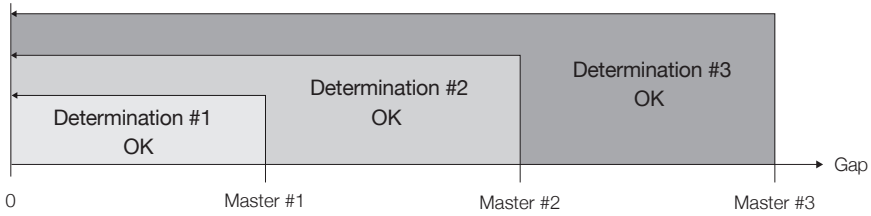
Instruction Manual — Air Gap Sensor DPA-PSR2B/PLR2B

■Summary

This sensor uses pneumatic non-contact measurement for high-precision workpiece measurement, performing comparison determinations of the preset signal points and current value.
The master values, composed of masters #1, #2, and #3, are displayed and output.
Determinations #1, #2, and #3 are carried out independently of one another:
OK when below the master values and NG when above the master values.
As it is a pneumatic sensor, it is capable of detecting without leaving measurement marks on the workpiece.
Available in 2 models according to the detection range, it supports a variety of measurement.



■Features

1. High-precision repeatability.
2. Three points (determinations #1, #2, and #3) are output.
3. Control with external input is possible.
4. Electrical response time is more than 10 times shorter than our conventional air gap sensors.
5. IP67 dust & water-proof structure.

■Basic usage

1. Use the master workpiece to set the master values in STOP mode.
2. While in measuring mode, the sensor outputs the result based on the comparison between the present value and the signal point value.

■Absolute maximum rating

Item	Value	Unit
Supply voltage	26.4	V
Input withstand voltage	26.4	V
Output withstand voltage	26.4	V
Output withstand current	20 each	mA
Supply pressure	0.30	MPa

Electrical current/voltage or supply pressure exceeding the absolute maximum rating listed above may cause serious damage to the internal structure.
Values in the table are not applicable to conditions exceeding the above conditions or the recommended operating conditions.

Specification

Product No.	**DPA-PSR2B** (Short range detection)	**DPA-PLR2B** (Long range detection)
Repeatability guarantee range	1-100 µm	80-350 µm
Setting method	Configurable by master set input 1-2	
Repeatability	±0.5 µm : Master value 1-60 µm ±1 µm : Master value 60-100 µm **Supply pressure variation falls within +/-1%**	±1 µm : Master value 80-150 µm ±3 µm : Master value 150-250 µm ±5 µm : Master value 250-350 µm **Supply pressure variation falls within +/-1%**
Input specification	Photocoupler input DC 24 V ±10%	
Output specification	Photocoupler output (Non-voltage floating output) DC 24 V ±10% (max) less than 20 mA Low level output voltage : less than 1.5 V (at 15 mA)	
Response time	0.8 seconds (Tube length 1.5 m/ Time between the air pressure supply and the signal output of the sensor)	
Electrical response time	10ms	
Protective structure	IP67	
Supply pressure range	0.15-0.20 MPa	
Pipe diameter	O.D. ø6 X I.D. ø4 tube	
Fluid	Dry air (filtered to 5 µm)	
Consumption flow rate	9 L/min (max)	24 L/min (max)
Operating temperature range	0-60°C (no condensation)	
Cable	Standard length 3 m, Oil resistance, ø5.5, 16 cores, AWG 28 equivalent	
Power supply voltage	DC 24 V ±10%	
Consumption current	Less than 100 mA	

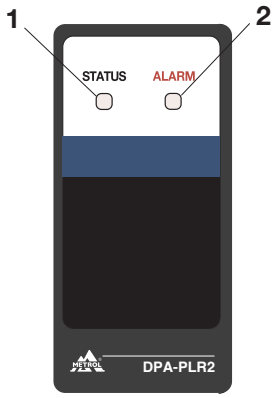
Notes

・Specifications apply to conditions where a recommended nozzle is used.
When using different nozzles, make appropriate judgements upon confirmation of use with the actual device.

