



< Actual Size >



# The World's Smallest Digital Pressure Sensor



Built-in  
Amplifier type  
AP-C30K Series



Separate  
Amplifier type  
AP-C40W Series



Separate Thin  
Amplifier type  
AP-V40W Series

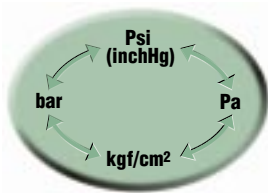


# Compact Pressure Sensor

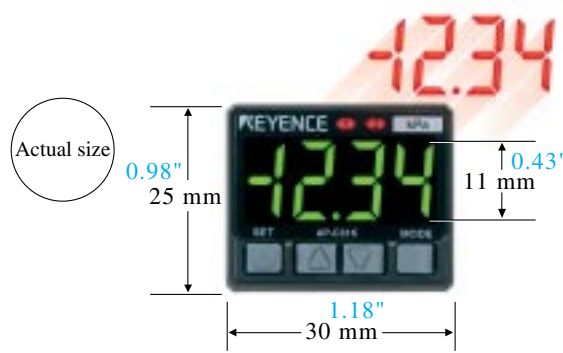
## The Ideal Size for Easy Installation and Operability

# World's Smallest Model with the Largest Character Height

The world's most compact pressure sensor with a width of 1.18" (30 mm), height of 0.98" (25 mm) and the largest character height in its class of 0.43" (11 mm). Furthermore, the AP-C30K Series incorporates a very easy-to-see 2-color LED display



**Unit conversion function**  
The pressure can be displayed in any of the four pressure units enabling it to be used worldwide.



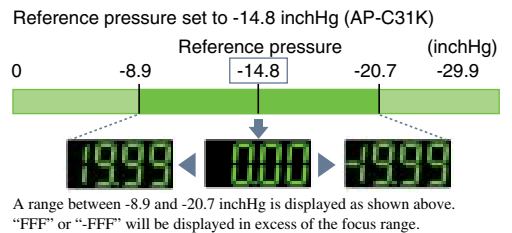
## Subminiature Digital Pressure Sensor AP-C30K Series

## Highest Performance in its Class

**Highest in Class** **High Resolution: 10x Area Focus Function** (AP-C31K and AP-C33K)

Based on the set reference pressure, the detected pressure can be precisely displayed within a  $\pm 20\%$  pressure range. The AP-C30K Series ensures a resolution of 0.01 inchHg\*, which is the highest in its class. The AP-C30K also features a zero-shift function.

\* When the AP-C31K is used in focus mode.



**Industry's First** **All-in-one I/O Function**

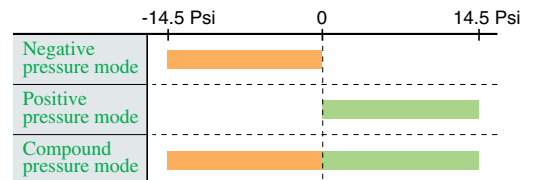
Independent 2-point output, analog monitor output, and a zero-shift input are incorporated as standard functions. There is no need to have multiple sensors to solve your pressure application.

\* Either the analog output or zero-shift input is selectable.



**Industry's First** **A Multi-range Model Playing Three Roles** (AP-C30K)

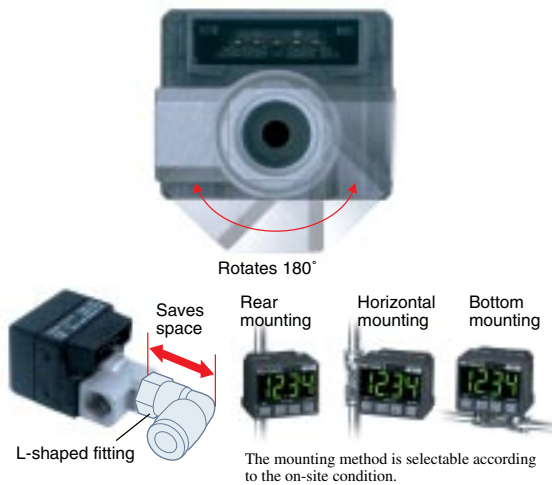
A new multi-range model is available, which supports a number of applications. By making setting changes, the AP-C30K can be used as a negative pressure model, positive pressure model, or a compound pressure model. Therefore, there is no need to keep a variety of models in stock.



# Flexible Mounting

## World's First Rotary Pressure Port

The unit incorporates a pressure port that rotates 180°, which directly connects to pipes in any direction. The pressure port is of non-slip structure. Therefore, the connection angle will not shift due to vibration. Furthermore, in the case of horizontal mounting, the unit does not require any L-shaped fittings, thus saving the space behind the rear panel. (Patent pending)



## Connector-type Wiring Ensures Ease of Installation and Maintenance

The wiring cables are provided with connectors for easy connection.



## Versatile Mounting using a variety of brackets

Four types of brackets allow mounting of the sensor up to 13 different ways, including a nameplate attachment type and a slanted type.



## Flush side-by-side mounting

A newly designed panel attachment allows side-by-side close mounting vertically or horizontally, thus saving space.



