

This sensor uses pneumatic non-contact measurement for high-precision workpiece measurement, performing comparison determinations of the preset signal points (+LIMIT point / -LIMIT point) and current value.

The signal points consist of +LIMIT point (upper limit) and -LIMIT point (lower limit).

By setting these points, the sensor can displays results and outputs signals based on 3 classifications:

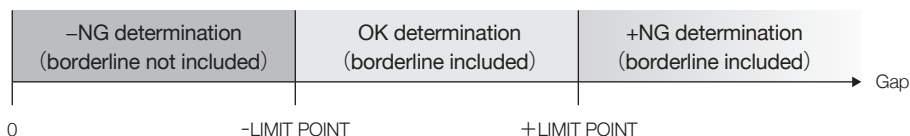
Over +LIMIT point (+NG determination)

Between +LIMIT and -LIMIT points (OK determination)

Below the -LIMIT point (-NG determination)

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. Outputs -NG, OK and +NG determinations. NG shifts can be determined.
3. Both button input and external input are available, and both controls are supported.
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. Set the signal point with a master workpiece.
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.

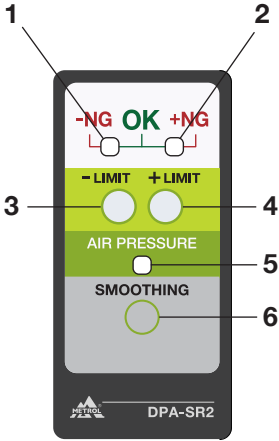
■ Specification

Product No.	DPA-SR2 (Short range detection)	DPA-LR2 (Long range detection)
Repeatability guarantee range	1-100 μm	80-350 μm
Setting method	Configurable by +LIMIT SET button, -LIMIT SET button or +LIMIT SET input, -LIMIT SET input	
Repeatability	$\pm 0.5 \mu\text{m}$: Master value 1-60 μm $\pm 1 \mu\text{m}$: Master value 60-100 μm Supply pressure variation falls within $\pm 1\%$	$\pm 1 \mu\text{m}$: Master value 80-150 μm $\pm 3 \mu\text{m}$: Master value 150-250 μm $\pm 5 \mu\text{m}$: Master value 250-350 μm Supply pressure variation falls within $\pm 1\%$
Input specification	Photocoupler input DC 24 V $\pm 10\%$	
Output specification	Photocoupler output (Non-voltage floating output) DC 24V $\pm 10\%$ (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	10 ms	
Protective structure	IP67	
Supply pressure range	0.15-0.20 MPa	
Pipe diameter	O.D. $\phi 6$ X I.D. $\phi 4$ 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, $\phi 5.5$, 16 cores, AWG 28 equivalent	
Power supply voltage	DC 24 V $\pm 10\%$	
Consumption current	Less than 100 mA	

