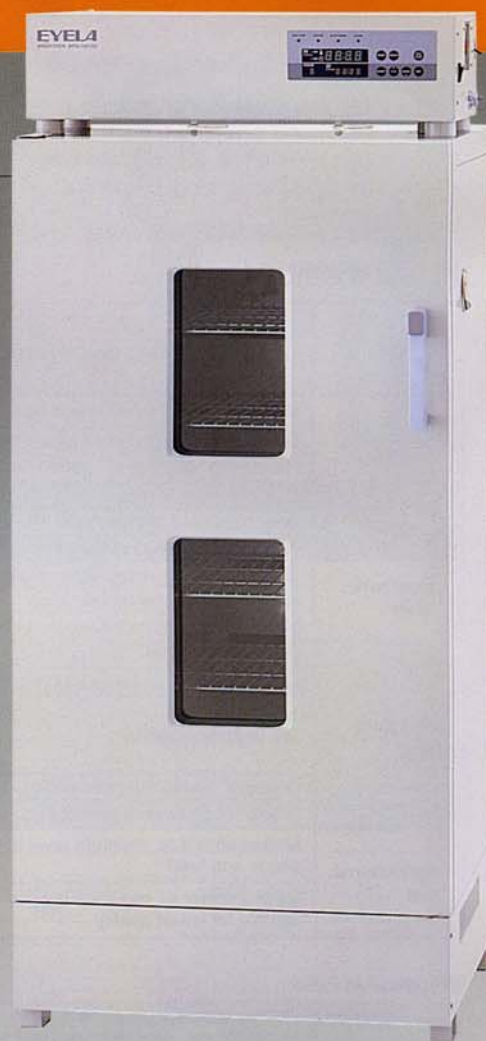


Programmable SD type to support a wide variety of research

NDO-451SD

WFO-601SD

WFO-1001SD



Product	Convection Oven		Forced Air Flow Oven		
Model	NDO-451SD	NDO-601SD	WFO-451SD	WFO-601SD	WFO-1001SD
Air flow	Gravity Convection		Forced Air Flow		
Temperature range	40°C~250°C		40°C~200°C		
Control accuracy	±1°C~		±1°C~		
Temperature uniformity	13°C or less (at 100°C) 21°C or less (at 200°C)	13°C or less (at 100°C) 27°C or less (at 200°C)	6°C or less (at 100°C) 16°C or less (at 200°C)	7°C or less (at 100°C) 16°C or less (at 200°C)	6°C or less (at 100°C) 10°C or less (at 200°C)
Temperature rise time	60~70min.	80~90min.	50~60min.	60~70min.	70~80min.
Temperature control	Microprocessor P.I.D. control				
Temperature setting	Membrane key pad, Digital readout				
Program function	Auto-start, Auto-stop, Repeat control, Ramp control, step operation				
Safety features	Self-diagnosis (Input error alarm, Door alarm, Upper/Lower temperature limit alarm, Temperature ramp alarm, Overheat alarm, Sensor alarm, Heater fault alarm, Power failure alarm, Breaker for electrical leakage and excess current, Independent overheat protector (variable))				
Heater capacity	1.2kW	1.35kW	1.2kW	1.35kW	2.2kW
Heater material	Stainless seath				
Temperature sensor	K thermo-couple (CA)				
Chamber dimensions (mm)	450W×450D×400H	600W×500D×500H	450W×450D×400H	600W×500D×500H	600W×500D×1000H
Capacity	81L	150L	81L	150L	300L
View window (mm)	180Wx300H (double glass)				180Wx300H (double glass×2)
Cable hole	1 hole on right side, dia.37mm				
Ventilation port	2 ports on top surface, dia.37mm				
No. of shelves	2	3	2	3	5
Mountable positions	12	15	12	15	30
Shelf maximum load	Uniform load Max. 15kg/shelf				
Ambient temperature for operation	5~35°C				
Overall dimension (mm)	550Wx560Dx820H	700Wx610Dx920H	550Wx560Dx820H	700Wx610Dx920H	700Wx660Dx1616H
Net weight (approx.)	58kg	82kg	58kg	82kg	105kg
Input power source	1.25kVA	1.4kVA	1.3kVA	1.45kVA	2.3kVA
Rated power source	AC115V 60Hz	AC115V 60Hz	AC115V 60Hz	AC115V 60Hz	AC200V 50/60Hz
	AC220V 50/60Hz	AC220V 50/60Hz	AC220V 50/60Hz	AC220V 50/60Hz	AC220V 50/60Hz

※Specifications are room temperature 20°C, AC100V (AC200V for WFO-1001SD), 50Hz, no load and ventilation ports closed.