# Unrivaled Ease of Use

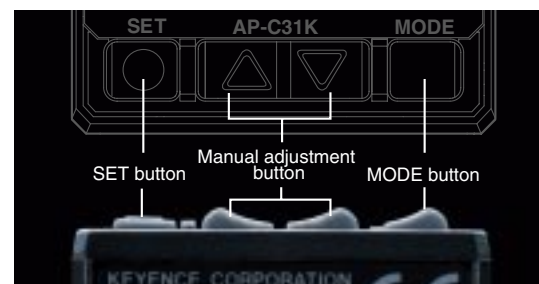
## As Easy as Fiberoptic Sensors

The button arrangement of the AP-C30K models is the same as fiberoptic sensors. Auto tuning is possible by just pressing the SET button. Furthermore, it allows manual threshold value adjustments, thus making it possible to operate the unit just like fiberoptic sensors.



## Button Layout Based on Human Ergonomics

The buttons are laid out with importance attached to operability. For example, the SET button is placed at a lower level to prevent operational mistakes, such as pressing more than one button simultaneously.



## High-speed, High-precision, Separate Amplifier Type with No Pneumatic Tubing Layout Required

### Separate Sensor Head and Amplifier

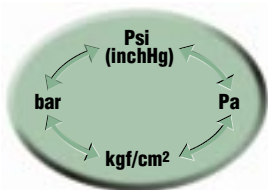
The subminiature sensor head can be mounted right next to the detection point. As a result, loss of response time due to the air tube length is eliminated.



**Subminiature sensor head**  
AP-41M (Negative pressure type)

### Super-tough Electrical Cable

The cable is highly flexible, thus allowing easy routing and handling compared to urethane tubing.

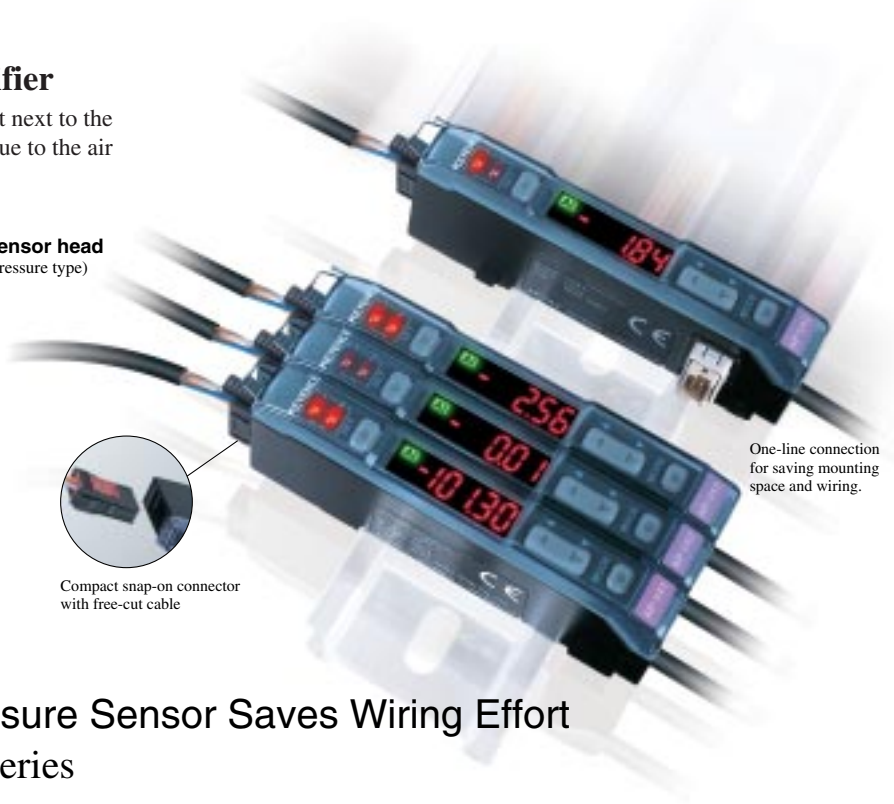


### Unit conversion function

The pressure can be displayed in any of four pressure units enabling it to be used worldwide.



Compact snap-on connector with free-cut cable



One-line connection for saving mounting space and wiring.

## Digital Pressure Sensor Saves Wiring Effort AP-V40W Series

### Features

#### Highest in Class High resolution: 10x

The AP-41M and AP-41 can achieve a resolution of 0.01 inchHg. A minute difference in pressure can be stably detected.

\* High-resolution mode



The unit displays the present value down to 1/100 of a digit, thus allowing fine settings.

#### Highest in Class 1 ms High-speed Response

The AP-V40W Series ensures a response time as low as 1 ms. The AP-V40W has an analog monitor output without any delay, because the processing time is only 1 ms.



#### Industry's First All-in-one I/O Function (AP-V41W)

Independent 2-point output, analog monitor output, and a zero-shift input are incorporated as standard functions. There is no need to select multiple sensors to solve your applications.

\* Either the analog output or zero-shift input is selectable.



#### World's First New AI (Artificial Intelligence) Tuning Function Incorporated (Patent Pending)

The pressure change is sampled while the system is in operation, and the optimum zero-shift timing and threshold values are automatically set. Suction check can be easily done.



# New-style Amplifier

## Operation is Just Like Fiberoptic Sensors

Auto tuning of the AP-V40W Series is possible by just pressing the SET button. Furthermore, manual threshold value adjustment is made possible with a simple rocker switch. The AP-V40W Series operates just like our fiberoptic sensors.



