

Satisfies the various levels of clean room cleanliness in a wide range of industries.

Air-operated actuator system selection guide

CKD offers various air-operated actuators as our major products for clean room specifications. The optimum model varies depending on the level of cleanliness and the location where the device is to be placed.

Read the guideline carefully and choose the optimum model.

Standard cylinder

Exhaust treatment

P7 Series

P5 Series

This has double rod packing. Dust is released outside the clean room through the pipe connected to the relief port in the middle section.

Vacuum treatment

P71 Series

P51 Series

A relief port is provided at the sliding section of the piston rod on the outer side of rod packing. Dust is sucked up and released through this port.

Guided cylinder

Low particle occurrence exhaust treatment

P72 Series

P52 Series

Double rod packing is incorporated as with the standard cylinder. Dust is released outside the clean room through the pipe connected to the relief port in the middle section. Low dust grease is used in the sliding section (piston rod, guide rod, linear guide). Only grease is replaced as a countermeasure against dust generation from the guide area.

Low particle occurrence vacuum treatment

P73 Series

P53 Series

As with the standard cylinder, a relief port is provided at the sliding section of the piston rod on the outside of rod packing. Dust is sucked up and released through this port with vacuum. Low dust grease is used in the sliding section (piston rod, guide rod, linear guide). Only grease is replaced as a countermeasure against dust generation from the guide area.

● Selection guide based on the relationship between the cleanliness of the clean room and the location where the device is to be placed
Based on the required level of cleanliness on the surface of the workpiece, the air flow around the workpiece, and the cylinder location, select a model using the following table as a guide.

Model for which its rod is the only sliding part/Standard cylinder (P*/P*1 Series)

Pneumatic cylinder to control dust generation in a clean room (P7 Series)

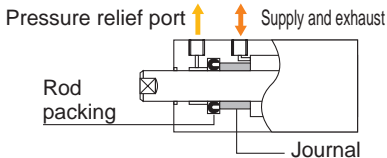


Required cleanliness on workpiece surface
ISO standards FED standards

ISO standards	FED standards	A zone	B zone	C zone
ISO4	10	P71 Series		
ISO5	10 ²		P7 Series	
ISO6	10 ³			Standard
ISO7	10 ⁴			

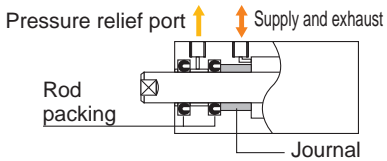
P71 Series

Vacuum treatment/Single packing construction



P7 Series

Exhaust treatment/Double packing construction



Pneumatic cylinder to control dust generation in a clean room and incompatible with copper-based, silicon-based and halogen-based materials (P5 Series)

Custom order product

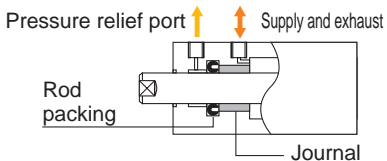


Required cleanliness on workpiece surface
ISO standards FED standards

ISO standards	FED standards	A zone	B zone	C zone
ISO4	10		P51 Series	
ISO5	10 ²			
ISO6	10 ³		P5 Series	
ISO7	10 ⁴			Option