※WFO-1001SD is not equipped with the mains plug.

Control Panel

Dual Indicator



Big and bright LED with the size of 8 x 14mm in the temperature display. Easy to check the temperature from distance.
Dual Indicator allows to view the preset temperature and the measured temperature simultaneously.

Safety features

Double safety mechanism



- Independent overheat protector cuts off the heater circuit independently from the microprocessor.



- Breaker for leakage and excess current cuts off the power supply circuit in case of electrical leakage or excess current.

- Battery backup mechanism

Alarm indication

Self diagnosis of trouble by microprocessor

In case of trouble, the alarm is indicated on the display by the microprocessor.

Indication	Alarm
EE	input error
HE	Heater
PF	Power failure
OT	Overshoot
US	Undershoot
SE	Sensor fault
OH	Overheat
DO	Door open
S-*	Ramp failure

*Heater circuit shall be cut off depending on the nature of trouble.

User adjustment mode

Auto-tuning



Auto-tuning function acts for temperature control based on chamber load. 7 patterns of programs are stored including the user program function which enables to set up to 8 steps.

Temperature indicator compensation



Temperature indicator compensation is the function which enables to calibrate the displayed temperature into the temperature measured by standard thermometer at sample position. This function achieves the accurate temperature control of samples.

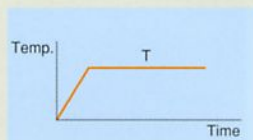
Upper/lower limit temperature alarm

Upper/lower limit temperature alarm can be set in the range of +0~90°C.

Program patterns

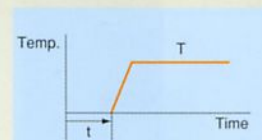
Various program operations are available to support the test and research.

Continuous operation (program 1)



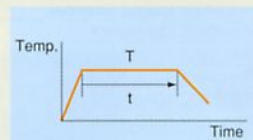
Continues operation at set temperature

Auto-start operation (program 2)



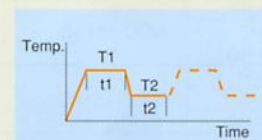
Automatically starts operation after set time elapses. The waiting time for start-up is eliminated.

Auto-stop operation (program 3)



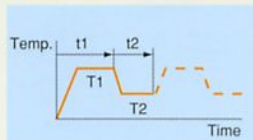
Automatically stops operation after set time elapses.

Step A operation (program 4)



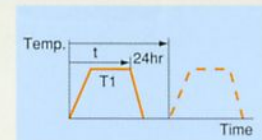
Automatically conducts the step program operation with 2 values for time and temperature (not including the time for rising or declining of the temperature to a set value). Continues the operation preset times.

Step B operation (program 5)



Automatically conducts the step program operation with 2 values for time and temperature (not including the time for rising or declining of the temperature to a set value). Continues the operation preset times.

24 hour-cycle operation (program 6)



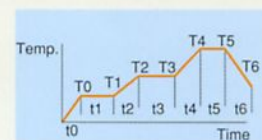
Conducts the operation at set temperature and time in the cycle of 24 hours. Continues operation preset times.

8 Step operation (program 7)



Up to 8 combinations of time and temperature settings (not including the time for rising or declining of the temperature to a set value) are available. Program patterns consists of 8 or less combinations of steps.

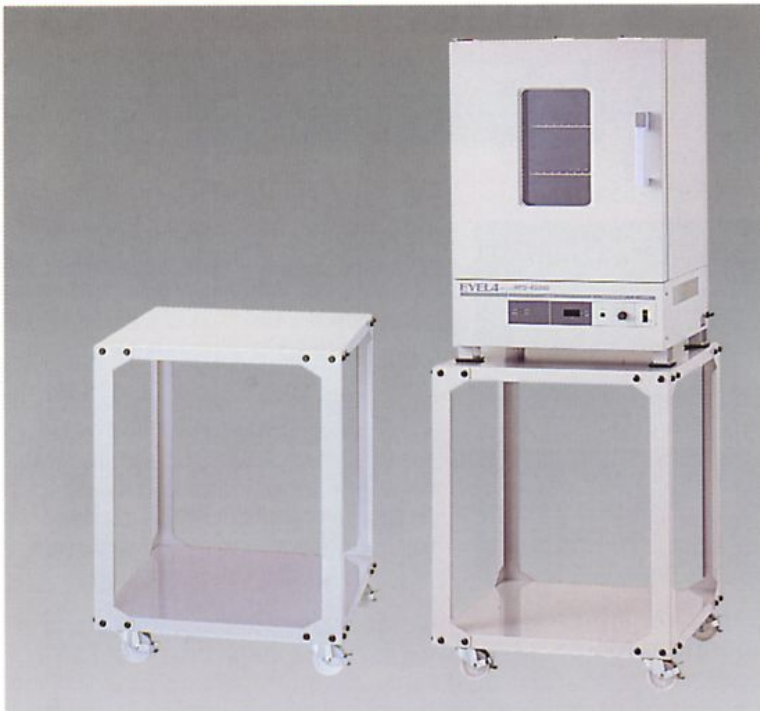
Ramp control (program 8)



