NEW!!

±0.5μm Repeatability

AIR GAP SENSORS
Pneumatic Sensors for Precision Seating Confirmation

DPA Series

IP67
Effectively prevents CNC industrial machined defect products.

±0.5μm – Repeatability.
Detects workpiece floating due to cutting chips, preventing defective products at the manufacturing stage.

**±0.5μm Repeatability**
- Minimal signal point variation and effective detection of workpiece floating due to cutting chips.
- Precision seating confirmation can be realized within the allowable tolerance, preventing machining defects.

**±20μm Repeatability**
- Large signal variation means only workpiece existence detection is possible.
- It is impossible to detect workpiece floating due to cutting chips and to accurately confirm workpiece and jig seating.
IP67 Resistant to Coolant

Sensor can be installed inside machine tools.

Shortened air piping improves response speed and realizes higher productivity.

| Air Gap Sensors | Conventional "pneumatic gap sensors"
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube length</td>
<td>1.5m (Internal installation)</td>
</tr>
<tr>
<td>Response speed</td>
<td>0.8 seconds</td>
</tr>
</tbody>
</table>

One-push Master Setting

The signal set point can be configured just by placing a master within allowable tolerance into the jig and keep pressing the master set button for one second.

Self-diagnosis Function

Alarm signal is output and LED flashes when the air pressure is outside appropriate measurement pressure range.

Product Lineup

Selection by detection distance

- **Short range detection** (1-100μm)
  - 1 signal point setting type
  - Detection range: 1-100μm
  - Workpiece

- **Long range detection** (80-350μm)
  - 2 signal point setting type **NEW!!**
  - Detection range: 80-350μm
  - Workpiece, Cutting chip
  - Surface roughness

- **Short range detection** (1-100μm)
  - 2 signal point setting type **NEW!!**
  - Detection range: 1-100μm
  - Workpiece

- **Long range detection** (80-350μm)
  - 2 signal point setting type
  - Detection range: 80-350μm
  - Workpiece, Cutting chip
  - Surface roughness
  - Classifications: -NG, OK, +NG

DPA Air Gap Sensors

Pneumatic Sensors for Precision Seating Confirmation

Short Range Detection

1 Signal / 2 Signal Point Setting Type

Long Range Detection

1 Signal / 2 Signal Point Setting Type

Selection by detection distance

DPA-SR1   → P.7
DPA-SR2   → P.9
DPA-LR1   → P.7
DPA-LR2   → P.9
**Application Examples**

**Ultra-precision machining can be realized by checking the precise seating of workpiece in jig. Effectively prevents defect products.**

- ±20µm Repeatability.
- 10µm gap caused by cutting chips cannot be detected.

- ±0.5µm Repeatability.
- Reliably detects 10µm gap caused by cutting chips and stops machining automatically.

**10µm gap caused by cutting chips can be detected reliably. Achieves ultra-precision machining with CNC lathes.**

- Cutting chips put between the bar material and stopper, shifting the processing point.

- With ±0.5µm repeatability, effectively detects 10µm gap due to cutting chips and stops machining automatically.
DPA-SR1 Short Range Detection (1-100µm)  
1 Signal Point Setting Type

Application Examples

**Detect shaft seating with ±0.5µm repeatability. Defective products can be prevented.**

<table>
<thead>
<tr>
<th>±20µm Repeatability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A gap caused by cutting chips cannot be detected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>±0.5µm Repeatability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliably detect 10µm uplift due to cutting chips and stop machining automatically.</td>
</tr>
</tbody>
</table>

**Shank adhesion confirmation realizes high-precision machining. Machining errors due to tool floating can be prevented.**

<table>
<thead>
<tr>
<th>50µm Repeatability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor adhesion of the shank produces defective products.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>±0.5µm Repeatability.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stably detects 10µm uplift due to cutting chips and stops machining automatically.</td>
</tr>
</tbody>
</table>

**Application Examples**

**Effectively detects seating of die cast component with rough surface.**
Shortened air piping improves productivity.

- **DPA-LR1** Long Range Detection (80-350µm) 1 Signal Point Setting Type

- **±20µm Repeatability.** Rough workpiece surface makes precision seating detection impossible.

- **±5µm Repeatability.** 350µm detection distance achieves precision seating confirmation.

- **Tube length : 12m**
- **Response speed : More than 5 seconds.**

- **Tube length : 1.5m**
- **Response speed : 0.8 seconds**

**High accuracy, non-contact detection of the wear on rotating grindstones.**
Realizes ultra-precision machining with CNC grinder.

- **±30µm Repeatability.** Detects wear on grindstones with contact.

- **±1µm Repeatability**
  - High accuracy, non-contact detection of grindstone wear.

**Contact**

**Air Gap Sensor**
Long range detection type

**±1µm Repeatability**
1. Low accuracy
2. Wear due to contact

**Non-contact**
1. ±1µm repeatability
2. No wear on grindstone
**Application Examples**

**Replacement of the pin gauge drastically reduced the time for inner diameter inspection.**

- Inner diameter inspection using pin gauge takes a lot of time.
- -NG / OK / +NG 3 classification significantly reduced the inspection time.

