZN9-JC10	1

#### Air Particle Sensors

#### Sensor Head

Appearance	Measured particle diameter	Model
	0.3, 0.5, and 1.0 μm	ZN-PD03

#### Amplifiers

Appearance	Power supply	Connection method	Model
	24 VDC	Cable connection	ZN-PDA11
		Connector connection (Air Clean Unit feedback connection)	ZN-PDA12

#### **Calculating Unit**

Appearance	Model
10	ZX-CAL2

#### **Clean Monitoring Systems**

Appearance	Contents	Connection method	Model
CD-ROM	ZN-SF11 Interface Unit + Realtime Clean Air Monitor	For RS-232C connection with personal computer only	ZN-SFW11
CD-ROM	ZN-SF12 Interface Unit + Realtime Clean Air Monitor	For RS-232C connection with personal computer or Air Clean Unit feedback connection	ZN-SFW12

An Interface Unit is not available by itself.

# Double-sided Connector Cable (for extension between Sensor Head and Amplifier)

Cable length	Model	Qty.
1 m	ZX-XC1A	1
4 m	ZX-XC4A	1
8 m	ZX-XC8A	1

	Model	Qty.
Sensor Head Replacement Filter Set	ZN9-PF1	1
Cleaning Filter	ZN9-PC1	1
Head Attachment Tool	ZN9-PB1	1

# **Specifications**

#### **Air Clean Units**

Item Model	ZN-A2502/A2502D	ZN-A4105/A4105D			
Air outlet dimension	225 × 205 mm	360 × 360 mm			
Particle outlet efficiency	More than 99.99%	for 0.3-µm particles			
Air volume (m³/min)	0.3 to 1.8 m³/min (typical)	1.0 to 5.0 m³/min (typical)			
Sound noise level (dBA)	Air volume level 3: 53 dB (typical)	Air volume level 3: 53 dB (typical)			
Souria noise lever (abA)	Air volume level 1: 41 dB (typical)	Air volume level 1: 40 dB (typical)			
Fan motor	Two, DC brushless compact centrifugal blowers	One DC brushless turbo fan			
Main filter	HEPA	A filter			
Main filter part number	ZN9-AHP25	ZN9-AHP41			
Pre-filter part number	ZN9-APF25	ZN9-APF41			
Power supply voltage	24 VDC±10%, Ripp	ole (p-p): 10% max.			
0	Air volume level 5: 2.1 A max. (RMS value)	Air volume level 5: 3.5 A max. (RMS value) (Peak: 5.5 A)			
Current consumption	Air volume level 1: 0.4 A max. (RMS value)	Air volume level 1: 0.32 A max. (RMS value)			
Indicators	Operating status: Green/Red				
muicators	Air volume: Blue				
Outputs	Alarm output 1: Alarm output 1 turns OFF when one of the following events occurs. (Normally alarm output 1 is ON.) (Check indicator to find out which event occurred.)  • Filter is clogged.  • Fan error  • Cleaning alarm for discharge needle (when ZN-J-series Ionizer (sold separately) is connected)  • Discharge error (when ZN-J-series Ionizer (sold separately) is connected)				
		Alarm output 2: Enabled only when ZN-J-series Ionizer (sold separately) is connected.  Alarm output 2 turns OFF to indicate that cleaning is necessary for ZN-J Series discharge needles.  (Normally alarm output 2 is ON.)			
	30 VDC, 50 mA max. Residual voltage: 1 V max. with loa	d current of 10 mA, 2 V max. with load current of 50 mA.			
Functions	Air volume selectable (levels 1 to 5), Automatic co	ontrol by ZN-PDA, Filter clogging alarm, ZN-J Ionizer			
i unotiono	connection, conne	ection of up to 9 Units			
Ambient temperature range	Operating and storage: 0 to 40°C (with no icing or condensation)				
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)				
Material	Upper case: ABS, Bottom frame: Steel				
Dimensions (mm)	250 × 250 × 97.5 mm (W × D × H) 410 × 410 × 129.5 mm (W × D × H)				
Weight	Approx. 2 kg (Packed state: Approx. 3.3 kg)  Approx. 5.2 kg (Packed state: Approx. 8.6 kg)				
Accessories	Instruction Sheet, Sealing parts, Mounting screws, I/O connector (XW4B-06B1-H1), AC adapter (excluding ZN-A2502D, ZN-A4105D.) (See not				

Note: AC Adapter: Made by Sanken Electric Co., Ltd.