・Specifications apply to conditions where one nozzle is used per body.
When using multiple nozzles, make appropriate judgements upon confirmation of use with the actual device.

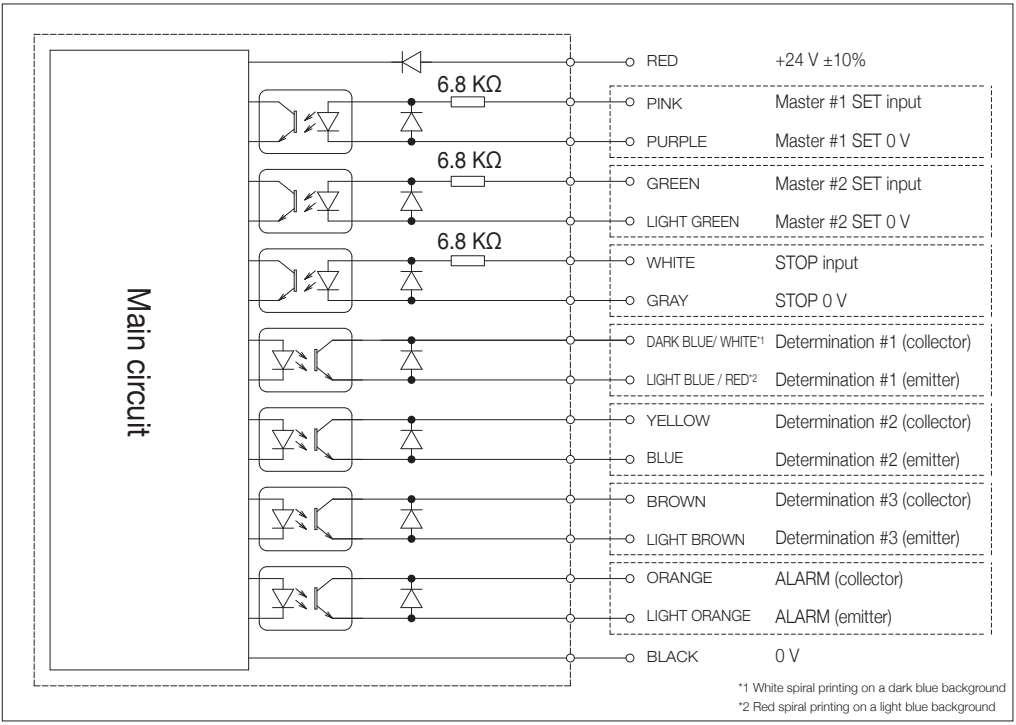
・ DPA-PSR2B specifications are under conditions using the attached leakage unit.

■Product parts and functions



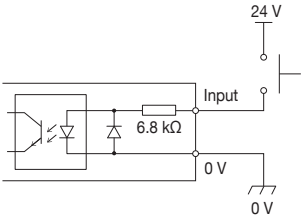
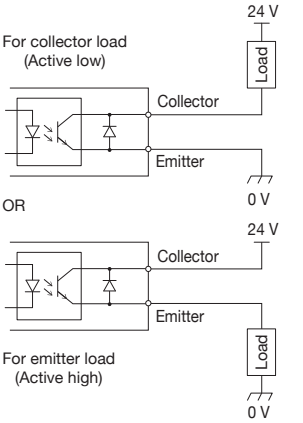
Item	Description
1. STATUS LED	Determination results are displayed while in Measuring mode. Input complete can be verified in the STOP mode.
2. Air pressure alarm LED	The status of the supply pressure is displayed.