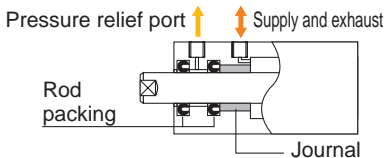
P51 Series

Vacuum treatment/Single packing construction

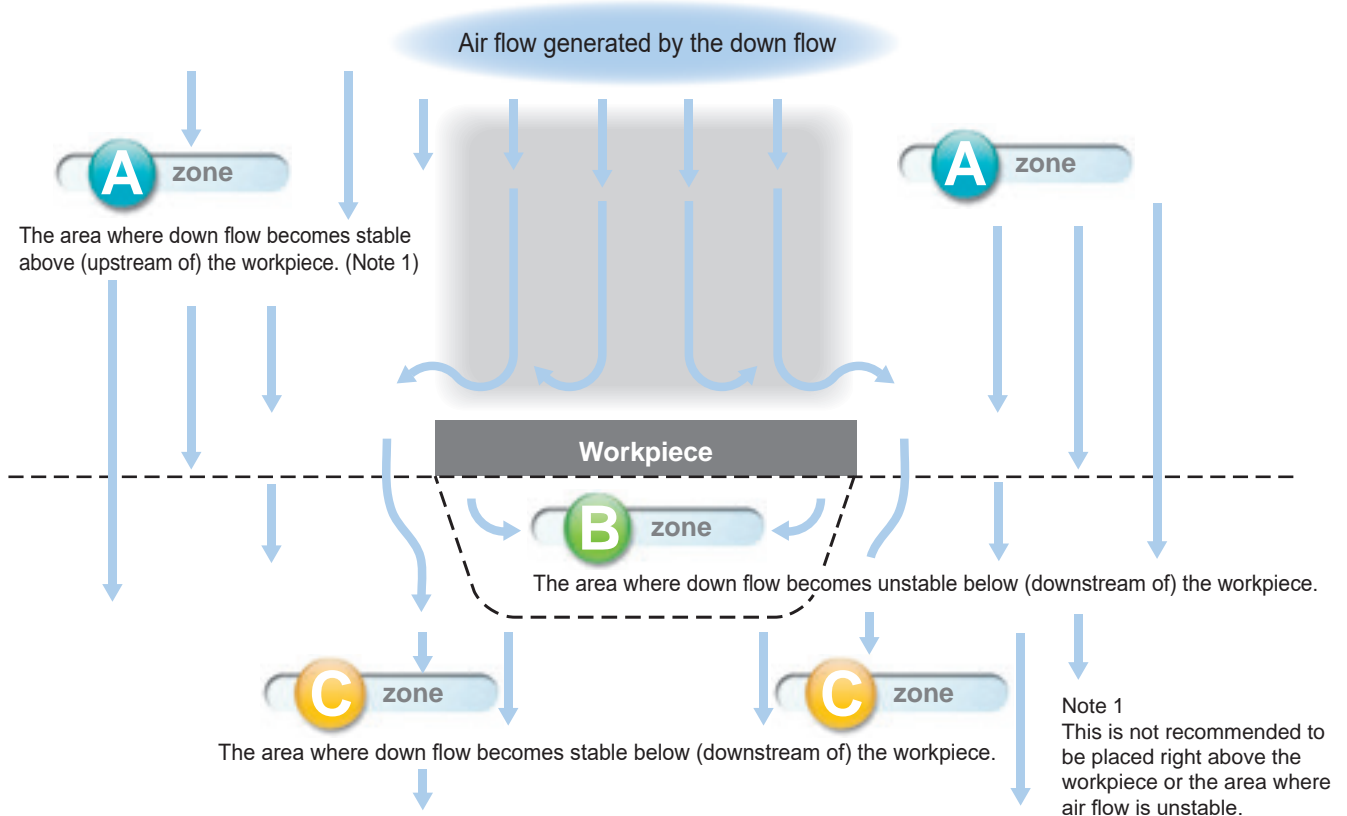


P5 Series

Exhaust treatment/Double packing construction



How dust generation affects cleanliness of the clean room depends on where the device is placed.