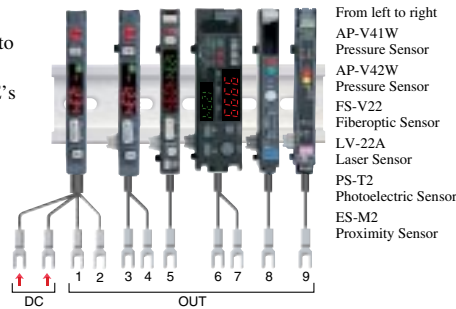
### Industry's First Space-saving Design

The amplifier is only 0.35" (9 mm) wide, which is the industry's thinnest model. A number of units can be coupled and installed side-by-side, minimizing the required mounting space.



### Industry's First The Industry's First Wire-saving Pressure Sensor

The one-line system supplies power through the connector to the expansion units on the side of the main amplifier. This eliminates two wires from each expansion unit. KEYENCE's Fiberoptic Sensors and Laser Sensors can be used in combination with the AP-V. (If only AP-VW amplifiers are used, a maximum of eight expansion units can be coupled.)



Main unit: AP-V41W  
 Expansion unit: AP-V42W

Versatile head variations for every application

### Subminiature Sensor Head AP-41M (Negative Pressure Type)



### Half the size of the Conventional Model and Ultra-light Weight of 4.8 g

The head is 0.68" (L) x 0.41" (W) x 0.27" (H) (17.3 (L) x 10.3 (W) x 6.8 (H) mm) in size, the volume of which is half the size of conventional ones. Furthermore, the head weighs only 4.8 g and is ideal for compact, high-speed suction devices.

### Compact Sensor Head

- AP-41 (Negative pressure model)
- AP-43 (Positive pressure model)
- AP-44 (Compound pressure model)



### Multi-Purpose Sensor Supporting Most Pressure Applications

Negative pressure, positive pressure, and compound pressure models are all available. The AP-41, AP-43, and AP-44 are compact and suitable for most applications, including suction checks, base pressure control and leak testing.

## The High-precision, Separate Amplifier Cube Models

- Industry's most compact amplifier
- Easy-to-see, large, two-color LED display
- High-resolution (10x), area focus function
- Fast response time of 1 ms
- Supports zero-shift input
- Zero-shift timer incorporated
- Analog output function incorporated
- Active two-point tuning function incorporated



Separate Amplifier Type  
 Subminiature Digital Pressure Sensor  
 AP-C40W Series

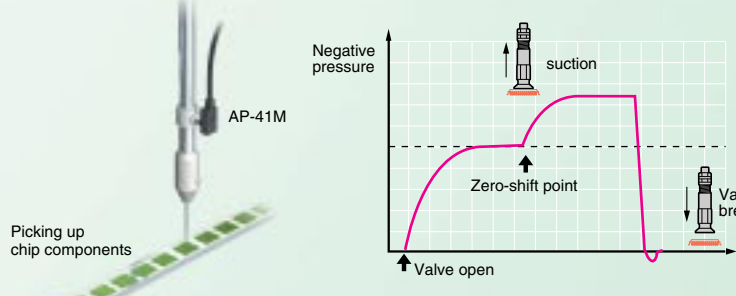


# Versatile Application Solving Functions

## Suction Check

[F-1 mode] [A-1 mode] Recommended models AP-C30K/C33K  
AP-41(M)/44

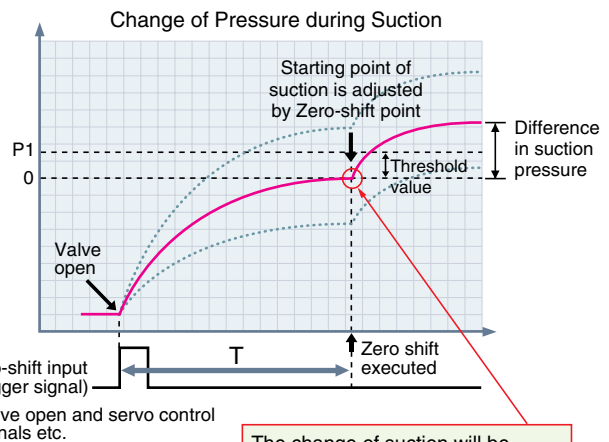
[Point 1] **Zero-shift Ensures Pressure Change is only Monitored During Suction.**



The zero-shift function forces the set pressure value before suction to zero so that only the change of suction is detected. This function cancels the influence of fluctuation in base pressure and the change of temperature, thus making it possible to detect the displacement only. A single negative pressure model as well as a single compound pressure model makes it possible to detect both suction and vacuum break pressures.

[Point 2] **Dedicated Suction Check Mode to Ensure Stable Detection**

AP-C/V models incorporate the A-1 mode (a dedicated suction check mode). In order to make stable suction checks, it is necessary to make a zero shift at a point as close as possible to the starting port of suction. AP-C/V models incorporate a zero-shift timer which can set in 1-ms increments the time between the input of the zero-shift signal and the moment a zero shift is executed.



The change of suction will be detected precisely, without being influenced by external disturbances, such as the change of base pressure, if the pressure at this point is shifted to the reference value (zero).