Notes

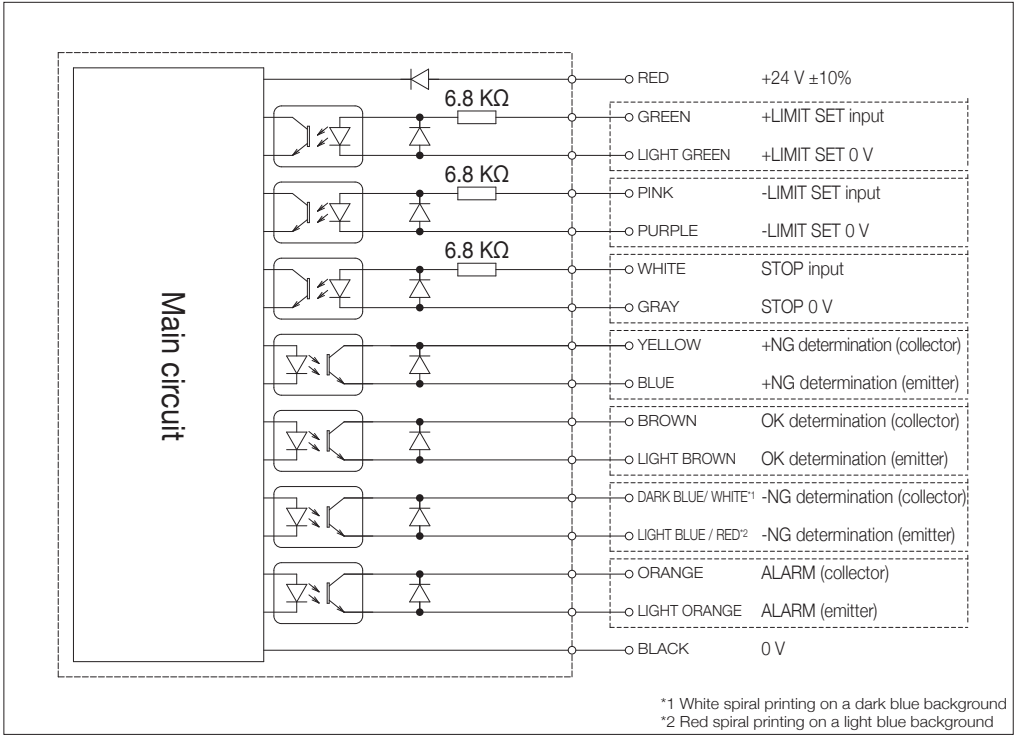
- Specifications apply to conditions where a recommended nozzle is used.
When using different nozzles, make appropriate judgements upon confirmation of use with the actual device.
- Specifications apply to conditions where one nozzle is used per body.
When using multiple nozzles, make appropriate judgements upon confirmation of use with the actual device.
- Specifications of DPA-SR2 apply to conditions where the attached leakage unit is used.

Product parts and functions



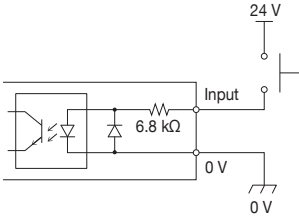
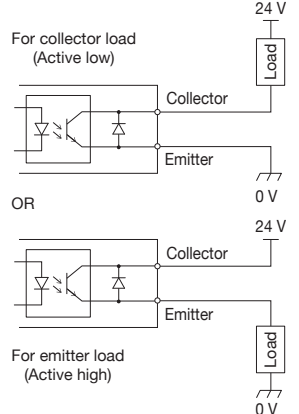
Item	Description
1. -NG LED	Determination results are displayed while in Measuring mode.
2. +NG LED	Input complete can be verified in the STOP mode.
3. -LIMIT SET button	Press for 1 second or more to set -LIMIT point (lower limit) while in Measuring mode.
4. +LIMIT SET button	Press for 1 second or more to set +LIMIT point (upper limit) while in Measuring mode.
5. Air pressuer alarm LED	The status of the supply pressure is displayed while in Measuring mode and STOP mode. The present electrical response time is displayed while in SMOOTHING set mode.
6. SMOOTHING buttton	Press for 1 second or more while in Measuring mode to move to SMOOTHING set mode.

I/O circuit diagram



*NG (Out of set value)

■Wiring

Color	Signal	Description	Example load connection
RED	DC 24 V $\pm 10\%$	Power supply	—
BLACK	0 V		
GREEN	+LIMIT SET input	+LIMIT point can be set by turning ON for 100 ms while in STOP mode.	
LIGHT GREEN	+LIMIT SET 0 V		
PINK	–LIMIT SET input	–LIMIT point can be set by turning ON for 100 ms while in STOP mode.	
PURPLE	–LIMIT SET input		
WHITE	STOP input	Turn ON while in Measuring mode to move to STOP mode.	
GRAY	STOP 0 V		
YELLOW	+NG determination (collector)	Turns ON for +NG determination while in Measuring mode.	
BLUE	+NG determination (emitter)	Turns ON for 200 ms as ACK for the +LIMIT set in STOP mode.	
BROWN	OK determination (collector)	Turns ON for OK determination while in Measuring mode.	
LIGHT BROWN	OK determination (emitter)		
DARK BLUE/WHITE	–NG determination (collector)	Turns ON for –NG determination while in Measuring mode.	
LIGHT BLUE/RED	–NG determination (emitter)	Turns ON for 200 ms as ACK for the –LIMIT set in STOP mode.	
ORANGE	ALARM (collector)	Turns ON while the supply pressure is normal in the Measuring mode and STOP mode.	
LIGHT GREEN	ALARM (emitter)		

Connect the output in accordance with the design conditions.

