Separate Amplifier Type Pressure Sensor

AP-40 Series

Features

- Industry's smallest-sensor head
- Ultra lightweight
- High-speed response
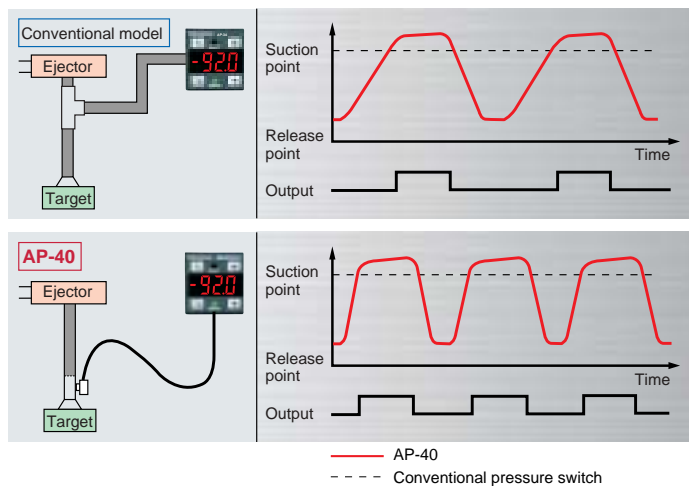- Two-color LED digital pressure display

C E

Description

Industry's smallest & lightest sensor head, weighing only 7 g

The super small and light sensor head measures 20 0.79"(L) x 13 0.51"(W) x 10 0.39"(H) (mm), weighing only 7 g. It can be mounted in a tight space or onto a moving section, such as a suction nozzle.

20 mm
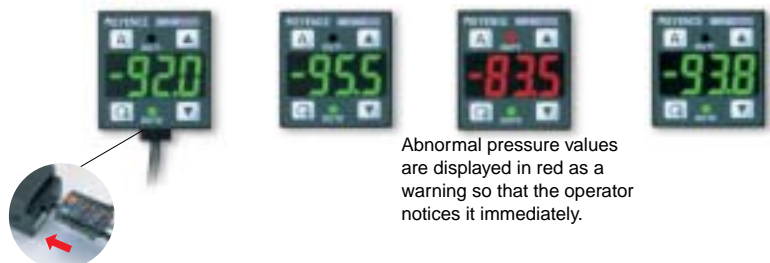0.79"

10 mm
0.39"
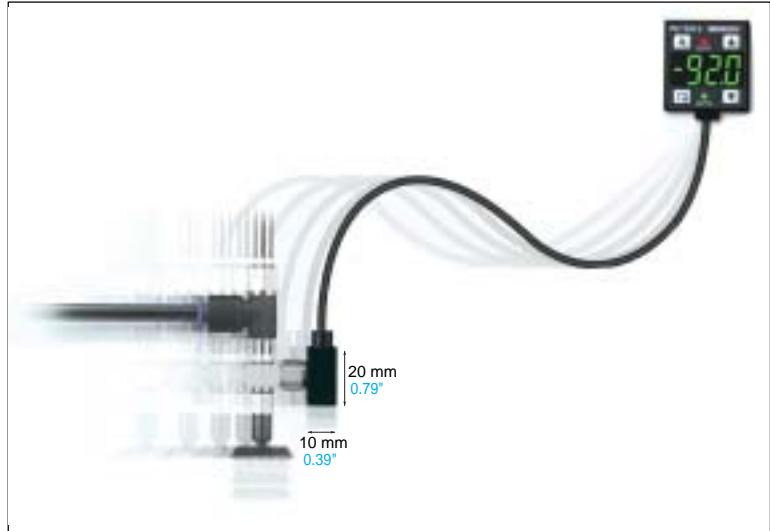
High-speed response of 2.5 ms

The super-small sensor head can be mounted close to the detection point. As a result, loss of response time due to air tube length can be eliminated.

Conventional model

Ejector

Target

Suction point

Release point

Output

Time

AP-40

Ejector

Target

Suction point

Release point

Output

Time

——— AP-40

- - - - Conventional pressure switch

Two-color LED display

Enables pressure control at an "easy-to-observe" location.