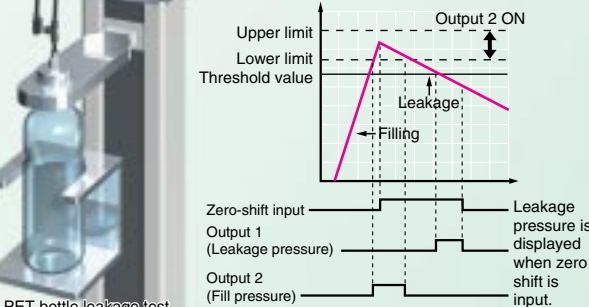
### AI Tuning Sets All Values Automatically

AI tuning samples the difference in pressure of equipment during continuous operation, and calculates the optimum zero-shift timer value (T) and the threshold value (P1), thus making ideal settings automatically. (AP-VW model only)

## Leakage Test

[A-2 mode] Recommended models AP-C30K/C33K  
AP-43/44

[Point 1] **Detects Both Fill and Leakage Pressure**



**Output 1 detects leakage pressure**  
**Output 2 detects fill pressure**

- When the air/gas builds up to a certain pressure, output2 turns on and closes the valve. Zero-shift is also set.
- Only the difference in displacement pressure due to leakage will be displayed while the zero shift is ON.
- The pressure change due to leakage is checked with output1.
- Normal pressure will be displayed when the zero-shift function turns OFF. Then the fill pressure can be checked again.  
(Output 2 always detects the difference from atmospheric pressure.)


A single unit plays two display roles.  
Normal pressure: 850  
Leakage pressure: 00  
Normal pressure: -104  
Normal pressure: 746

\*Output 1 will be displayed while zero-shift input is ON when in A-2 mode.

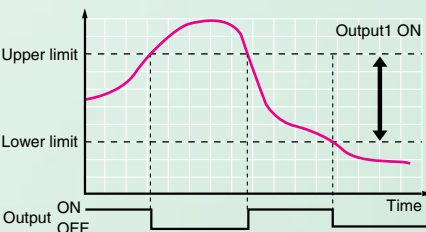
# Base Pressure Control

[F-3 mode] Recommended models AP-C33K  
AP-43

## [Point 1] Upper and Lower “Window” Tolerances are easily set.



Supplying screws



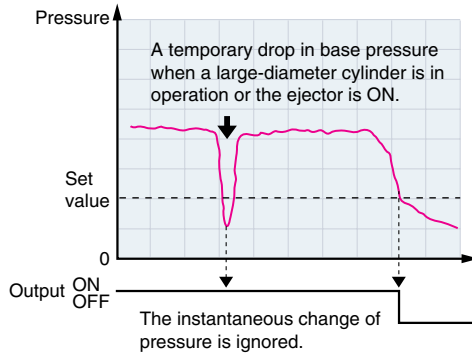
Upper limit  
Lower limit  
Output ON  
OFF  
Time

**Window Mode [F-3]**

Base pressure monitoring is possible by just setting upper and lower pressure limits. Moreover, the output will turn OFF in the event of wire disconnection as if an error in pressure is detected. Use the F-1/F-2 modes to allow two independent outputs for the upper and lower limit values.

## [Point 2] Chatter Prevention

The chatter prevention function is incorporated so that instantaneous changes in pressure can be ignored.



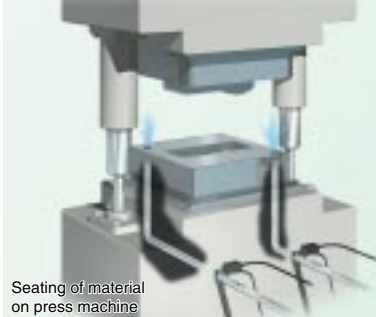
## [Point 3] Easy-to-see 2-color LED Display

Using two colors allows an error to be instantly recognized (Green while in normal operation and red when pressure is in excess of the upper or lower limit).

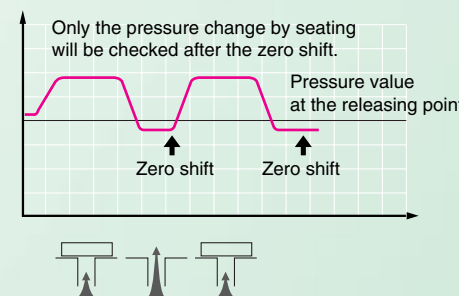
# Seating Check

[F-1 mode] Recommended models AP-C30K/C33K  
AP-43/44

## [Point 1] Zero-shift Function Cancels Base Pressure Fluctuation



Seating of material on press machine

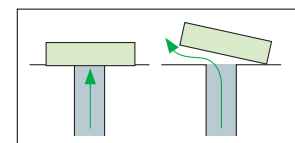


Only the pressure change by seating will be checked after the zero shift.  
Pressure value at the releasing point  
Zero shift  
Zero shift

By performing a zero shift at the time of starting the system, a seating check will be made according to the base pressure of the day. By performing a zero shift before the valve is seated, a lighter pressure change can be detected.

## [Point 2] Resolution: 10x

If the high-resolution mode (on the AP-V40W Series) or the area focus mode (excluding the AP-C30K) is used, the AP can not only check the existence of the workpiece but also check the delicate difference in pressure caused by positioning of the workpiece.