Note: Individually isolate the unused input and output lines.

*NG (Out of set value)

■ Display at power on

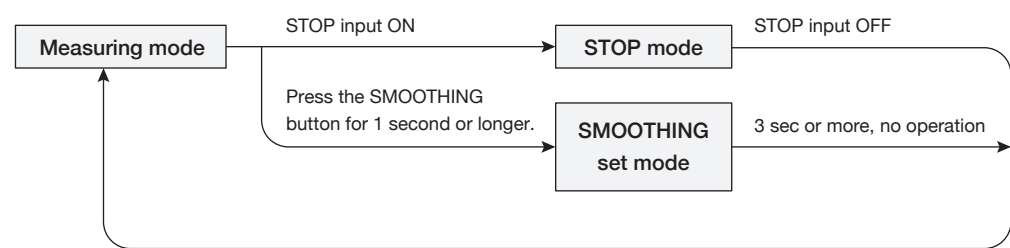
When the power turns on, green LED blinks and the sensor starts normal operation.

In case of memory error, all LED blinks red. Please contact us.

■ Modes

DPA-SR2/LR2 have 3 modes listed below.

Item	Description	How to change modes
1. Measuring mode	The sensor outputs the results based on the comparison between the present value and the signal point. The signal point is set by button. (In the same way as when using DPA-SR1/LR1) No external input is allowed.	Turns STOP input OFF.
2. STOP mode	The sensor stops measuring and turns any outputs except alarm signal OFF. No button input is allowed.	Turns STOP input ON while in Measuring mode.
3. SMOOTHING set mode	The sensor stops measuring and turns all outputs OFF. By pressing SMOOTHING button, electrical response time can be changed.	Press SMOOTHING button for 1 second or longer while in Measuring mode.



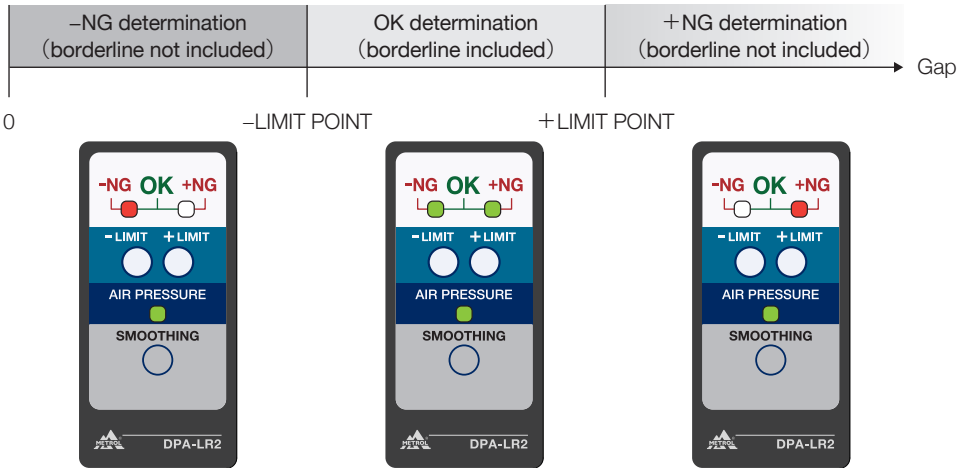
1. Measuring mode

When the STOP input is OFF, the sensor enters Measuring mode.
While in Measuring mode, it continuously performs comparison determinations of the preset signal point points (+LIMIT point / -LIMIT point) and current value.
The determination result is displayed with LED and output. The signal points can be set with button input.