Model SEB100P2-24.0 for ZN-A2502: Supply voltage of 100 VAC to 240 VAC

Model SEC165P2-24.0 for ZN-A4105: Supply voltage of 100 VAC to 240 VAC

#### **Ionizers**

Item Model	ZN-J25A	ZN-J25	ZN-J41A	ZN-J41
Applicable Air Clean Units	ZN-A2502		ZN-A4105	
Power supply voltage		24 VDC±10%, R	ipple (p-p): 10% max.	
Current consumption		300 mA	max	
Output voltage		±7 kV r	nax	
Discharge method		Variable	DC	
Discharge time (typical) (See note 1.		5 s m	ax.	
Ion balance (typical) (See note 2.)		±30 V r	nax.	
Indicators	Power (green), Clea	Power (green), Cleaning notice (orange flashing), Cleaning alarm (orange), High voltage error (red)		
Outputs	High voltage error output, cleaning output: photo-MOS relay (30 VDC, 300 mA max.)			DC, 300 mA max.)
Functions		Manual Ion balance adjustment, cleaning alarm, high voltage error alarm		
Ambient temperature range	Operating and storage: 0 to 40°C (with no icing or condensation)			
Ambient humidity range	Operating and storage: 35% to 65% (with no condensation)			
Materials		Unit: ABS, Discharge needles: Tungsten		
Dimensions (mm)	248 × 310 × 45	248 × 310 × 45 mm (W × D × H) 408 × 470		
Weight	Approx. 0.6 kg (Packet	ed state: Approx. 1.4 kg)	Approx. 1.5 kg (Packe	d state: Approx. 2.7 kg)
Accessories	Instruction Sheet Sealing parts Mounting screws Connector cable for Air Clean Unit (excluding ZN-A2502D, ZN-A4105D.) Ferrite core English warning label	Instruction Sheet Sealing parts Mounting screws I/O cable (2 m) AC Adapter (excluding ZN-A2502D, ZN-A4105D.) (See note 3.) Ferrite core English warning label	Instruction Sheet Sealing parts Mounting screws Connector cable for Air Clean Unit (excluding ZN-A2502D, ZN-A4105D.) Ferrite core English warning label	Instruction Sheet Sealing parts Mounting screws I/O cable (2 m) AC Adapter (excluding ZN-A2502D, ZN-A4105D.) (See note 3.) Ferrite core English warning label

Note 1. Measurement conditions:

1. Measurement conditions:
Distance: 300 mm
Air Clean Unit: ZN-A Series with air level 5 at center of air outlet
Discharging from ±1000 V to ±100 V with Charge Plate Monitor (150 × 150 mm, 20 pF)
Temperature: 18 to 28°C, Humidity: 55% to 65%
The performance may not be satisfied when gases such as solvents are in the measurement area.

2. Measurement conditions:
Distance: 300 mm
Air Clean Unit: ZN-A Series with air level 5 at center of air outlet
Discharging with Charge Plate Monitor (150 × 150 mm, 20 pF) for 10 s
Temperature: 18 to 28°C, Humidity: 55% to 65%
The performance may not be satisfied when gases such as solvents are in the measurement area.

3. AC Adapter: Made by Sanken Electric Co., Ltd.
Model SEA40N2-24.0: Supply voltage of 100 VAC to 240 VAC

# **Specifications**

#### **Air Particle Sensors**

#### Sensor Head

Item Model	ZN-PD03	
Applicable Amplifier	ZN-PDA11/ZN-PDA12	
Measurement method	90° sideways light-scattering method	
Light source	urce Semiconductor laser	
Applicable particle size	0.3, 0.5, or 1.0 μm min.	
Applicable cleanliness class	table cleanliness class Equivalent to Class 100 to 100,000 (FED-STD-209D)	
Indicator	Level indicator for Class 100 to 100,000 (FED-STD-209D)	
Connection tube	Inner diameter: 4, Length: 1 m max.	
Ambient temperature range	Operating: 0 to 40°C, Storage: –15 to 50°C (with no icing or condensation)	
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance	10 to 55 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions	
Shock resistance	150 m/s <sup>2</sup> 3 times each in six directions (up/down, left/right, forward/backward)	
Connection method	Connector cable (standard cable length: 0.5 m)	
Material	ABS	
Weight	Approx. 300 g (Packed state: Approx. 450 g)	
Accessories	Instruction Sheet, connection tube	