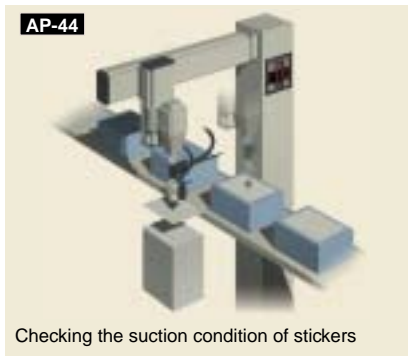Two-color LEDs are used for pressure display. On site Visibility is enhanced.

Abnormal pressure values are displayed in red as a warning so that the operator notices it immediately.

An one-touch connector is used.

KEYENCE AP-40
A OUT1
OUT2

Applications

Checking the suction condition of IC chips

Checking the suction condition of stickers

Confirmation of workpiece seating

Photoelectric Sensors

Area Sensors

Proximity Sensors

Pressure Sensors

PLCs

Counters, Timers

Bar Code Readers

Vision Systems

Static Elimination

High Precision Sensors

Displacement Sensors

Thrubeam Measuring

Analog Sensor Controllers

Video Microscopes

Selection Chart

Configuration	Detectable pressure range	Type	Major applications	-100 k	0	100 k	1 M (Pa)	Model
20 0.79" 10 0.39" M5 male screw	0 to –101.3 kPa	Negative pressure	Suction checking					AP-41
	0 to 1 MPa	Positive pressure	Base pressure control, leakage testing					AP-43
	+101.3 kPa to –101.3 kPa	Compound pressure	Suction checking, vacuum break checking					AP-44

Specifications

Sensor head

Model	AP-41	AP-43	AP-44
Rated pressure	0 to -101.3 kPa (0 to -760 mmHg)	0 to 1 MPa (0 to 10 kgf/cm^2)	+101.3 kPa to -101.3 kPa (760 to -760 mmHg)
Proof pressure	500 kPa	1.5 MPa	500 kPa
Fluid types	Air or noncorrosive gases		
Pressure type	Gauge pressure		
Repeatability	±0.2% of F.S. max. (including amplifier)		
Temperature fluctuation	±2% of F.S. max.		
Connection port diameter	M5 male screw		
Ambient temperature	0 to 50°C (32 to 122°F), No freezing		
Relative humidity	35 to 85%, No condensation		
Material	Housing: PBT, Screw: Stainless steel		
Weight	7 g (without cable), 70 g (including 3 m 6.6' cable)		

Amplifier

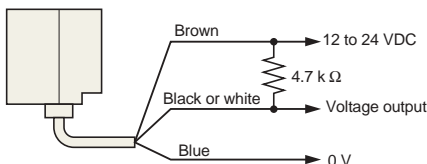| Model	AP-40		
Applicable sensor head	AP-41	AP-43	AP-44
Power supply	12 to 24 VDC ±10%, Ripple (p-p): 10% max.		
Current consumption	105 mA (12 V), 55 mA (24 V) (including sensor head)		
Display	3 1/2-digit, 2-color, 7-segment LED (Character height: 11 mm), Display cycle: 5 times/sec.		
Detectable pressure range	-15% to +110% of F.S.		
Display resolution	0.1 kPa, 1 mmHg, 0.1 inchHg, 0.001 bar	0.001 MPa, 0.01 kgf/cm^2 0.2 Psi, 0.01 bar	0.2 kPa, 2 mmHg 0.1 inchHg, 0.002 bar
Response time (chattering prevention function)	2.5/5/100/500 ms		
Control output	NPN: 100 mA max. (40 V max.), Residual voltage: 1 V max. 2-output (N.O./N.C. selectable)		
Analog voltage output	1 to 5 V		
Temperature fluctuation for display	±1.0% max. of F.S.		
Temperature fluctuation for analog output	±2.0% max. of F.S.		
Ambient temperature	0 to 50°C (32 to 122°F), No freezing		
Relative humidity	35 to 85%, No condensation		
Vibration	10 to 55 Hz, 1.5 mm double amplitude in X, Y, and Z directions, 2 hours respectively		
Shock	100 m/s^2 in X, Y, and Z directions, 3 times respectively		
Material	Front housing: Polyamide, Front panel sheet: PET, Rear housing: Polysulfone, Cable: Oil-proof cabtyre cable		
Mounting	With supplied mounting bracket (2 types) or optional panel mounting bracket [1]		
Weight	80 g (including 2 m 6.6' cable) (28 g without cable)		