LED display and output in Measuring mode

	Item	–NG determination	OK determination	+NG determination	+LIMIT set complete	-LIMIT set complete	Supply pressure error
LED	+ NG LED	Unlit	Green /lit	Red /lit	Unlit ↓ Green / blinking	Unlit	Unlit
	–NG LED	Red /lit	Green /lit	Unlit	Unlit	Unlit ↓ Green / blinking	
	Air pressure alarm LED	Green /lit			Green /lit or Orange /blinking (±0.01 MPa change) ↓ Unlit		Red /blinking(≥0.22 MPa) Red /lit(≤0.10 MPa) Orange /blinking(±0.01 MPa Change)
Output	+ NG determination output	OFF	OFF	ON	Responds to determination		OFF
	OK determination output	OFF	ON	OFF			
	–NG determination output	ON	OFF	OFF			
	ALARM output	ON			ON or OFF (±0.01 MPa change) ↓ ON		

Example



*NG (Out of set value)

2. STOP mode

Outputs other than the alarm are turned OFF and button setting of the signal points is prohibited.
The signal points can be set with external input only when the +NG LED and -NG LED are lit orange (when supply pressure is normal, or deviation from signal point values is less than ±0.01 MPa).

LED display and output in STOP mode

	Item	Normal supply pressure	+LIMIT set complete	-LIMIT set complete	Supply pressure error
LED	+NG LED	Orange/lit	Unlit ↓ Orange/lit	Orange/lit	Unlit(≥ 0.22 MPa) Unlit(≤ 0.10 MPa) Orange/lit(± 0.01 MPa Change)
	-NG LED	Orange/lit	Orange/lit	Unlit ↓ Orange/lit	
	Air pressure alarm LED	Green/lit	Green/lit or Orange/blink (± 0.01 MPa change) ↓ Green/lit		Red/blinking(≥ 0.22 MPa) Red/lit(≤ 0.10 MPa) Orange/blinking(± 0.01 MPa Change)
Output	+NG determination output	OFF	ON for 200 ms(ACK) ↓ OFF	OFF	OFF
	OK determination output	OFF	OFF	OFF	
	-NG determination output	OFF	OFF	ON for 200 ms(ACK) ↓ OFF	
	ALARM output	ON	ON or OFF (± 0.01 MPa change) ↓ ON		



*NG (Out of set value)

3. SMOOTHING set mode

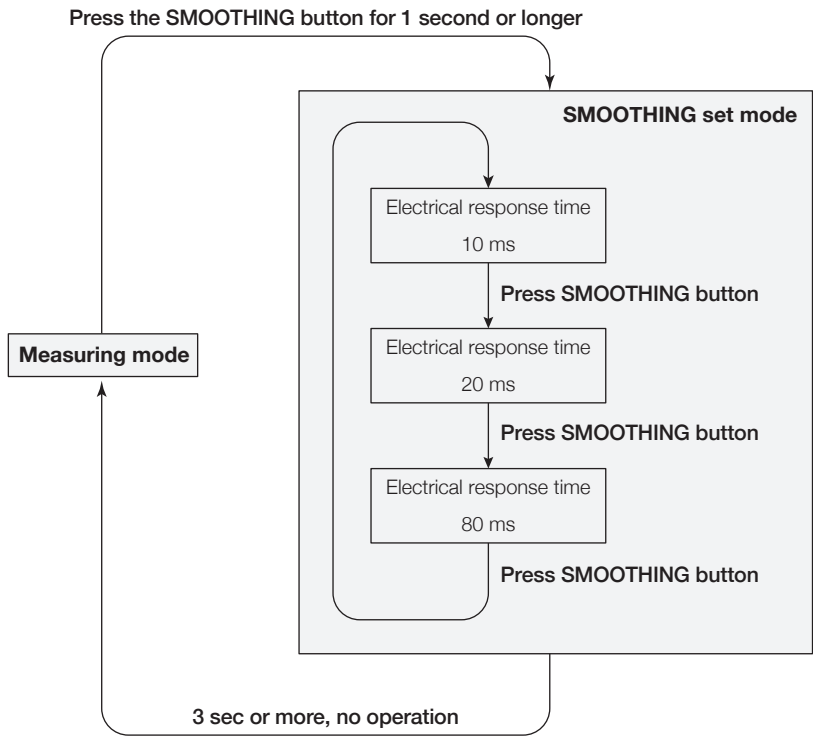
The sensor enters SMOOTHING set mode by pressing the SMOOTHING button for 1 second or longer while in Measuring mode.