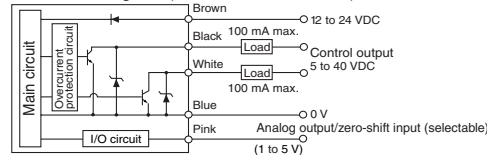
Specifications

Type	Multi range			Negative pressure	Positive pressure	
Model	NPN	AP-C30K		AP-C31K	AP-C33K	
	PNP	AP-C30KP		AP-C31KP	AP-C33KP	
Rated pressure range	Negative pressure mode 0 to -29.9 inchHg		Positive pressure mode 0 to 29.5 inchHg	Compound pressure mode 29.9 to -29.9 inchHg	0 to -29.9 inchHg	
Proof pressure	500kPa				1.5MPa	
Fluid type	Air or non-corrosive gases					
Pressure type	Gauge pressure					
Electrical rating	Power supply voltage	12 to 24 VDC $\pm 10\%$ with ripple (p-p) of 10% max.				
	Power consumption	12 V		24 V		
		Normal	720 mW (60 mA) max.		960 mW (40 mA) max.	
Economical mode	480 mW (40 mA) max.		720 mW (30 mA) max.			
Display	3 1/2-digit, 2-color, 7-segment LED (Character height: 0.43" (11 mm)) Display cycle: 10 times/s					
Set and display range <sup>1</sup> :	-10 to +110% of F.S.			-15 to +110% of F.S.		
Operation indicator	Red LED x 2 (corresponding to control output 1 and 2)					
Resolution	Multi range	Negative 0.1 inchHg	Positive 0.1 inchHg	Compound 0.1 inchHg	—	
	Normal mode	—			0.1 inchHg	0.2 Psi
	Focus mode	—			0.01 inchHg	0.02 Psi
Repetitive precision	$\pm 0.2\%$ of F.S.					
Hysteresis <sup>2</sup> :	Variable (Standard: 0.5% of F.S.)					
Display temperature characteristic	$\pm 1\%$ of F.S. max.					
Response time (chatter prevention function)	2.5, 5, 100, or 500 ms (selectable)					
Zero-shift input	Non-voltage input (contact or SSR) with input time of 2 ms or more. (or analog output selectable)					
Control output	NPN open collector 100 mA max. (at 40 V or below) with max. residual voltage of 1 V, 2 outputs (NO or NC selectable)					
Analog output	1 to 5 V with load impedance of 1 k $\Omega$ max. (or zero-shift input selectable)					
Ambient temperature	0 to 50°C (32 to 122°F), No condensation					
Relative humidity	35 to 85%, No condensation					
Vibration	10 to 55 Hz, 0.06" 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively					
Pressure port	NPT 1/8 180° rotation					
Material	Front housing: Polysulfone, Rear housing: PBT, Front seat: Polycarbonate, Pressure port: Zinc die-casting					
Weight	Approx. 30 g (without cable) Approx. 85 g (with 6.6' 2-m cable)					
Accessory	Power supply cord (6.6' 2-m with connector), Unit seal <sup>3</sup> .					

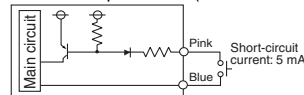
1. The focus range applies while in focus mode only. 2. A standard of 0.2% of FS applies while in focus mode. 3. The seal is provided with the AP-C33K only.

Connection Diagrams

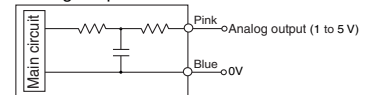
I/O Circuit Diagram (AP-C30K/C31K/C33K)



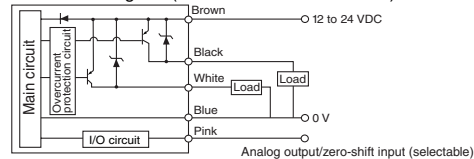
Zero-shift Input Circuit (AP-C30K/C31K/C33K)



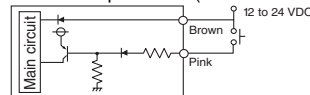
Analog Output Circuit



I/O Circuit Diagram (AP-C30KP/C31KP/C33KP)



Zero-shift Input Circuit (AP-C30KP/C31KP/C33KP)



Display Unit Selection Chart

Display unit can be changed by setting as shown below.

AP-C30K Series

Model	Multi range AP-C30K	Negative pressure AP-C31K	Positive pressure AP-C33K
Setting	PA	kPa	Mpa (kPa)
	GF	kg/cm <sup>2</sup>	kg/cm <sup>2</sup>
	nnH	mmHg	—
	inH	inHg	—
	Psi	psi	psi
	Bar	bar	bar (mbar)

( ) shows the data in Focus mode.

AP-C40W/V40W Series

Model	Negative pressure AP-41	Positive pressure AP-43	Multi range AP-44
Setting	PA	kPa	kPa
	GF	—	kgf/cm <sup>2</sup>
	nnH	mmHg	—
	inH	inHg	—
	Psi	psi	psi
	Bar	bar (mbar)	bar

( ) shows the data in Focus (AP-C40) or High-Resolution (AP-V40) mode.

## Sensor Head Variations

Shape	Rated pressure range*	Pressure type	Major application	-29.9 inchHg	0	29.9 inchHg	145 Psi	Model
	0 to -29.9 inchHg	Negative pressure	Suction check					AP-41M
	0 to -29.9 inchHg	Negative pressure	Suction check					AP-41
	0 to 145.0 Psi	Positive pressure	Base pressure control and leakage test					AP-43
	29.9 to -29.9 inchHg	Compound pressure	Suction check and vacuum break check					AP-44

\*The set pressure range is between -15 and 110% of the rated pressure range.