■I/O circuit diagram



*1 White spiral printing on a dark blue background
*2 Red spiral printing on a light blue background

Wiring

<table>
<tr><th>Color</th><th>Signal</th><th colspan="2">Description</th><th>Example load connection</th></tr>
<tr><td>RED</td><td>DC 24 V ±10%</td><td colspan="2" rowspan="2">Power supply</td><td rowspan="2">—</td></tr>
<tr><td>BLACK</td><td>0 V</td></tr>
<tr><td>PINK</td><td>Master #1 SET input</td><td rowspan="2">Master #1 can be set by turning ON for 100 ms while in STOP mode.</td><td rowspan="4">Master #3 can be set by turning ON for 100 ms simultaneously while in STOP mode.</td><td rowspan="4"> 
</td></tr>
<tr><td>PURPLE</td><td>Master #1 SET 0 V</td></tr>
<tr><td>GREEN</td><td>Master #2 SET input</td><td rowspan="2">Master #2 can be set by turning ON for 100 ms while in STOP mode.</td></tr>
<tr><td>LIGHT GREEN</td><td>Master #2 SET 0 V</td></tr>
<tr><td>WHITE</td><td>STOP input</td><td colspan="2" rowspan="2">Turns ON while in Measuring mode to move to STOP mode.</td></tr>
<tr><td>GRAY</td><td>STOP 0 V</td></tr>
<tr><td>DARK BLUE/ WHITE</td><td>Determination #1 (collector)</td><td colspan="2" rowspan="2">Outputs the master #1 determination in Measuring mode.
Turns OFF when the current value is at or below master #1.
Turns OFF for 200 ms as ACK for the master #1 set in STOP mode.</td><td rowspan="6"> 
</td></tr>
<tr><td>LIGHT BLUE / RED</td><td>Determination #1 (emitter)</td></tr>
<tr><td>YELLOW</td><td>Determination #2 (collector)</td><td colspan="2" rowspan="2">Outputs the master #2 determination in measurement mode.
Turns OFF when the current value is at or below master #2.
Turns OFF for 200 ms as ACK for the master #2 set in STOP mode.</td></tr>
<tr><td>BLUE</td><td>Determination #2 (emitter)</td></tr>
<tr><td>BROWN</td><td>Determination #3 (collector)</td><td colspan="2" rowspan="2">Outputs the master #3 determination in measurement mode.
Turns OFF when the current value is at or below master #3.
Turns OFF for 200 ms as ACK for the master #3 set in STOP mode.</td></tr>
<tr><td>LIGHT BROWN</td><td>Determination #3 (emitter)</td></tr>
<tr><td>ORANGE</td><td>ALARM (collector)</td><td colspan="2" rowspan="2">Turns ON while the supply pressure is normal.</td></tr>
<tr><td>LIGHT ORANGE</td><td>ALARM (emitter)</td></tr>
</table>

Connect the output in accordance with the design conditions.
Note: Individually isolate the unused input and output lines.

■Display at power on

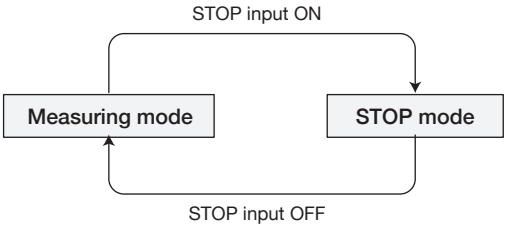
When the power is turned ON, the STATUS LED blinks red, the pneumatic alarm LED blinks green, and normal operation begins.

In case of memory error, all LEDs blink in red. Please contact us.

■Modes

DPA-PSR2B/PLR2B have the following modes.

Item	Description	How to change modes
1. Measuring mode	Compares the master values and current value and outputs the determination results. Setting master values is prohibited.	Turns STOP input OFF.
2. STOP mode	Stops the determination and turns outputs other than alarms ON. The master values can be set with external input.	Turns STOP input ON.