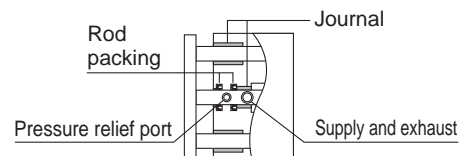
Model which has external sliding parts/Guided cylinder (P*2/P*3 Series)

Pneumatic cylinder to control dust generation in a clean room (P7 Series)

		A zone B zone C zone		
Required cleanliness on workpiece surface				
ISO standards	FED standards			
ISO4	10			
ISO5	10 ²		P72 Series	P73 Series
ISO6	10 ³			Standard
ISO7	10 ⁴			

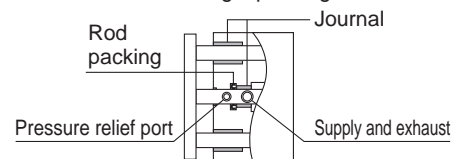
P72 Series

Exhaust treatment/Double packing construction



P73 Series

Vacuum treatment/Single packing construction



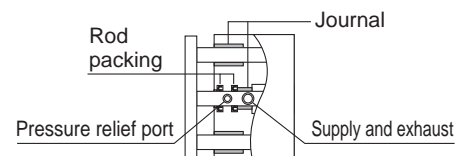
Pneumatic cylinder to control dust generation in a clean room and incompatible with copper-based, silicon-based and halogen-based materials (P5 Series)

Custom order product

		A zone B zone C zone		
Required cleanliness on workpiece surface				
ISO standards	FED standards			
ISO4	10			
ISO5	10 ²			
ISO6	10 ³		P52 Series	P53 Series
ISO7	10 ⁴			Semi-Standard

