

# OPEN CLEAN SYSTEM KOACH

## -WORLD STANDARDISO Class 1 -

# Specialty of FLOOR KOACH

## High irrigation and buoyancy

# Electricity saving

Tabl

# Possible to Expand/Move

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# **Technology of FLOOR KOACH**



Filter Stream Technology Technology

Make the top international level Purity

## What is ISO class 1?

ISO		Upper limit density (unit /m <sup>3</sup> ) displays particle density with more than of target particle size					
Purity	(Federal Standard 209E)class	0.1µm	0.2µm	0.3µm	0.5µm	5µm	
Class 1		10	2	1		KOAC	┣
Class 2		100	24	10			
Class 3	Class 1	1,000	237	102		URIVIAI	F
Class 4	Class 10	10,000	2,370	1,020	352		
Class 5	Class 100	100,000	23,700	10,200	3,520	29	
Class 6	Class 1000	1,000,000	237,000	102,000	35,200	293	
Class 7	Class 10000				352,000	2,930	
Class 8	Class 100000				3,520,000	29,300	

### FILTER TECHNOLOGY FERENA Original nano Fiber High sampling performance for the pressure loss that is low like a HEPA filter at the same level as a ULPA filter



Thin fiber and equally gap

ULPA (×10,000)



Thick fiber and few gap

	Purity	Pressure loss	Electric consumption
HEPA	0	0	0
ULPA	O	$\bigtriangleup$	$\bigtriangleup$
FERENA	O	0	0

# Stream Technology

# Same vector assembly stream (high transportation power to contaminate)

A coherent nature (no spreading) set style of the slight wind velocity (0.2–0.5m/s) that a direction and speed were adjusted to like all appears with an aspect from push hood. No spreading = No turbulence , so it **can carry the contaminant.** 





Specification of a clean room (class xx, etc.) indicates the numerical value at the time of construction where no humans and no machines are operating!!

Movement of human and machines = "inevitably" generates dust!!

\*Are you satisfied with your clean device?\*Is your clean operation trouble free?

Actual Clean solves your trouble!

KOKEN LTD.

Contribute to society through cleanliness, health, and safety

# High discharging performance \* Why we need to exhaust it efficiently?

motion	amount of dust unit/min (grain 0.3µm)
Moving arm up and down	463,000
Moving arm freely	572,000
Twist of the upper body	390, 000
Anteflexion of the upper body	770,000
Flexion	1, 110, 000
Stamp	1, 210, 000
Walking	1, 290, 000

Become dirty during people works

### The difference of conventional Clean Room

#### ①Quick recovery of purity=High purity during working

exhaust contaminate in the space quickly. When it have stained a setup and the inside, it also exhaust contaminate quickly

### **2**Reduce electricity cost greately

It should start just before use (doesn't need the 24 hours operation).

If it is a sleep mode, 90% of electricity will reduce.

#### **3 Make Super Clean anywhere you like**

You can make "Super Clean" in existing space (room). You can install it in a short term without stopping a line.

#### (in case of 5m×20m×3m(100mfloor)

ISO Class	Number of air changes	Percentage of the filter placed on ceiling	Number of filter unit	Set up cost	Running cost	Discharge
1		KOA(	СН			
2	Por	tification Sys	stom Down			
3	4 Ket	Flow Clean	Room	×××	×××	000
4	3 Se	emi-rectificati	on System	×××	××	00
5	200	50%	(15m <sup>2</sup> /min)	××	×	0
6	50	1006 Install 1	20~30unit	Δ	Δ	×
7	31 R	Turbulent System Clean Room in existing facilities		0	0	×
8	15	4%	5∼10unit (10㎡/min)	0	0	×××

#### Rectification System Down Flow Clean Room [Cleaner than ISO Class3]



Dust continues to accumulate in gratings

#### Rectification System Down Flow Clean Room [Cleaner than ISO Class 3]



- Frequent ventilation and higher cleanliness
- Causes less retention and smooth exhaustion
- High installation cost and high running cost
- Needs to be constructed as a building

#### Semi-rectification System Down Flow Clean Room [ISO Class 4-5]



It is a clean room which doesn't require cleanliness as high as a rectification down flow clean room, while initial running cost is reduced.

[Major users]

- Assembly process of semiconductor products
- Precision electronics

#### Semi-rectification System Down Flow Clean Room [ISO Class 4-5]



#### **Advantages**

 Possible to reduce cost by making air volume lower than that of rectification system.

#### **Disadvantages**

- Causes retention and variation in cleanliness in the space
- Requires installation such as construction work of ceiling

### Turbulent System Clean Room [ISO Class 6-8]



Increase the number of exhaust fans in accordance with the size of room and frequency of ventilation.

It places more emphasis on costs than on cleanliness.