If there is no operation for 3 seconds or more in SMOOTHING set mode, the mode will automatically shift to Measuring mode.

Pressing the SMOOTHING button while in SMOOTHING set mode will change the electrical response time as follows: 10 ms → 20 ms → 80 ms → 10 ms.

By changing electrical response time, chattering speed can be changed.

Use when stable measurement cannot be performed due to chattering caused by the vibration of the measuring system.



LED display and output in SMOOTHING set mode

	Item	Electrical response time		
		10 ms	20 ms	80 ms
LED	+NG LED	Unlit		
	-NG LED			
	Air pressure alarm LED	Red/blinking	Orange/blinking	Green/blinking
Output	+NG determination output	OFF		
	-NG determination output			
	OK determination output			
	ALARM output			

*NG (Out of set value)

■How to set signal point values

The signal set points can be changed in Measuring mode or STOP mode.
Refer to the table below, as setting methods differ by mode.
The signal points are saved even when the power is turned off.
When the reproducibility of the entire measurement system has changed, reset the signal point values.

Mode	How to set signal points		ACK output
	Set with button	Set with external output	
1. Measuring mode	Possible	Not possible	✕
2. STOP mode	Not possible	Possible	✓

NOTE: Be sure to set the signal points so that "+LIMIT point > -LIMIT point".

Reference: The determination output of "+LIMIT point < -LIMIT point" is as follows.
OK determination is not output regardless of the detected value.
When the detected value is over +LIMIT or under -LIMIT, +NG and -NG determinations will be output at the same time.

Setting signal points with button input (Measuring mode)

1. Switch to the Measuring mode.
2. Confirm that the supply pressure is within the rating. (Green or Orange LED blink)
3. Place the +LIMIT setting master on the measurement point.
4. Press +LIMIT SET button for 1 second or longer.
5. Once the -NG LED and pneumatic alarm LED go OFF and the +NG LED blinks green, the setting is completed. Releasing the button will start the determination.
6. Place the -LIMIT setting master on the measurement point.
7. Press -LIMIT SET button for 1 second or longer.
8. Once the +NG LED and pneumatic alarm LED go OFF and the -NG LED blinks green, the setting is completed. Releasing the button will start the determination.

+LIMIT set (3 - 5) and -LIMIT set (6 - 8) may be done in any order.

Setting signal points with external input (STOP mode)

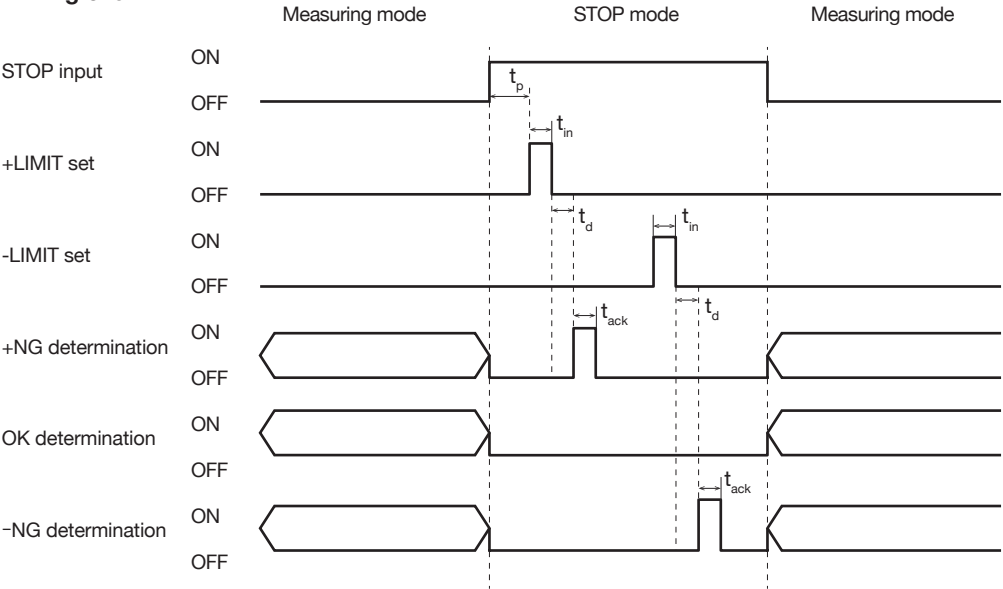
1. Switch to STOP mode.
2. Make sure that the supply pressure is within the rating. (+NG LED and -NG LED are lit orange)
3. Place the +LIMIT setting master on the measurement point.
4. For +LIMIT SET input, input a pulse of 100 ms ON or more.
5. When the +NG LED goes OFF and the +NG determination output turns ON as the ACK output for 200 ms, the setting is complete .
6. Place the -LIMIT setting master on the measurement point.
7. For -LIMIT SET input, input a pulse of 100 ms ON or more.
8. When the -NG LED goes OFF and the -NG determination output turns ON as the ACK output for 200 ms, the setting is complete .