#### Amplifiers

Item Model	ZN-PDA11	ZN-PDA12	
Sampling time	1 to 599 s (selectable)		
Average count setting	1, 2, 4, 8, 16, 32, or 64		
Indicators	Operation indicators: OUT1 (orange), OUT2 (yellow), 7-segment main display (red), 7-segment sub-display (yellow), power (green), wide range display (green), unit selection display (green)	7-segment main display (red), 7-segment sub-display (yellow), power (green), wide range display (green), unit selection display (green)	
Status outputs (2 outputs: OUT1/OUT2) (See note.)	NPN open-collector outputs, 30 VDC, 30 mA max., Residual voltage: 1.2 V max.		
Reset input (See note.)	ON: Short-circuited with 0-V terminal or 1.5 V or less, OFF: Open		
Functions	Measurement result display, Setting value display, Unit selection, Scaling, Peak hold, Hysteresis setting, Threshold level selection, Wide range display, Key look, ECO mode, Display reverse, Display digit change, Initialize	Measurement result display, Communications condition display, Unit selection, Scaling, Air Clean Unit automatic control, Air Clean Unit air level change, Threshold level selection, Wide range display, Key lock, ECO mode, Display reverse, Display digit change, Initialize	
Communications with Air Clean Unit		Unique communications specifications (RJ-45 connector and straight LAN cable)	
Power supply voltage	24 VDC ±10%, Ripple (p-p): 10% max.	24 VDC ±10%, Ripple (p-p): 10% max. (Supplied from Air Clean Unit.)	
Current consumption	300 mA max.		
Ambient temperature range	Operating: 0 to 40°C , Storage: -15 to 50°C (with no icing or condensation)		
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)		
Insulation resistance	20 MΩ min. at 500 VDC		
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min		
Vibration resistance	10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions		
Shock resistance	300 m/s <sup>2</sup> 3 times each in six directions (up/down, left/right, forward/backward)		
Connection method	Cable (standard cable length: 2 m)	Connector cable (standard cable length: 2 m)	
Materials	Case: PBT (polybutylene terephthalate), Cover: Polycarbonate		
Weight	Approx. 180 g (Packed state: Approx. 350 g)		
Accessories	Instruction Sheet		

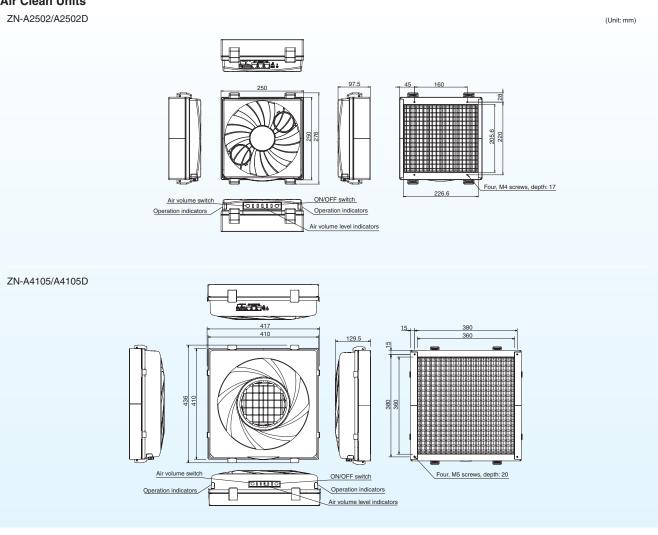
Note: OUT2 and the reset input are switched by using the DIP switch on the bottom of the Amplifier.