### Turbulent System Clean Room [ISO Class 6-8]



#### **Advantages**

- Relatively low installation cost and running cost
- Installation takes relatively short period of time

#### Disadvantages

- Recovery of cleanliness takes time
- Place where cleanliness is high is unspecified

### KOACH Ez [ISO Class 1]



#### Advantages

- Relatively low installation cost and running cost
- Installation takes relatively short period of time
- Requires less maintenance for cleanliness
- Able to achieve high cleanliness with less air volume

#### Disadvantages

Range with ISO class 1 is limited.

KOACH has an impression that it cleans only inside the guide.

# The effect surround KOACH

# The filter stays clean even after one year. (according to Mr. Hirose, the University of Tokyo)



Circulating airflow exhausted by KOACH in the room is expected to increase cleanliness of the whole room. Volume of room:  $9 \times 7.5 \times 3.1 = 209 \text{ m}^3$ KOACH (0.3 m/sec): 960 m<sup>3</sup>/h × 12 = 11,520 m<sup>3</sup>/h 11,520 ÷ 209 = Number of ventilation changes: 55 times (equivalent to ISO class 6)

### **Problems of Conventional Clean Room**



 \* Survey by Mr. Toshinobu Kanaya, a specially appointed professor, of Tokyo Institute of Technology Solution Research Laboratory (Internet survey on 600 people who are representatives of companies and research institutions possessing a clean room or considering introducing one, February 2013)

### Comparison of Power Consumption for Maintaining Cleanliness



Power consumption required for maintaining a space with width of 7 m, length of 20 m, and height of 2.7 m at ISO class 5. (According to survey by KOKEN)

### Comparison of Power Consumption (1) Comparison of power consumption of only air blower units

	KOACH Ez	Clean room
Cleanliness	ISO class 1	ISO class 7
Number of fans	15	15 (10 m³/min)
Power consumption (kW/h)	2.5 kW	1.5 kW
Electricity cost/hour (15 yen/kW)	37.5 yen	22.5 yen
Electricity cost/day (15 yen/kW)	<b>500 yen</b> (Operating time 8 hours, sleep mode 16 hours)	<b>540 yen</b> (Operating time 24 hours)
Electricity cost/year (15 yen/kW)	<b>158,500 yen</b> (Operating days 245 days, sleep mode 120 days)	<b>189,000 yen</b> (Operating days 350 days, complete shutdown 15 days)

The above is a comparison of power consumption when 15 units of KOACH Ez are installed in a clean area of 300 m<sup>3</sup> (D5m x W20m x H3m) and when 15 units of FFU (100w) are operated in the same room (ISO class 7). Power consumption is approximate calculation. Please note that the numerical values change depending on conditions.

### Comparison of Power Consumption (2) Comparison of power consumption of only air blower units

	KOACH Ez	Clean room
Cleanliness	ISO class 1	ISO class 6
Number of fans	15	25 (10 m³/min)
Power consumption (kW/h)	2.5 kW	2.5 kW
Electricity cost/hour (15 yen/kW)	37.5 yen	37.5 yen
Electricity cost/day (15 yen/kW)	<b>500 yen</b> (Operating time 8 hours, sleep mode 16 hours)	<b>900 yen</b> (Operating time 24 hours)
Electricity cost/year (15 yen/kW)	<b>158,500 yen</b> (Operating days 245 days, sleep mode 120 days)	<b>315,000 yen</b> (Operating days 350 days, complete shutdown 15 days)

The above is a comparison of power consumption when 15 units of KOACH Ez are installed in a clean area of 300 m<sup>3</sup> (D5m x W20m x H3m) and when 25 units of FFU (100w) are operated in the same room (ISO class 6). Power consumption is approximate calculation. Please note that the numerical values change depending on conditions.

## **Comparison of Power Consumption (3)**

# Comparison of power consumption of only air blower units

	KOACH Ez	Clean room
Cleanliness	ISO class 1	ISO class 5
Number of fans	15	60 (15 m³/min)
Power consumption (kW/h)	2.5 kW	9.0 kW
Electricity cost/hour (15 yen/kW)	37.5 yen	135 yen
Electricity cost/day (15 yen/kW)	<b>500 yen</b> (Operating time 8 hours, sleep mode 16 hours)	<b>3,240 yen</b> (Operating time 24 hours)
Electricity cost/year (15 yen/kW)	<b>158,500 yen</b> (Operating days 245 days, sleep mode 120 days)	<b>1,134,000 yen</b> (Operating days 350 days, complete shutdown 15 days)

The above is a comparison of power consumption when 15 units of KOACH Ez are installed in a clean area of 300 m<sup>3</sup> (D5m x W20m x H3m) and when 60 units of FFU (150w) are operated in the same room (ISO class 5). Power consumption is approximate calculation. Please note that the numerical values change depending on conditions.

### Annual Power Consumption of Only Air Blower Units



# Sleep Mode

It reduces power consumption by 70% during night time when people don't work and dust is not generated.



Air volume is controlled just by pushing the switch. Power consumption can be reduced while maintaining cleanliness.