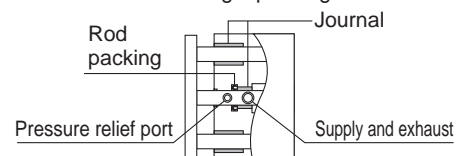
P52 Series

Exhaust treatment/Double packing construction



P53 Series

Vacuum treatment/Single packing construction

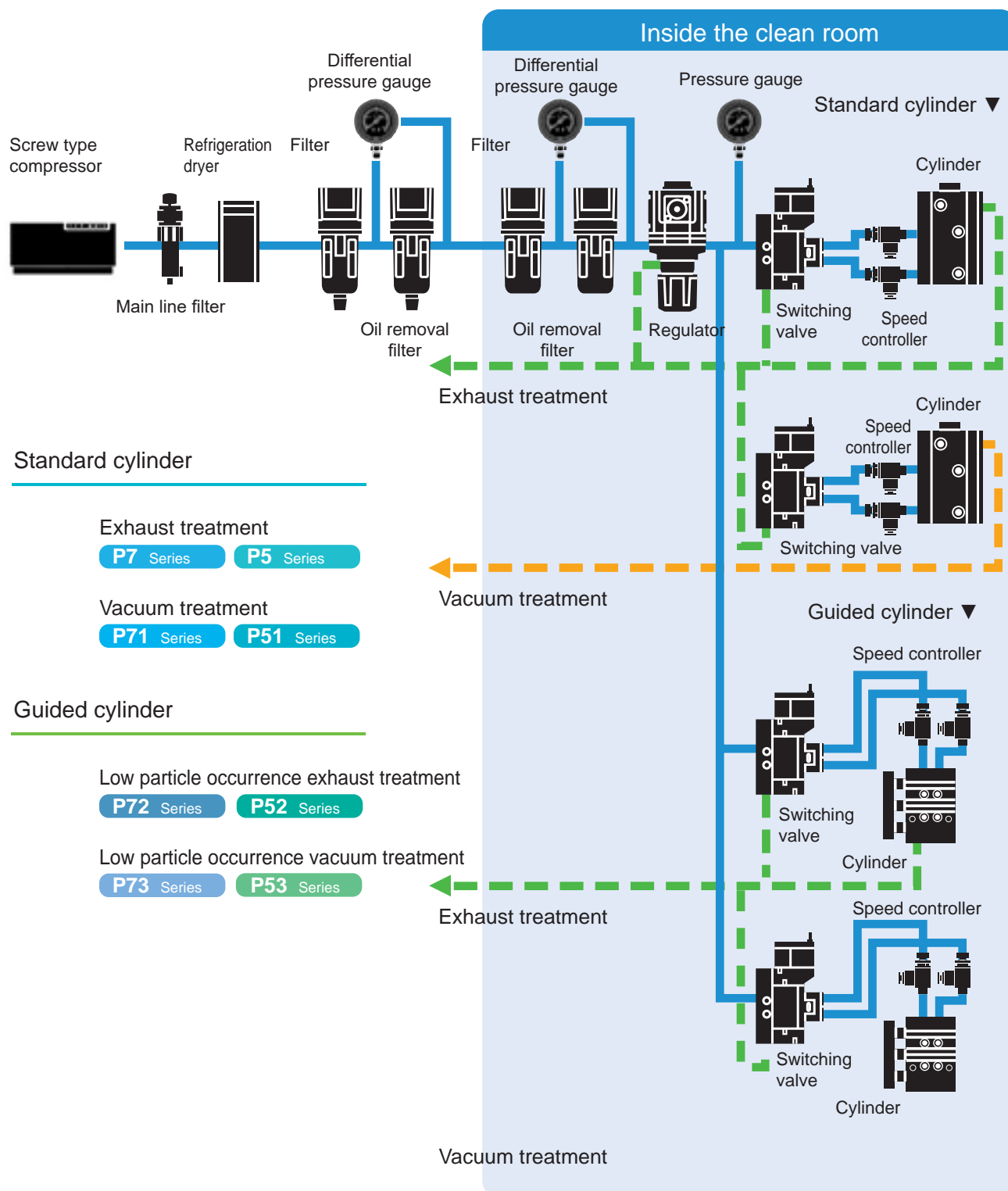


If the device has an external sliding part, A zone is not recommended as diameters of the particles are greater compared to the device for which its rod is the only sliding part.

Targeting zero particle generation with vacuum and exhaust treatment.

Air-operated actuator system circuit structure

This illustrates a typical circuit of an air-operated device system which consists of pneumatic cylinders, switchover valves, speed controllers, and F/R devices as a clean room device system. With this system, dust is sure to be released outside the clean room.



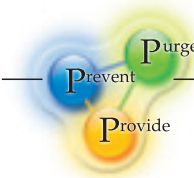
[Remark]

Note: Cylinders, switching valves, regulators, and filters should all have individual exhaust pipes. Do not share the exhaust piping.

Two series of pneumatic cylinders for various applications.

(Exhaust treatment and vacuum treatment)

CLEAN philosophy



Industry-specific clean room specifications for air-operated equipment systems

Construction of the pneumatic cylinder and materials vary depending on the industry for which the equipment is to be used. CKD offers two different groups of air-operated devices to satisfy different requirements for various industries. The clean room specifications shown here is for the pneumatic cylinders, which are the major components of the system.



Semiconductor



Clean room specifications for LCD manufacturing

Pneumatic cylinder series to control dust generation in a clean room.



Standard

P7 Series

- Exhaust treatment port place in the piston rod sliding area
- Double packing construction

P71 Series

- Vacuum treatment port place in the piston rod sliding area
- Single packing construction

Guided

P72 Series

- Exhaust treatment port place in the piston rod sliding area
- Double packing construction
- Low dust generation treatment of the guide area

P73 Series

- Vacuum treatment port place in the piston rod sliding area
- Single packing construction
- Low dust generation treatment of the guide area



Clean room specifications for manufacturing industries with material restrictions (custom order product)

Pneumatic cylinder to control dust generation in a clean room without using copper-based, silicon-based and halogen-based materials.



Standard

P5 Series

- Exhaust treatment port place in the piston rod sliding area
- Double packing construction
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P51 Series

- Vacuum treatment port place in the piston rod sliding area
- Single packing construction
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Guided

P52 Series

- Exhaust treatment port place in the piston rod sliding area
- Double packing construction
- Low dust generation treatment of the guide area
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P53 Series

- Vacuum treatment port place in the piston rod sliding area
- Single packing construction
- Low dust generation treatment of the guide area
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Selecting the optimum pneumatic pressure control system for the application.