1. Inspection by inserting and extracting a pin gauge manually takes a lot of time.
2. Variations in inspection results among workers are caused.

**Replacement of the air micrometer reduced the cost significantly. Machine can be automated by externally outputting signals to NC.**

- The air micrometer is expensive.
- -NG / OK / +NG 3 classification significantly reduced the cost for inner diameter measurement.

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**DPA-SR2/LR2**

2 Signal Point Setting Type (-NG, OK, +NG classifications)

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Air Gap Sensors

**DPA-SR1/LR1**

**1 Signal Point Setting Type**
Short/Long Range Detection

- **1–100μm Short Range Detection Type**
  **DPA-SR1**
  The gaps caused by cutting chips put between the workpiece and the jig can be detected reliably with ±0.5μm to ±1μm repeatability.

- **80–350μm Long Range Detection Type**
  **DPA-LR1**
  Reliably detects the gaps of 80 to 350μm with ±1μm to ±5μm repeatability.
  Best suited for seating confirmation of big workpieces or workpieces with rough surface.

### Specification

<table>
<thead>
<tr>
<th>Product name</th>
<th>DPA-SR1 (Short range detection type)</th>
<th>DPA-LR1 (Long range detection type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection range</td>
<td>1–100μm (When using a recommended nozzle)</td>
<td>80–350μm (When using a recommended nozzle)</td>
</tr>
<tr>
<td>Signal point</td>
<td>Configurable by master set button</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.5μm : Detection range 1–60μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>±1μm : Detection range 60–100μm</td>
<td></td>
</tr>
<tr>
<td>Air Pressure change</td>
<td>within ±1%</td>
<td></td>
</tr>
<tr>
<td>Tube length</td>
<td>1.5m/When using a recommended nozzle</td>
<td></td>
</tr>
<tr>
<td>Response speed</td>
<td>0.8 seconds (Tube length 1.5m/Time between the air pressure supply and the signal output of the sensor.)</td>
<td></td>
</tr>
<tr>
<td>Electrical response speed</td>
<td>80ms</td>
<td></td>
</tr>
<tr>
<td>Protective structure</td>
<td>IP67</td>
<td></td>
</tr>
<tr>
<td>Setting pressure</td>
<td>0.15–0.2MPa</td>
<td></td>
</tr>
<tr>
<td>Pipe diameter</td>
<td>O.D. φ6 X I.D. φ4 tube</td>
<td></td>
</tr>
<tr>
<td>Fluid</td>
<td>Dry air (filtered to 5μm)</td>
<td></td>
</tr>
<tr>
<td>Consumption flow rate</td>
<td>9ℓ/min (max)</td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>0°C–60°C (no condensation)</td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td>Standard length 3m Oil resistance φ5/4 cores AWG 30</td>
<td></td>
</tr>
</tbody>
</table>
| Power supply voltage | DC24V±10%
| Current consumption : less than 100mA |
| Output specification | Photo MOS output (Non-voltage floating output) DC30V (max) 100mA (max) |

### Air piping diagram

Air lines are to be provided by the user.

- Air filter (5μm mesh) Recommended air filter : AF20-02 (SMC)
- Adjust the setting pressure within 0.15–0.2MPa. Recommended regulator : IR2000 (SMC)

### Precautions for air piping

Connect the air pipe after adjusting the setting pressure within the range of 0.15–0.2MPa.

### Circuit diagram

Main Circuit

- Orange DC24Vs10%
- Green NO
- Yellow
- Black 0V

Photo MOS relay DC 30V (max) 100mA (max)
DPA-SR1/LR1 Short/Long Range Detection 1 Signal Point Setting Type

**Outer dimension**

<table>
<thead>
<tr>
<th>Product No.</th>
<th>Tube length</th>
<th>Cable protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPA-SR1</td>
<td>Blank : 3m</td>
<td>Blank : No cable protection</td>
</tr>
<tr>
<td>DPA-LR1</td>
<td></td>
<td>P2 : Protective tube 2m</td>
</tr>
</tbody>
</table>

Recommended nozzle shape

- C0.1–0.2 (slight chamfering)

**Options**

- e.g.) DPA-SR1-P2

Protective tube for cable protection

- Dimension: outer diameter ø9
- Minimum bending radius: 25mm

**Handling instruction**

1. Because protective tube is not flexible, clamp it to fix so as not apply excessive force to the sensor.
2. When binding it up and clamp with other cables, make sure not to apply excessive force to the attachment end.
3. Cables are not waterproof.

Sensor side is screwed in and metal ring is attached to machine side.
Air Gap Sensors

DPA-SR2/LR2

NEW

* Photo shows the optional protective tube attached.