1. Two types of panel mounting branckets are available: OP-31357 (black) and OP-32908 (gray).
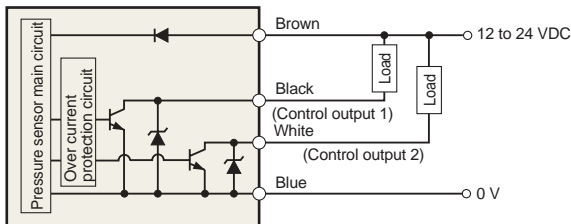
Connections

Drive current load
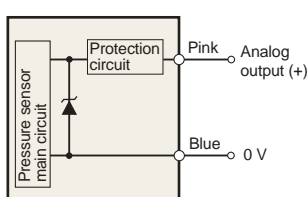

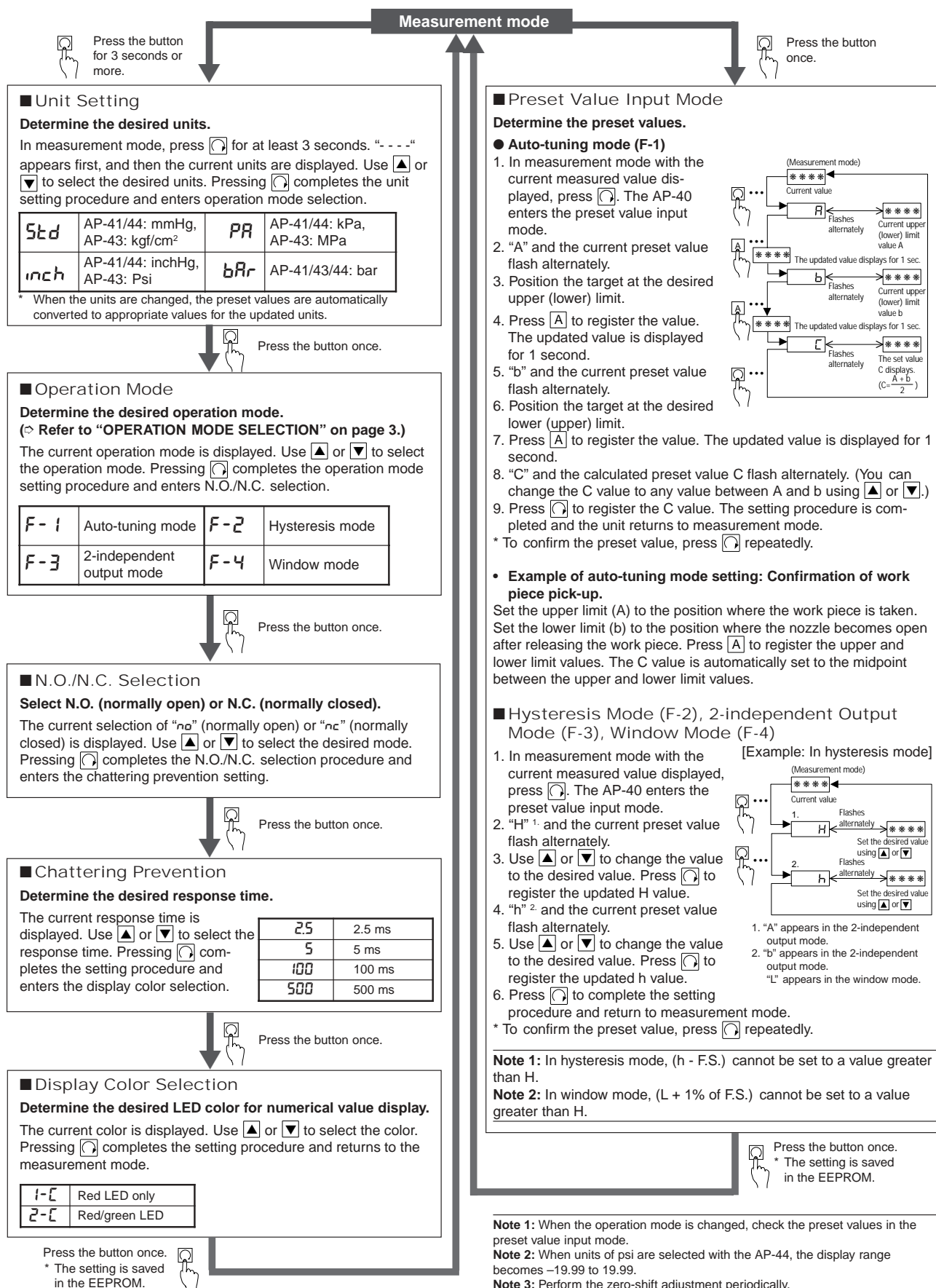### Input to voltage input equipment

Input/Output Circuits

Output circuit

Analog output circuit

Adjustment

Measurement mode

Press the button for 3 seconds or more.

Press the button once.

■ Unit Setting

Determine the desired units.

In measurement mode, press ⟳ for at least 3 seconds. "- - - -" appears first, and then the current units are displayed. Use ▲ or ▼ to select the desired units. Pressing ⟳ completes the unit setting procedure and enters operation mode selection.

5Ed	AP-41/44: mmHg, AP-43: kgf/cm²	PA	AP-41/44: kPa, AP-43: MPa
inch	AP-41/44: inchHg, AP-43: Psi	bAr	AP-41/43/44: bar

* When the units are changed, the preset values are automatically converted to appropriate values for the updated units.

Press the button once.

■ Operation Mode

Determine the desired operation mode.
(⇨ **Refer to "OPERATION MODE SELECTION" on page 3.**)

The current operation mode is displayed. Use ▲ or ▼ to select the operation mode. Pressing ⟳ completes the operation mode setting procedure and enters N.O./N.C. selection.

F-1	Auto-tuning mode	F-2	Hysteresis mode
F-3	2-independent output mode	F-4	Window mode

Press the button once.

■ N.O./N.C. Selection

Select N.O. (normally open) or N.C. (normally closed).

The current selection of "no" (normally open) or "nc" (normally closed) is displayed. Use ▲ or ▼ to select the desired mode. Pressing ⟳ completes the N.O./N.C. selection procedure and enters the chattering prevention setting.