Industry-specific clean room specifications for pneumatic control systems

Specifications for pneumatic valves, filters, and regulators vary from application to application.

In this section, the clean room specifications of devices other than the pneumatic cylinder, such as directional switchover valves, filters, regulators, speed controllers, fittings and tubes are shown.



Semiconductor



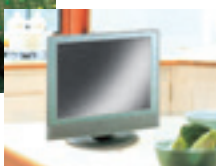
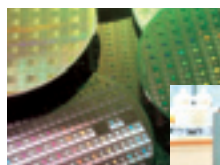
Clean room specifications for LCD manufacturing

Pneumatic control system series to control dust generation in a clean room.

Directional switching valve

P70 Series

- Exhaust treatment port



Filters and regulators

P70 Series

- Exhaust treatment port

P80 Series

- Oil prohibited

P90 Series

- Made of stainless steel
- Oil prohibited

Sensors, auxiliary devices, fittings, and tubes

P70 Series

- Dust generation control

P80 Series

- Oil prohibited



Clean room specifications for manufacturing industries with material restrictions

Pneumatic control system to control dust generation in a clean room without using copper-based, silicon-based, and halogen-based materials.

Directional switching valve

P74 Series

- Exhaust treatment port
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited



Filters and regulators

P74 Series

- Exhaust treatment port
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P84 Series

- Oil prohibited
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P94 Series

- Oil prohibited
- Wetted parts: made of stainless steel
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Sensors, auxiliary devices, fittings, and tubes

P74 Series

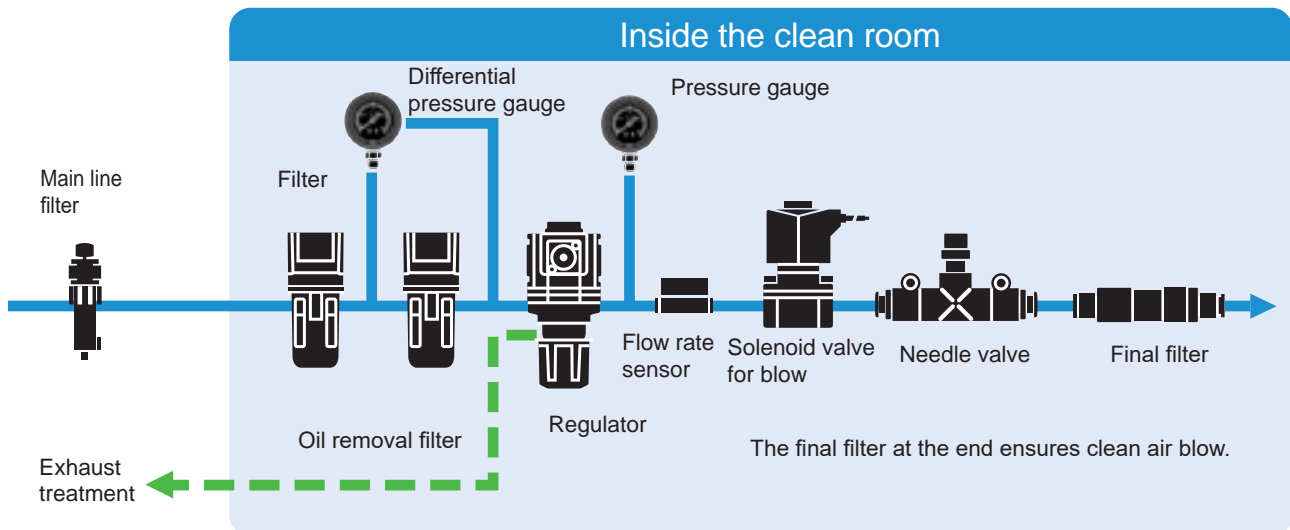
- Dust generation control
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P84 Series

- Oil prohibited
- Copper-based/silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Sample clean blow system circuit and industry-specific clean room specifications

Recommended products and sample circuits for providing the air blow system with air of high cleanliness are shown. CKD offers two different groups of devices for the clean air blow system to satisfy different requirements for various industries. Clean room specifications for various industries are shown.