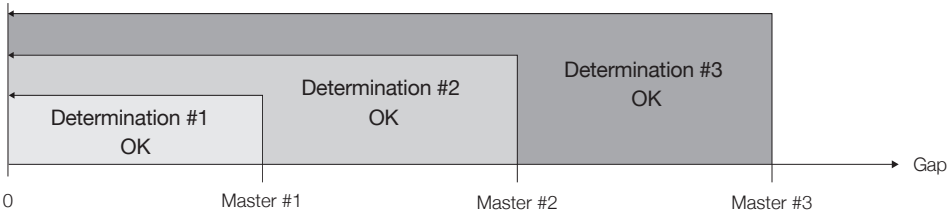
1. Measuring mode

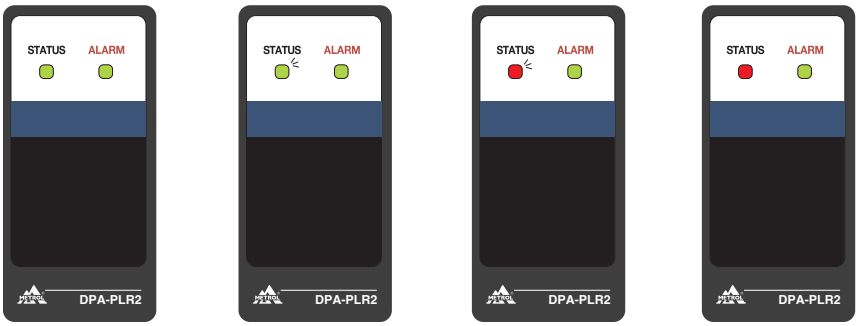
When the STOP input is OFF, the sensor enters Measuring mode.
While in Measuring mode, it continuously performs comparison determinations of the preset signal points (Master #1/ Master #2/ Master #3) and current value.
The determination result is displayed with LED and output.

LED display and output in Measuring mode

	Item	Determination #1 OK #2 OK #3 OK	Determination #1 NG #2 OK #3 OK	Determination #1 NG #2 NG #3 OK	Determination #1 NG #2 NG #3 NG	Supply pressure error
LED	STATUS LED	**Green**/lit	**Green**/blink	**Red**/blink	**Red**/lit	Unlit
LED	Air pressure alarm LED	**Green**/lit				**Red**/blink(≧0.22 MPa) **Red**/lit(≦0.10 MPa) **Orange**/blink (±0.01 MPa Change)
Output	Determination #1	OFF	ON	ON	ON	ON
Output	Determination #2	OFF	OFF	ON	ON	
Output	Determination #3	OFF	OFF	OFF	ON	
Output	ALARM	ON				OFF

Example





2. STOP mode

When the STOP input is ON, the sensor enters STOP mode.
Outputs other than the alarm are turned ON and external input of the signal points is permitted.
The master values can be set with external input only when the STATUS LED is lit orange (when supply pressure is normal, or deviation from master values is less than ±0.01 MPa).

LED display and output in STOP mode

<table>
<tr><th></th><th>Item</th><th>Normal supply pressure</th><th>Master #1 Set Complete</th><th>Master #2 Set Complete</th><th>Master #3 Set Complete</th><th>Supply pressure error</th></tr>
<tr><td rowspan="2">LED</td><td>STATUS LED</td><td>Orange/lit</td><td colspan="3">Unlit
↓
Orange/lit</td><td>Unlit(≧0.22 MPa)
Unlit(≦0.10 MPa)
Orange/lit(±0.01 MPa Change)</td></tr>
<tr><td>Air pressure alarm LED</td><td>Green/lit</td><td colspan="3">Green/lit or Orange/blink (±0.01 MPa change)
↓
Green/lit</td><td>Red/blink(≧0.22 MPa)
Red/lit(≦0.10 MPa)
Orange/blink(±0.01 MPa Change)</td></tr>
<tr><td rowspan="4">Output</td><td>Determination #1</td><td>ON</td><td>OFF for 200ms (ACK)
↓
ON</td><td>ON</td><td>ON</td><td rowspan="3">ON</td></tr>
<tr><td>Determination #2</td><td>ON</td><td>ON</td><td>OFF for 200 ms (ACK)
↓
ON</td><td>ON</td></tr>
<tr><td>Determination #3</td><td>ON</td><td>ON</td><td>ON</td><td>OFF for 200 ms (ACK)
↓
ON</td></tr>
<tr><td>ALARM</td><td>ON</td><td colspan="3">ON or OFF (±0.01 MPa change)
↓
ON</td><td>OFF</td></tr>
</table>

■How to set master values

The master valuess (signal set points) can be changed in STOP mode.
The master values are saved even when the power is turned off.
When the reproducibility of the entire measurement system has changed, reset the master values.