Press the button once.

■ Chattering Prevention

Determine the desired response time.

The current response time is displayed. Use ▲ or ▼ to select the response time. Pressing ⟳ completes the setting procedure and enters the display color selection.

2.5	2.5 ms
5	5 ms
100	100 ms
500	500 ms

Press the button once.

■ Display Color Selection

Determine the desired LED color for numerical value display.

The current color is displayed. Use ▲ or ▼ to select the color. Pressing ⟳ completes the setting procedure and returns to the measurement mode.

1-C	Red LED only
2-C	Red/green LED

Press the button once.
* The setting is saved in the EEPROM.

Press the button once.

■ Preset Value Input Mode

Determine the preset values.

● **Auto-tuning mode (F-1)**
1. In measurement mode with the current measured value displayed, press ⟳. The AP-40 enters the preset value input mode.
2. "A" and the current preset value flash alternately.
3. Position the target at the desired upper (lower) limit.
4. Press A to register the value. The updated value is displayed for 1 second.
5. "b" and the current preset value flash alternately.
6. Position the target at the desired lower (upper) limit.
7. Press A to register the value. The updated value is displayed for 1 second.
8. "C" and the calculated preset value C flash alternately. (You can change the C value to any value between A and b using ▲ or ▼.)
9. Press ⟳ to register the C value. The setting procedure is completed and the unit returns to measurement mode.
* To confirm the preset value, press ⟳ repeatedly.