Clean room specifications for LCD manufacturing

Solenoid valve for blow

P90 Series

- Oil prohibited
- Low dust generation treatment
- Wetted parts made of stainless steel (copper-based material not allowed)

Sensors

P80 Series

- Oil prohibited

P90 Series

- Oil prohibited
- Wetted parts made of stainless steel

Filters and regulators

P80 Series

- Oil prohibited

P90 Series

- Oil prohibited
- Wetted parts made of stainless steel

Fittings, tubes and auxiliary devices

P80 Series

- Oil prohibited



Clean room specifications for manufacturing industries with material restrictions

Solenoid valve for blow

P94 Series

- Oil prohibited
- Low dust generation treatment
- Wetted parts made of stainless steel (copper-based material not allowed)
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Sensors

P84 Series

- Oil prohibited
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P94 Series

- Oil prohibited
- Wetted parts made of stainless steel
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Filters and regulators

P84 Series

- Oil prohibited
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

P94 Series

- Oil prohibited
- Wetted parts made of stainless steel
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Fittings, tubes and auxiliary devices

P84 Series

- Oil prohibited
- Silicon-based/halogen-based materials (fluorine, chlorine, bromine) are prohibited

Clean room device system table

Major applications	Code	Basic specifications		Models and remarks					
		Material restrictions	Structure	Cylinder	Pneumatic valves	Control valve	Electronic sensors	Filters and regulators	Tubes, fittings, and auxiliary devices
Semiconductor and LCD	P7	Fluorine-based grease is used	Exhaust treatment clean room package	○	—	—	—	—	—
	P70	(Dust generation control)		—	Exhaust treatment clean room package	—	Oil prohibited	Fluorine-based grease is used Exhaust treatment clean room package	Fluorine-based grease equivalent is used No sealing agent Clean room package
	P71	Fluorine-based grease is used	Vacuum treatment clean room package	○	—	—	—	—	—
	P72	Fluorine-based grease is used	Low dust generation treatment clean room package for the exhaust treatment guide area (Note 1)	○	—	—	—	—	—
	P73	Fluorine-based grease is used	Low dust generation treatment clean room package for the vacuum treatment guide area	○	—	—	—	—	—
	P80	Oil prohibited	Clean room package	—	—	—	○	Exhaust treatment	No sealing agent
	P90	Oil prohibited Stainless steel is used	Clean room package	—	—	Low dust generation treatment	—	Exhaust treatment	Copper-based materials prohibited (all parts) No sealing agent
Clean + Material restrictions	P5	Copper-based materials in (sliding and flow path parts) prohibited Silicon- and Halogen-based materials prohibited	Exhaust treatment clean room package	○	—	—	—	—	—
	P51	Copper-based materials in (sliding and flow path parts) prohibited Silicon- and Halogen-based materials prohibited	Vacuum treatment clean room package	○	—	—	—	—	—
	P52	Copper-based materials in (sliding and flow path parts) prohibited Silicon- and Halogen-based materials prohibited	Low dust generation treatment clean room package for the exhaust treatment guide area	○	—	—	—	—	—
	P53	Copper-based materials in (sliding and flow path parts) prohibited Silicon- and Halogen-based materials prohibited	Low dust generation treatment clean room package for the vacuum treatment guide area	○	—	—	—	—	—
	P74	Copper-, Silicon- and Halogen-based materials prohibited	Clean room package	—	Exhaust treatment	—	Copper-based materials prohibited (sliding and flow path parts) oil free	Fe materials prohibited PTFE (fluoroplastics) prohibited Fluorine-based grease is used for exhaust treatment	Fluorine-based grease prohibited No sealing agent
	P84	Copper-, Silicon- and Halogen-based materials prohibited, oil prohibited	Clean room package	—	—	—	Copper-based materials prohibited (sliding and flow path parts)	Fluorine-based grease is used for exhaust treatment	Fluorine-based grease prohibited No sealing agent
	P94	Copper-, Silicon- and Halogen-based materials prohibited, S.S. used, oil prohibited	Clean room package	—	—	—	○	Fluorine-based grease is used for exhaust treatment	—