Mode	How to set master values	ACK output
1. Measuring mode	Not possible	×
2. STOP mode	Possible	✓

NOTE: We recommend setting the master values so that "master value #3 > master value #2 > master value #1".

Reference: When not checking the status with the STATUS LED, settings other than "master value #3 > master value #2 > master value #1" are also acceptable. In this case, LED display and output will be as below.

LED display: STATUS LED display will become irregular.
Determination: Determinations will be correctly carried out and output according to the results.

Setting master values

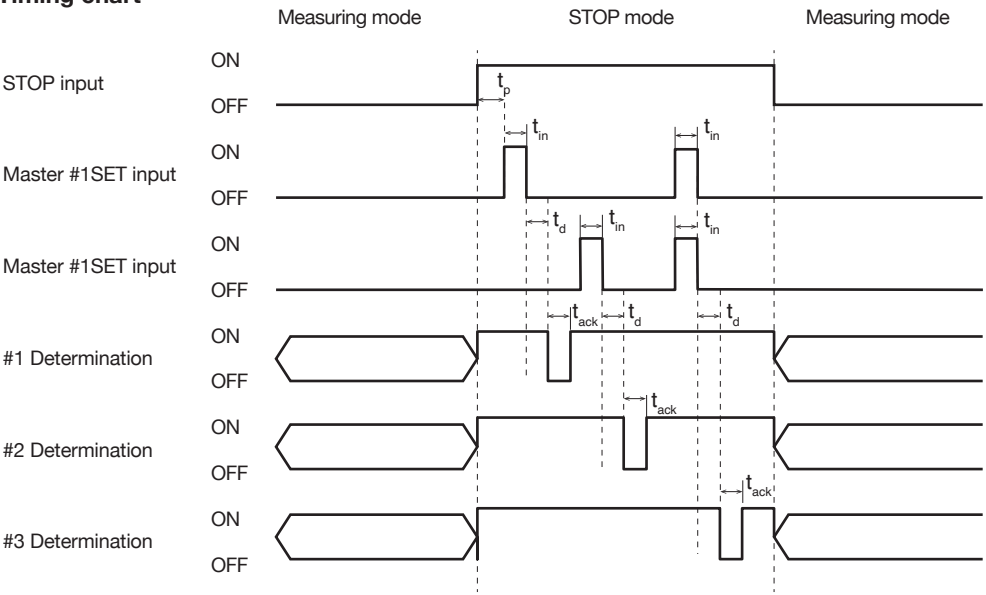
1. Switch to STOP mode.
2. Confirm that the supply pressure is within the rating. (STATUS LED lit orange, pneumatic alarm LED lit green or blinking orange)
3. Place the master #1 setting master on the measurement point.
4. For master #1 SET input, input a pulse of 100 ms ON or more.
5. Once the STATUS LED goes OFF and determination #1 output Turns OFF as the ACK output for 200 ms, the setting is completed.
6. Place the master #2 setting master on the measurement point.
7. For master #2 SET input, input a pulse of 100 ms ON or more.
8. Once the STATUS LED goes OFF and determination #2 output Turns OFF as the ACK output for 200 ms, the setting is completed.
9. Place the master #3 setting master on the measurement point.
10. For master #1 & #2 SET input, input a pulse of 100 ms ON or more simultaneously.
11. Once the STATUS LED goes OFF and determination #3 output Turns OFF as the ACK output for 200 ms, the setting is completed.

Master #1 SET (3 - 5) , master #2 set (6 - 8) and master #3 (9 - 11)may be done in any order.

Notes

- The input is completed when it falls (it does not complete while turned ON).
- Operation is not possible for the t_p period from the beginning of STOP input. Therefore, wait until after t_p from the beginning of STOP input for each set input.