(Measurement mode) Current value — A Flashes alternately / Current upper (lower) limit value A / The updated value displays for 1 sec. — b Flashes alternately / Current upper (lower) limit value b / The updated value displays for 1 sec. — C Flashes alternately / The set value C displays. $(C = \frac{A+b}{2})$

• **Example of auto-tuning mode setting: Confirmation of work piece pick-up.**

Set the upper limit (A) to the position where the work piece is taken. Set the lower limit (b) to the position where the nozzle becomes open after releasing the work piece. Press A to register the upper and lower limit values. The C value is automatically set to the midpoint between the upper and lower limit values.

■ Hysteresis Mode (F-2), 2-independent Output Mode (F-3), Window Mode (F-4)

[Example: In hysteresis mode]

1. In measurement mode with the current measured value displayed, press ⟳. The AP-40 enters the preset value input mode.
2. "H" [1.] and the current preset value flash alternately.
3. Use ▲ or ▼ to change the value to the desired value. Press ⟳ to register the updated H value.
4. "h" [2.] and the current preset value flash alternately.
5. Use ▲ or ▼ to change the value to the desired value. Press ⟳ to register the updated h value.
6. Press ⟳ to complete the setting procedure and return to measurement mode.
* To confirm the preset value, press ⟳ repeatedly.

(Measurement mode) Current value — 1. H Flashes alternately / Set the desired value using ▲ or ▼ — 2. h Flashes alternately / Set the desired value using ▲ or ▼

1. "A" appears in the 2-independent output mode.
2. "b" appears in the 2-independent output mode. "L" appears in the window mode.

Note 1: In hysteresis mode, (h - F.S.) cannot be set to a value greater than H.
Note 2: In window mode, (L + 1% of F.S.) cannot be set to a value greater than H.

Press the button once.
* The setting is saved in the EEPROM.

Note 1: When the operation mode is changed, check the preset values in the preset value input mode.
Note 2: When units of psi are selected with the AP-44, the display range becomes −19.99 to 19.99.
Note 3: Perform the zero-shift adjustment periodically.
Note 4: The initial output voltage may fluctuate by ±1.0% immediately after the power is turned on. To measure minute differences in pressure, let the sensor warm up for approximately 15 to 30 minutes.
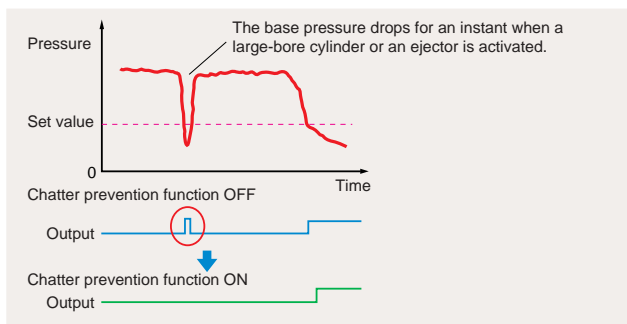
Functions

Chatter prevention function

Prevents erroneous output caused by instantaneous pressure changes.

When a large-bore cylinder or an ejector is activated, the base pressure drops for an instant. The chatter prevention function ignores this abnormal pressure change for a specified period. This eliminates the need for external sequence programs.


Automatic head type detection function

The sensor head type can be checked and detected automatically. There is no need for setting the sensor head type on the amplifier.

Compound pressure type

Measures both negative and positive pressure.

A single sensor head can check not only the suction condition of a workpiece but also the vacuum break for releasing the workpiece.
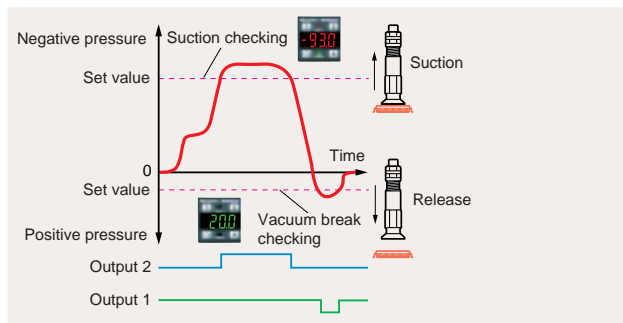
Peak-hold/bottom-hold display function

When the pressure value changes quickly during suction condition checking, the peak-hold/bottom-hold function is used to check the highest and lowest pressure the sensor received during operation. This ensures reliable checking of the pressure condition.