## Specifications

### Sensor Head

Model	AP-41M	AP-41	AP-43	AP-44
Rated pressure range	0 to -29.9 inchHg		0 to 145.0 Psi	29.9 to -29.9 inchHg
Proof pressure	500kPa		1.5MPa	500kPa
Fluid type	Air or non-corrosive gases			
Pressure type	Gauge pressure			
Temperature characteristic	±2% of F.S. max.			
Pressure port	M5 (M3) male screw			
Ambient temperature	0 to 50°C (32 to 122°F), No condensation			
Relative humidity	35 to 85%, No condensation			
Vibration	10 to 55 Hz, 0.06* 1.5mm double amplitude in X, Y, and Z directions, 4 hours respectively			
Shock	1,000 m/s <sup>2</sup> in X, Y, and Z directions 10 times respectively (60 times in total)			
Material	Housing: PBT, Screw: Stainless steel			
Weight	7 g (without cable) 70 g (with 9.8' 3-m cable) (41M: 4.8 g / 67.8 g)			

### Amplifier Unit

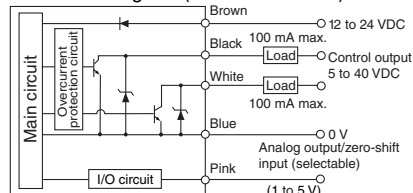
Model	NPN	AP-V41W/V42W/C40W					
	PNP	AP-V41WP/V42WP/C40WP					
Applicable sensor head	AP-41M/41		AP-43		AP-44		
Electrical rating	Power supply voltage	12 to 24 VDC ±10% with ripple (p-p) of 10% max.					
Electrical rating	Power consumption	AP-V41W/V42W	12 V	24 V	AP-C40W	12 V	24 V
		Normal	720 mW (60 mA) max.	960 mW (40 mA) max.	Normal	780 mW (65 mA) max.	1080 mW (45 mA) max.
		Economical mode	480 mW (40 mA) max.	720 mW (30 mA) max.	Economical mode	540 mW (45 mA) max.	840 mW (35 mA) max.
Display	AP-V41W/V42W	4 1/2-digit, 2-color, 7-segment LED (Character height: 0.18* 4.5 mm) AI indicator (green) Display cycle: 10 times/s					
Display	AP-C40W	3 1/2-digit, 2-color, 7-segment LED (Character height: 0.43* 11 mm) Display cycle: 10 times/s					
Set and display range		-15 to 110% of F.S. <sup>2</sup>					
Operation indicator		Red LED x 2 (corresponding to control output 1 and 2)					
Resolution	Standard mode	0.1 inchHg	0.01 kgf/cm <sup>2</sup>		0.1 inchHg		
Resolution	High-resolution/Focus mode	0.01 inchHg	0.02 Psi		0.01 inchHg		
Repetitive precision		±0.2% of F.S.					
Hysteresis		Variable (Standard: 0.5% of FS; high-resolution/focus mode: 0.1% of F.S.)					
Display temperature characteristics		±1% of F.S. max.					
Response time (chatter prevention function)		1 (in high-speed mode only), 2.5, 5, 100, or 500 ms (selectable)					
Zero-shift input		Non-voltage input (contact or SSR) with input time of 2 ms or more. (or analog output selectable)					
Control output		NPN open collector 100 mA max. (at 40 V or below) <sup>3</sup> with max. residual voltage of 1 V, 2 outputs (NO or NC selectable)					
Analog output <sup>1</sup> :		1 to 5 V with load impedance of 1 kΩ max. (or zero-shift input selectable)					
Ambient operating temperature		0 to 50°C (32 to 122°F), No condensation					
Ambient operating humidity		35 to 85%, No condensation					
Vibration resistance		10 to 55 Hz, 0.06* 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively					
Material	AP-V41W/V42W	Polycarbonate					
Material	AP-C40W	Front housing: Polysulfone, Rear housing: PBT, Front seat: Polycarbonate					
Weight		AP-V41W and AP-V42W: Approx. 80 g (with 6.6' 2-m cable) AP-C40W: Approx. 74 g (with 6.6' 2-m cable)					
Accessory	AP-V41W/V42W	Mounting bracket (AP-V41W), End unit (AP-V42W), Head connector, and Expansion seal (AP-V42W)					
Accessory	AP-C40W	Power supply cord (6.6' 2-m cable with connector), Head connector, and Unit seal					

1. Only the AP-V41W (Main unit) and AP-V40W apply. 2. The focus range applies while in focus mode only.

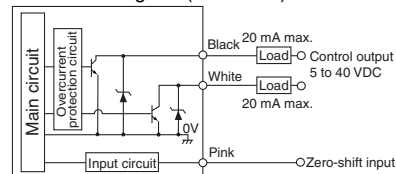
3. The maximum current is 20 mA if the AP-V42W as an expansion unit is installed.