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Pneumatic Sensors for Precision Seating Confirmation

2 Signal Point Setting Type

Short/Long range detection

- 3 Classifications (-NG, OK, +NG)
  Displays results and outputs signals based on 3 classifications (-NG, OK, +NG) by setting upper and lower limit points.

<table>
<thead>
<tr>
<th>Distance</th>
<th>-NG (Borderline not included)</th>
<th>OK (Borderline included)</th>
<th>+NG (Borderline not included)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>−LIMIT point</td>
<td>+LIMIT point</td>
<td></td>
</tr>
</tbody>
</table>

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Specification

<table>
<thead>
<tr>
<th>Product name</th>
<th>DPA-SR2 (Short range detection type)</th>
<th>DPA-LR2 (Long range detection type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection range</td>
<td>1–100μm (When using a recommended nozzle)</td>
<td>80–350μm (When using a recommended nozzle)</td>
</tr>
<tr>
<td>Signal point</td>
<td>Set by +LIMIT SET button, -LIMIT SET button, + LIMIT SET input and -LIMIT SET input</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.5μm : Detection range 1–60μm</td>
<td>±1μm : Detection range 80–150μm</td>
</tr>
<tr>
<td></td>
<td>±1μm : Detection range 60–100μm</td>
<td>±3μm : Detection range 150–250μm</td>
</tr>
<tr>
<td></td>
<td>±5μm : Detection range 250–350μm</td>
<td>±5μm : Detection range 250–350μm</td>
</tr>
<tr>
<td>Air pressure change : within ±1%</td>
<td>Tube length 1.5m/When using a recommended nozzle</td>
<td></td>
</tr>
<tr>
<td>Response speed</td>
<td>0.8 seconds (Tube length 1.5m/Time between the air pressure supply and the signal output of the sensor.)</td>
<td></td>
</tr>
<tr>
<td>Electrical response speed</td>
<td>10ms</td>
<td></td>
</tr>
<tr>
<td>Protective structure</td>
<td>IP67</td>
<td></td>
</tr>
<tr>
<td>Setting pressure</td>
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<td>0°C–60°C (no condensation)</td>
<td></td>
</tr>
<tr>
<td>Cable</td>
<td>Standard length 3m Oil resistance φ5.5/16 cores AWG 28</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>DC24V±10% Current consumption : less than 50mA</td>
<td></td>
</tr>
<tr>
<td>Input specification</td>
<td>Photocoupler input DC24V±10%</td>
<td></td>
</tr>
<tr>
<td>Output specification</td>
<td>Photocoupler output (Non-voltage floating output) DC24V±10% 15mA (max) Low level output voltage : less than 1.5V (at 15mA)</td>
<td></td>
</tr>
</tbody>
</table>

Air piping diagram

Air lines are to be provided by the user.

Air filter (5μm mesh) Recommended air filter : AF20-02 (SMC)

Air pressure alarm LED

Precision regulator

Adjust the setting pressure within 0.15–0.2MPa. Recommended regulator : IP2000 (SMC)

Precautions for air piping

Connect the air pipe after adjusting the setting pressure within the range of 0.15–0.2MPa.

Circuit diagram

Main circuit

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### Outer dimension

**DPA-SR2**: Detection distance 1-100μm  
**DPA-LR2**: Detection distance 80-350μm

<table>
<thead>
<tr>
<th>Options</th>
<th>Tube length</th>
<th>Cable protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPA-SR2</td>
<td>Blank : 3m</td>
<td>Blank : No cable protection</td>
</tr>
<tr>
<td>DPA-LR2</td>
<td></td>
<td><strong>P2</strong>: Protective tube 2m</td>
</tr>
</tbody>
</table>

- e.g.) DPA-SR2-P2

### Protective tube for cable protection

- **Dimension**: outer diameter φ9  
- **Minimum bending radius**: 25mm

```
Sensor side is screwed in and metal ring is attached to machine side.
```

### Handling instruction

1. Because protective tube is not flexible, clamp it to fix so as not apply excessive force to the sensor.  
2. When binding it up and clamp with other cables, make sure not to apply excessive force to the attachment end.  
3. Cables are not waterproof.
Precision Mechanical Type
AIR GAP SENSOR
for Short Range Detection

**DPA-A2**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name</td>
<td>DPA-A2</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±1μm*</td>
</tr>
<tr>
<td>Response speed</td>
<td>0.8 seconds*</td>
</tr>
<tr>
<td>Protective structure</td>
<td>IP67</td>
</tr>
<tr>
<td>Detection range</td>
<td>2–80μm (10μm at the factory setting)</td>
</tr>
<tr>
<td>Setting pressure</td>
<td>0.1MPa</td>
</tr>
</tbody>
</table>

*Tube length 1.5m / When using a recommended nozzle

For more detail, please contact us.

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Case Study

DENSO Corporation

“Prevented machining defects using precise workpiece seating confirmation”

Read full case study here. ➤

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© The specifications and descriptions are subject to change without notice due to improvements in products.