Timing chart



Timing definition

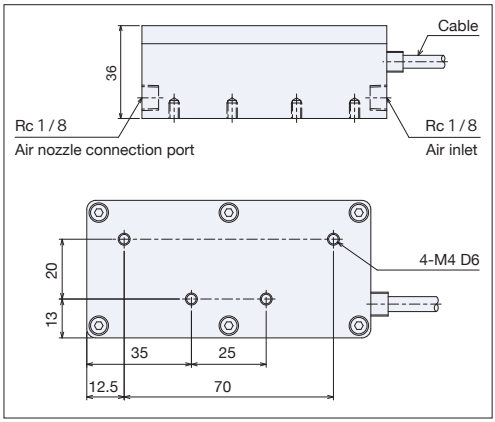
Parameter		MIN	MAX	Unit
Set input prohibition time	t_p		100	ms
Set input time (pulse width)	t_{in}	100		ms
Time from set input completion to ACK output	t_d		100	ms
ACK output time (pulse width)	t_{ack}	200		ms

■Operation preparation

1.Joint mounting

Mount joints to the air nozzle connection port and the air inlet as in the figure at right.

Note: Joints are not included.
Note: Make sure to use a seal tape.



2.Body mounting

Using 4-M4 D6 on the mounting surface, mount on the machine body referring to the figure at right.

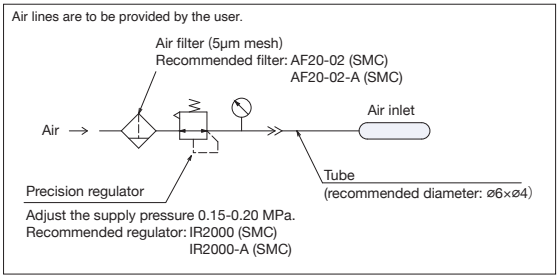
Precautions for body mounting

1. Mount the body as far above the nozzle as possible. (in order to prevent backflow of coolant from the nozzle)
2. To maintain reproducibility of detection accuracy, keep the piping between the body and the nozzle as short as possible when determining location.

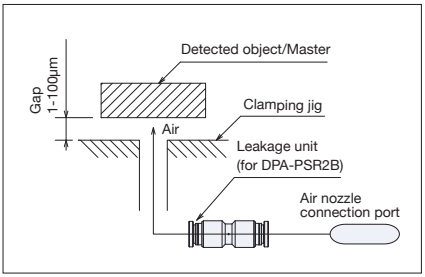
3.Air piping

Connect the supply air to the air inlet referring to the air piping diagram, and connect the air nozzle and leakage unit to the air nozzle connection port referring to the air nozzle piping diagram.

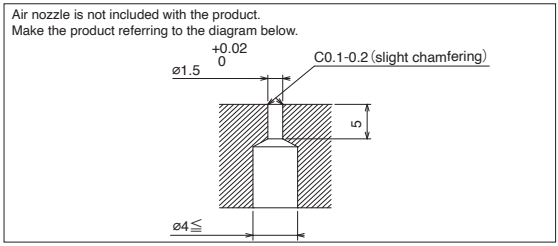
Air supply piping diagram



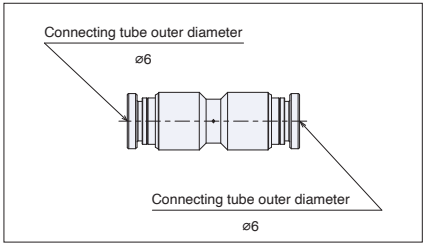
Air nozzle piping diagram



Recommended nozzle shape



Leakage unit (standard accessory of DPA-PSR2B)



Precautions for air piping

1. For the piping from the body to the detection nozzle, do not use devices or joints which will lead to air leaks or resistance.
2. Use a precision-class regulator. (±0.5%-class)
3. When supplying air of 0.30 MPa or higher to the device, there is a risk of sensor damage. Connect the air pipe after adjusting the setting pressure within the range of 0.15 to 0.20 MPa.
4. Select the installation location of leakage unit so that it can avoid direct hit by coolant and cutting chips when the supply of air is stopped.
5. Be careful not to block the hole of leakage unit.

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

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