The 6<sup>th</sup> Manufacturing Japan Grand Prix Prime Minister's Award

The 44<sup>th</sup> Machine Design Award <u>Minister of Economy,</u> <u>Trade and Industry Award</u>



### Easy to Relocate/Expand

Since Floor KOACH employs a block system, it is easy to change the size of the entire push hood.

Right-angle join technology\* prevents leakage of dust from between individual hoods.



\* Right-angle join technology: It is a technology to prevent leakage of dust by using airflow without packing or the like.

## **Right-angle Join Technology**



Making airflows collide with each other at gaps between hoods prevents entrance of external air.

It is easy to install, since physical airtightness is not necessary.



### **Short Construction Period**

Construction period for building a conventional clean room A general clean room which cannot be built without construction of structures such as ceiling and floor requires a long period of time until completion of a building and before it can be operated.

Floor KOACH Ez can form a clean space with a ventilation function equivalent to or higher than that of a vertical laminar flow clean room, just by installing it on a general floor which doesn't generate dust. Also, construction of a 200 m<sup>2</sup> clean space can be completed within two weeks.

## Flow for Introducing a Clean Room



# It is a clean room that a non-general contractor can propose.

## Ready to Cope with Change of Layout

In comparison with conventional clean rooms built as a building, it is possible to relocate a clean space. It is also possible to make an existing room into a clean room. Since it is capable of coping with changes in lines, it involves no concern of investment failure, thereby gaining acclaim.





## **Response to Disasters**



A clean booth comprising fan units installed on the ceiling turned over due to the Great East Japan Earthquake, and it took time for restoration. (Tohoku University)



Since Floor KOACH Ez doesn't require installation of heavy devices on the ceiling, it can be restored quickly in case of a disaster.

## Safety Control

It is easy to communicate with the inside of the clean room, and you can clearly see how operations are conducted.



## **Convenience of Filter Replacement**



You can <u>replace</u> filters <u>on</u> <u>your own.</u>



<u>Clean room company will</u> <u>replace</u> a clean bench.

#### Confidential matters can be protected.

# Example of Employment Kaizen Achieved by KOACH

Things which couldn't be materialized can now be materialized...

#### EIZO Corporation Manufacture of liquid crystal displays, Floor KOACH Ezp



#### [Concern]

They wanted to build a new clean room, but their concern was power consumption. Conventional clean rooms need to be operated for 24 hours, and power consumption is 528,000 kWh/year (ISO class 7: 98 m<sup>2</sup>)

#### [Improvement]

Introduction of Floor KOACH Ezp reduced power consumption to one-tenth even though it was operated for 24 hours.

Power consumption was reduced to 49,824 kWh/year by making use of sleep mode. (ISO class 1: 100 m<sup>2</sup>)

Oct 2017 Issue

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#### Shimane Fujitsu Assembly of waterproof tablet, Floor KOACH Ez

Sept 2013 Issue



[Improvement]

One year has passed since the introduction of Floor KOACH, and there has been no contamination problem.

Further, workers in the Floor KOACH are working without wearing clean suits. Since KOACH capable of achieving ISO class 1 can strongly exhaust contaminants, it is managed as ISO class 5 or higher class, which doesn't require full clean suit.

#### Yamagata Casio Co., Ltd. Quality Control Department Lens assembly process, KOACH C900-F

Feb 2015 Issue



#### [Concern]

- Since a clean bench restricts hand movement, skills of experts cannot be fully utilized.
- A clean booth is contaminated when things are taken in and out, and it isn't possible to maintain cleanliness.

#### [Improvement]

Since the space is open, it doesn't impair workability and things can be taken in and out just like before. Airflow of KOACH is so subtle (0.4 m/sec.) that workers are almost unconscious of its existence. A big advantage is that they can do precision work requiring concentration just like before.

#### Kikuchi Precision Optics Co., Ltd. Inspection of optical lens, KOACH C900-F

Jun 2017 Issue



#### [Concern]

Only one worker can work at one clean bench.

Clean benches have to be installed in equal number to workers.

[Improvement] Stand KOACH enables workers to do work while sitting face-to-face or side-by-side, as a clean space is divided by air flow. Up to 4 workers can work at one unit.

# ShinMaywa Industries, Ltd. Jun 2015 Issue Completion inspection of air spindle motor, KOACH C900-F



#### [Concern]

Workers have to change into a clean suit and take an air shower before entering a clean room.

#### [Improvement]

Since KOACH is capable of exhausting contaminants as soon as they are generated in a clean area by means of clean airflow, there is no effect even if workers work in regular work clothes. Because any staff member can utilize the clean environment easily, work can be done very efficiently.

## Sales Tools

- Product brochure "KOKEN ADVANCED PURIFYING TECHNOLOGY"
- Cartoon leaflet for introducing showrooms
- Leaflet "Manufacturing Japan Grand Prix"
- Kaizen case examples "Corporate edition, University edition"
- CHS News
- Introductory DVD

### **Utilization of Showrooms**



**Tokyo Showroom** 



Super Clean Technical Center



Nagoya Showroom



#### **Osaka Showroom**



Kyushu Showroom



# END