Analog output (AP-40)

The pressure value can be linearly output as analog value from 1 to 5 V. The analog output can be used to record pressure data easily.

Hints on Correct Use

Be sure to follow the instructions below to avoid malfunctions.

Connection
- When using a commercially available switching regulator, be sure to ground the frame ground terminals.
- Isolate the sensor's wiring from power lines or high-voltage lines; otherwise, the sensor may malfunction due to noise interference.
- The amplifier becomes hot or breaks down due to improper wiring.
- The press-fitting is available only once for each sensor head connector.

Other
- Do not use the AP-40 Series for the detection of corrosive gases or liquid.
- Do not insert any objects, such as wires, from the pressure port. The pressure-sensing element may break, resulting in malfunctions.
- Do not press the front panel keys with a pointed object.
- The AP-40 Series does not have an explosion-proof structure.
  Do not use it for the detection of flammable gases.

Options

Panel mounting bracket
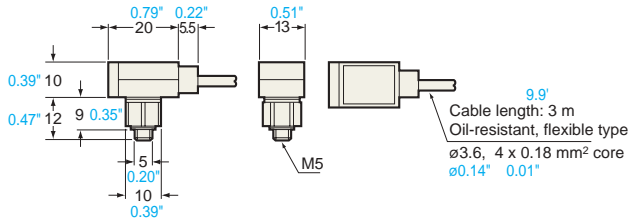**OP-32908** Gray panel
OP-31357 Black panel
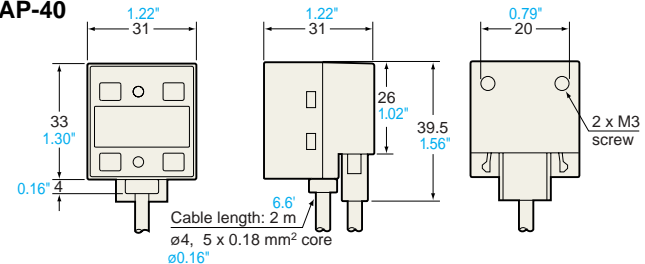
Dimensions

▶**For CAD Data Download >>>** http://world.keyence.com/cadg

Unit: mm   Inch

Sensor head

AP-41/43/44

0.79" 20   0.22" 5.5   0.51" 13
0.39" 10
0.47" 12   9 0.35"
5 0.20"
10 0.39"
M5

9.9'
Cable length: 3 m
Oil-resistant, flexible type
ø3.6, 4 x 0.18 mm² core
ø0.14"   0.01"

Amplifier

AP-40

1.22" 31   1.22" 31   0.79" 20
33 1.30"
26 1.02"
39.5 1.56"
0.16" 4
2 x M3 screw

6.6'
Cable length: 2 m
ø4, 5 x 0.18 mm² core
ø0.16"

Mounting bracket A (Accessory)

0.87" 22   0.63" 16
25 0.98"
35 1.38"
2 x ø4.5 ø0.18"

30 1.18"
0.79"
20 0.55"
14
4 x ø3.5 ø0.14"
0.79" 20
0.75" 19
45 1.77"
35 1.38"
t= 1.5 t= 0.06"
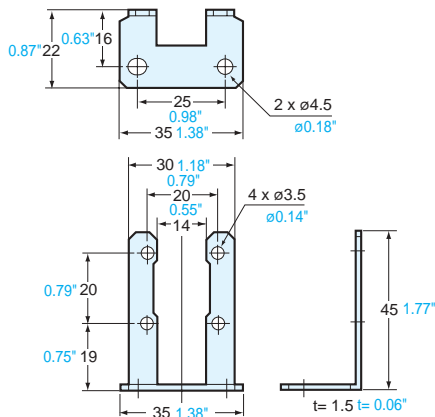
When mounting bracket A is attached