+LIMIT set (3 - 5) and -LIMIT set (6 - 8) may be done in any order.

Notes

- The input is completed when it falls (it does not complete while turned ON).
- Do not input the +LIMIT and -LIMIT set inputs at the same time.
- 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

*NG (Out of set value)

■ 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.

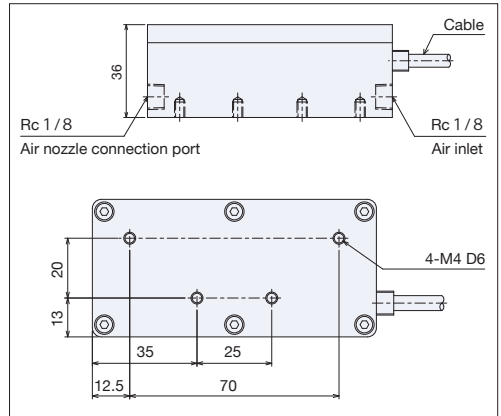
Note: Make sure to use a seal tape.

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

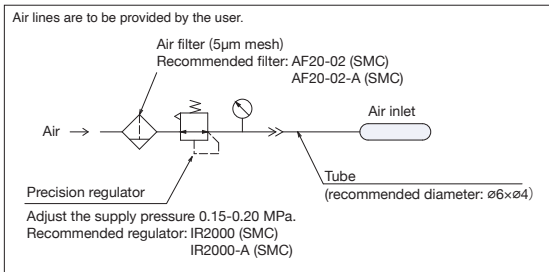
1. Mount the body as far above the nozzle as possible.
(in order to prevent backflow of coolant from the nozzle)
2. To maintain reproducibility of detection accuracy, keep the piping between the body and the nozzle as short as possible when determining location.



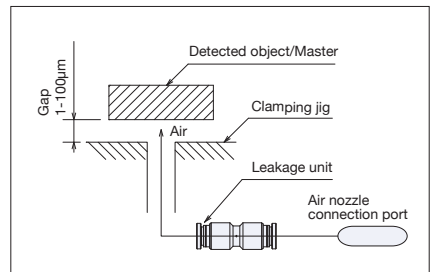
3. Air piping

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 piping diagram.

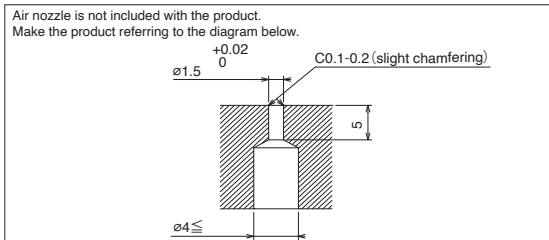
Air supply piping diagram



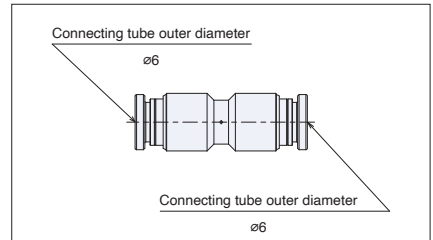
Air nozzle piping diagram



Recommended nozzle shape



Leakage unit (standard accessory of DPA-SR2)



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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GM-DPASRLR2-E-K002