## Connection Diagrams

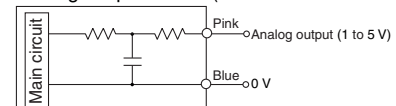
### I/O Circuit Diagram (AP-V41W/C40W)



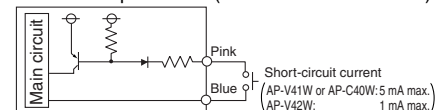
### I/O Circuit Diagram (AP-V42W)



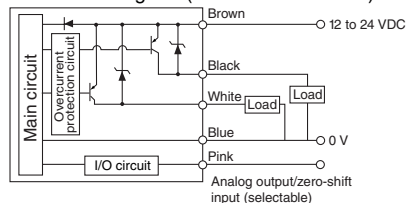
### Analog Output Circuit (AP-V41W/V41WP/C40W)



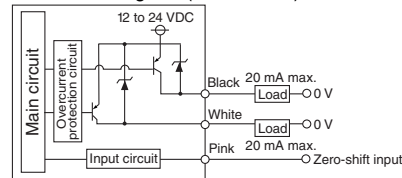
### Zero-shift Input Circuit (AP-V41W/V42W/C40W)



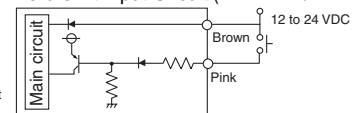
### I/O Circuit Diagram (AP-V41WP/C40WP)



### I/O Circuit Diagram (AP-V42WP)



### Zero-shift Input Circuit (AP-V41WP/V42WP/C40WP)



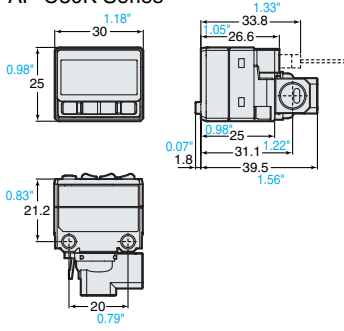
# AP-C30K/C40W

## Dimensions

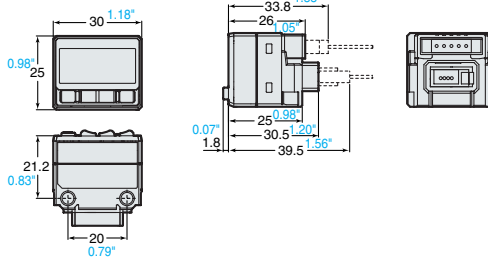
Unit: mm Inch

### Amplifier Unit

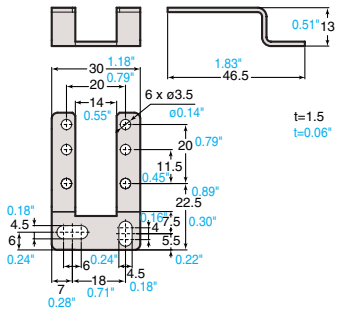
#### AP-C30K Series



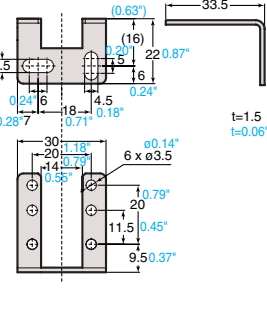
#### AP-C40W Series



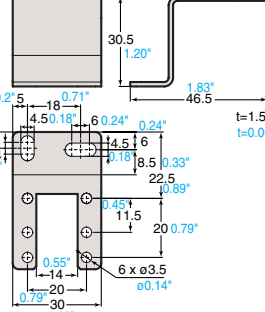
#### AP-B01 Mounting Bracket (Optional)



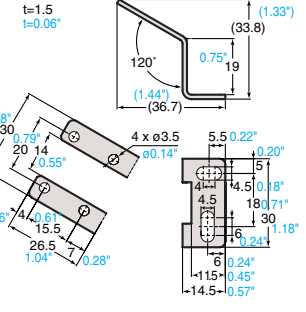
#### AP-B02 Mounting Bracket (Optional)



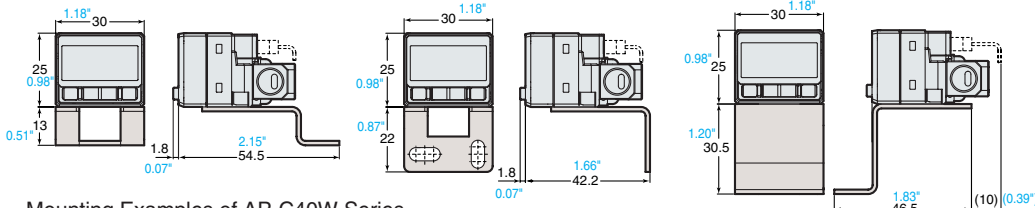
#### AP-B03 Mounting Bracket (Optional)



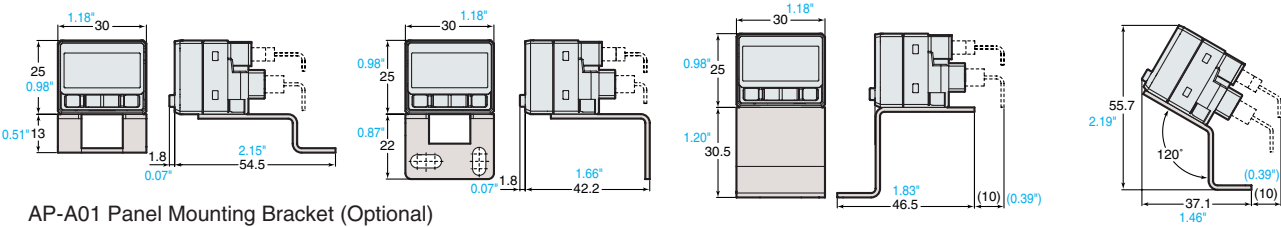
#### AP-B04 Mounting Bracket (Optional)