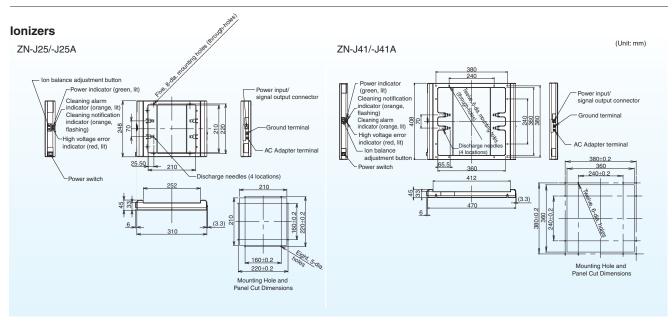
#### **Clean Monitoring Systems**

Item	Model	ZN-SFW11	ZN-SFW12
Power supply voltage		Supplied from the ZN-PDA.	
Current consumption		45 mA max. with 24-VDC power supply voltage (excluding current consumption and current output of the Amplifier)	
Applicable Amplifiers		ZX Series, ZJ-SD Series, ZN-PD Series	
Applicable Amplifier Unit software versions		ZX-LDA□□-N V1.000 or higher, ZX-EDA□□ V1.300 or higher, ZX-TDA□□ V1.100 or higher, ZJ-SDA□□ V1.000 or higher, or ZN-PDA□□ V1.000 or higher	
No. of connectable Amplifiers		10 max. (For ZN-PDA)	
Indicator		Power: Green, Sensor communications: Green, Sensor communications error: Red, External terminal communications: Green, External terminal communications error: Red	Power (POWER: Green), Serial communications (STA1: Green) Not clean (OPE1: Orange), Clean (OPE2: Green)
Functions			Automatic control for Air Clean Units (multi-unit system control), Air level change for Air Clean Units
	Communications port	RS-232C (9-pin, D-Sub connector)	
	Protocol	CompoWay/F	
Commu- nications	Baud rate	38,400 bps	
	Data configuration	Data bits: 8, Parity: None, Start bits: 1, Stop bits: 1, Flow control: None	
	For external device 2		Unique communications specifications (RJ-45 connector and straight LAN cable)
Ambient temperature range		Operating: 0 to 40°C, Storage: –15 to 50°C (with no icing or condensation)	
Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
Insulation resistance		20 MΩ min. at 500 VDC	
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min	
Vibration resistance		10 to 150 Hz, 0.7-mm double amplitude 80 min each in X, Y, and Z directions	
Shock resistance		300 m/s² 3 times each in six directions (up/down, left/right, forward/backward)	
Connection method			Connector cable (standard cable length: 2 m)
Materials		Case: PBT (polybutylene terephthalate), Cover: Polycarbonate	
Weight		Approx. 100 g (Packed state: Approx. 480 g)	Approx. 200 g (Packed state: Approx. 550 g)
Accessories		CD-ROM (Realtime Clean Air Monitor), Instruction Sheet, Two clamps	

# **Dimensions**

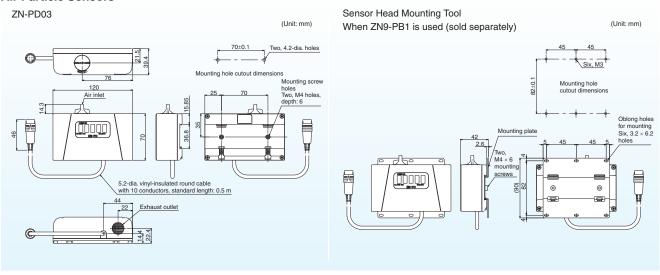
#### **Air Clean Units**

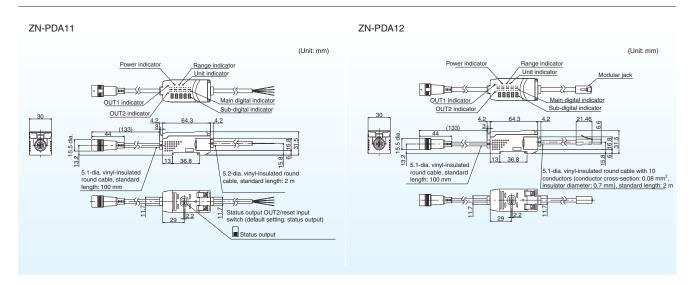




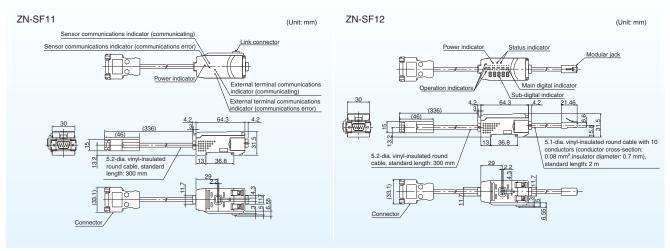
# **Dimensions**

#### **Air Particle Sensors**





#### **Interface Unit**



This document provides information mainly for selecting suitable models. Please read the document System Manual (Z267) carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

#### **OMRON Corporation**

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