1.22" 31   1.22" 31   0.87" 22
1.79" 45.5
35 1.38"
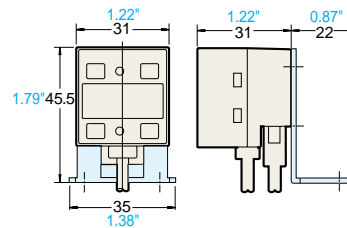
Mounting bracket B (Accessory)

1.18" 30
0.79" 20
0.55" 14
ø0.14"
4 x ø3.5
0.51" 13
0.79" 20
19 0.75"
8.6 0.34"
6 0.24"
20 0.79"
2 x ø4.5 ø0.18"
45 1.77"
t= 1.5 t= 0.06"
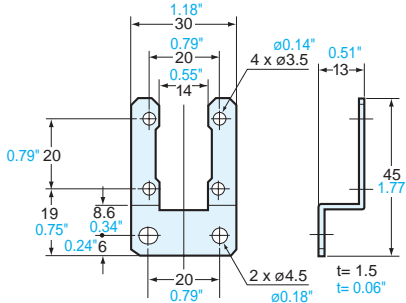
When mounting bracket B is attached

1.22" 31   1.22" 31   0.51" 13
1.79" 45.5
20 0.79"
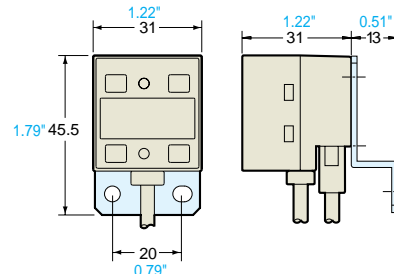
When flush-mounted in control panel with OP-31357 (optional)

0.04" to 0.14"
Panel (thickness:1 to 3.5mm)
Protective front cover
Panel mounting frame
Panel mounting ring
Sensor head

Panel cutout

40 1.57"
75 2.95"
36 +0.5 0   1.42" +0.02" 0
36 +0.5 0   1.42" +0.02" 0
Panel thickness:
1 to 3.5mm 0.04" to 0.14"
(panel cutout dimensions)

Panel cutout: side-by-side mounting

Panel cutout: side-by-side mounting
36 +0.5 0   1.42" +0.02" 0
X +1.0 0   X +0.04" 0

X = 36 + (A - 1) x 40
1.42" + (A - 0.04") x 1.57"
A is the number of sensor heads.
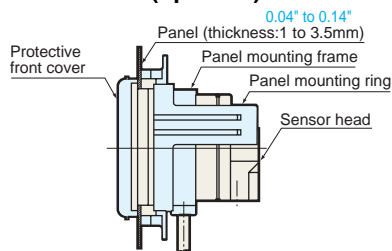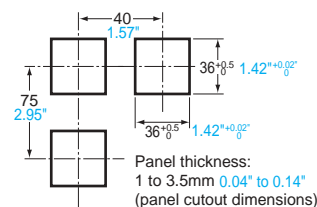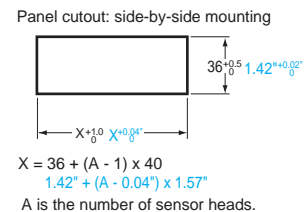
The OP-31357 consists of the following components:

Panel mounting frame

40 1.57"
40 1.57"

Panel mounting ring

56 2.20"
38.8 1.53"
1.45" 36.8
1.30" 32

Protective front cover

42 1.65"
40 1.57"
6 0.24"
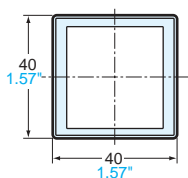
AP-40 Accessory	
Mounting bracket A	X1
Mounting bracket B	X1
Quick Reference Sticker	X1
Hexagonal-socket port stopper	X1
AP-41/43/44 Accessory	
Replacement connector	X1

Photoelectric Sensors
Area Sensors
Proximity Sensors
Pressure Sensors
PLCs
Counters, Timers
Bar Code Readers
Vision Systems
Static Elimination
High Precision Sensors
Displacement Sensors
Thrubeam Measuring
Analog Sensor Controllers
Video Microscopes
AP-30
AP-40