#### Mounting Examples of AP-C30K Series

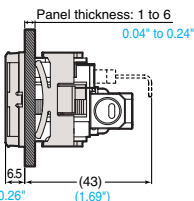


#### Mounting Examples of AP-C40W Series

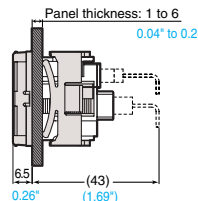


#### AP-A01 Panel Mounting Bracket (Optional)

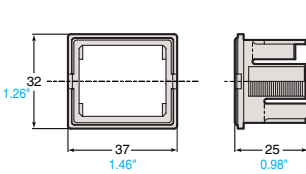
##### Mounting Examples of AP-C30K Series



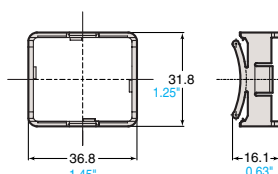
##### Mounting Examples of AP-C40W Series



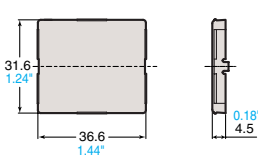
##### Panel Mounting Bracket



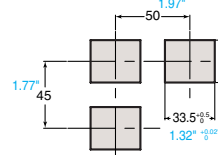
##### Panel Mounting Ring



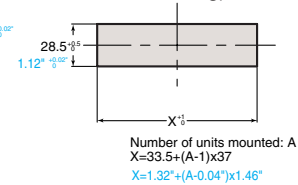
##### Protective Front Cover



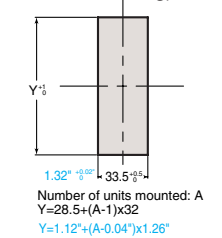
##### Panel Cutout



##### (Horizontal Side-by-side Close Mounting)



##### (Vertical Side-by-side Close Mounting)



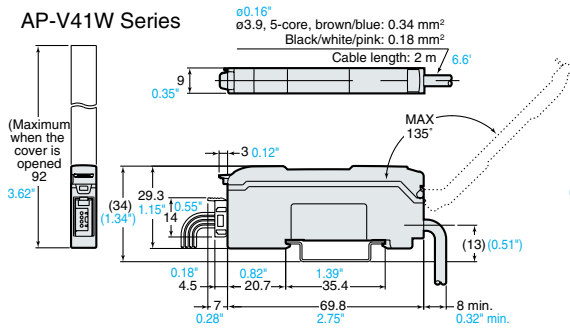
# AP-V40W

Unit: mm Inch

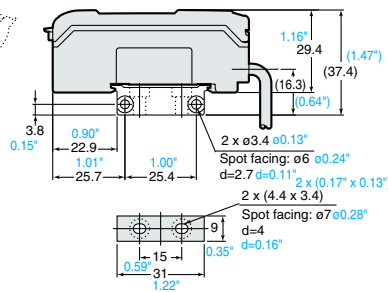
## Dimensions

### Amplifier Unit

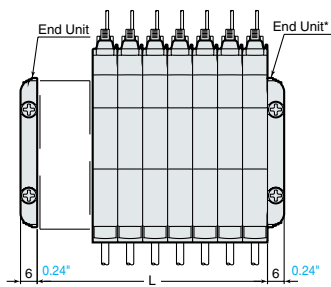
#### AP-V41W Series



#### With Mounting Bracket (included with AP-V41W)

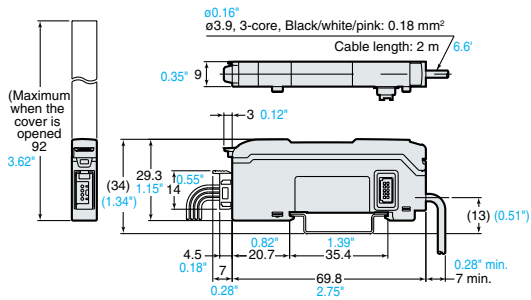


#### When several units are connected

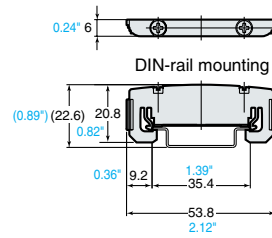


\* When using expansion units, be sure to use the end unit.

#### AP-V42W Series



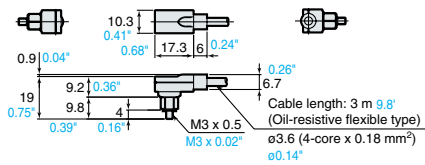
#### End Unit (included with AP-V42W)



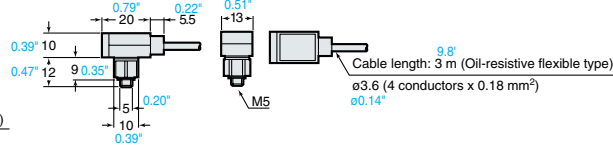
No. of expansion units	L (mm)
1	0.71" 18
2	1.06" 27
3	1.42" 36
4	1.77" 45
5	2.13" 54
6	2.48" 63
7	2.83" 72
8	3.19" 81

### Sensor Head

#### AP-41M



#### AP-41/43/44



### AP-C30K and AP-C40W Use

#### Horizontal Mounting Bracket AP-B01



#### Mounting example



#### Wall Mounting Bracket AP-B02



#### Mounting example



#### Nameplate Mounting Bracket AP-B03



#### Mounting example



#### Slanted Mounting Bracket AP-B04



#### Mounting example



#### Panel Mounting Bracket AP-A01



#### Mounting example



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