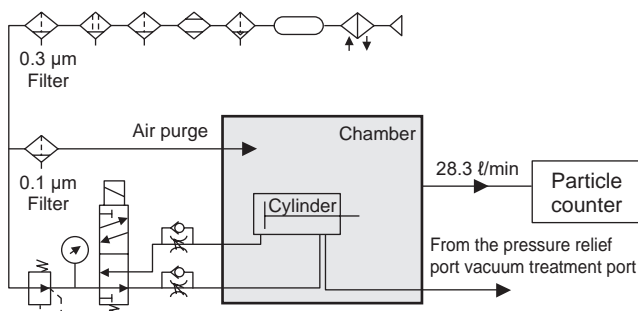
Note 1: For MRL2 series, the sliding parts are processed to minimize dust.

Dust generation measuring method

Measuring instrument

Particle counter : Laser dust monitor
 Minimum measurable particle diameter : $0.1\ \mu\text{m}$
 Suction rate : $28.3\ \text{l/min}$

Test circuit



Measuring method

1. Place a cylinder in an antistatic chamber made of acrylic or stainless steel.
2. Send clean air passed through a $0.1\ \mu\text{m}$ filter at the same flow rate as the particle counter suction rate ($28.3\ \text{l/min}$).
3. Confirm that the particle counter value is zero before you start operating the cylinder.
4. Operate the cylinder, and measure particles generated during the operation.

Note: A sealed chamber is used so that particles other than those generated from the test cylinder do not enter the chamber.

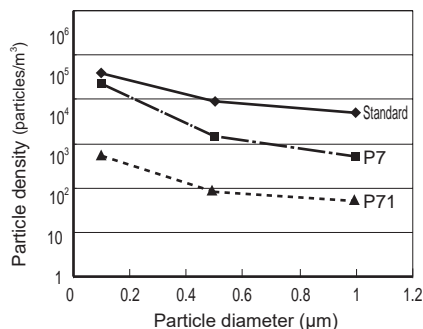
Measuring conditions

- Quality of air
 For driving the cylinder: "Grade 2.2.1" (JIS B8392-1)
 For purging: "Grade 2.2.1" + $0.1\ \mu\text{m}$ gas filter
- Cylinder supply pressure: 0.5 MPa
- Cylinder operating speed: general speed (200 mm/s)
- Operating condition: no load; horizontally mounted (parallel to the purge flow)
- Relief port for exhaust treatment is connected and released outside the chamber.
- Vacuum port for vacuum treatment is connected and vacuum treated at $-26\ \text{KPa}$.

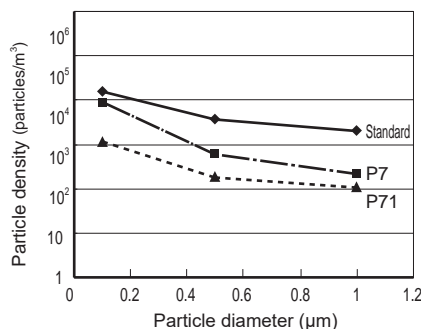
Dust generation measuring

● CMK2 (port size 25, stroke length 50) ● STR2 (port size 20, stroke length 30) ● MRL2 (port size 16, stroke length 200)

Number of endurance cycles: initial state
 Operating frequency: 40 cpm



Number of endurance cycles: initial state
 Operating frequency: 30 cpm



Number of endurance cycles: initial state
 Operating frequency: 30 cpm