This control method enables to increase the temperature from a certain value to a set value during the set time or to maintain the constant temperature. Useful for the crystallization of new material or chemical compound and for the heat durability test of engineering plastic.

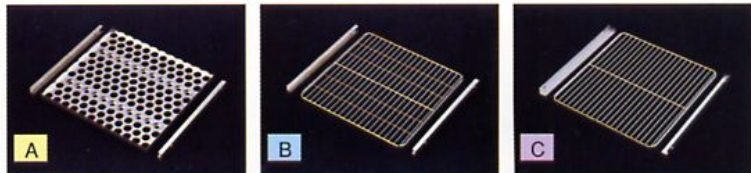
Optional accessories

Table with casters



Solid tables for best use of space

Table w/casters	CAT.No.	Applicable oven
HSS-23C	195330	NDO-400 • WFO-400
HSS-21C	100300	NDO-451SD • WFO-451SD
HSS-31C	100310	NDO-601SD • WFO-601SD



	Shelf, Shelf support	CAT.No.	Applicable oven
A	HST-452 (Shelf)	195370	NDO-400 (W) • 700 (W)
B	HST-453 (Shelf)	195380	WFO-400(W) • 700 (W) • 1200 (W)
AB	HSH-452 (Shelf support)	195390	NDO-400(W) • 700(W) • WFO-400(W) • 700(W) • 1200(W)
C	HST-451 (Shelf)	100360	NDO-451SD • WFO-451SD
	HSH-451 (Shelf support)	100380	
	HST-601 (Shelf)	100370	NDO-601SD • WFO-601SD • 1001SD
HSH-601 (Shelf support)	100390		

Shelf, Shelf support

The high opening ratio of the shelf facilitates the convection of upper and lower air to keep the uniform temperature distribution. Uniform load resistant is max.15kg. Material is SUS304, water-resistant.

Cable

Recorder output cable 3m

CAT. No. 100410

RS-232C communication cable 4m

CAT. No. 167370

※Cable for EYELA model RSC-1200 is recommended (Dsub25P male - Dsub9 (Dsub9P female, cross))

※Please check the specifications of RS-232C of your PC.

Spec. for Recorder output/communications

Please specify upon placing an order (factory option)

Model	Applicable oven	Optional specifications
NDO-451SD-R	NDO-451SD	with Recorder output terminal
NDO-451SD-C		with RS-232C connector
NDO-451SD-RC		with Recorder output terminal + RS-232C connector
NDO-601SD-R	NDO-601SD	with Recorder output terminal
NDO-601SD-C		with RS-232C connector
NDO-601SD-RC		with Recorder output terminal + RS-232C connector
WFO-451SD-R	WFO-451SD	with Recorder output terminal
WFO-451SD-C		with RS-232C connector
WFO-451SD-RC		with Recorder output terminal + RS-232C connector
WFO-601SD-R	WFO-601SD	with Recorder output terminal
WFO-601SD-C		with RS-232C connector
WFO-601SD-RC		with Recorder output terminal + RS-232C connector
WFO-1001SD-R	WFO-1001SD	with Recorder output terminal
WFO-1001SD-C		with RS-232C connector
WFO-1001SD-RC		with Recorder output terminal + RS-232C connector

※Recorder output is DC 0~400V (0~400°C).

※Recorder output cable is necessary for connection with recorder.

※Communication cable is necessary for connection with personal computer.

Nonstandard specification

- Left side open door (for SD only)
- Air flow volume controller (for WFO)
- Cable hole (excluding SD)

EYELA



Safety precaution

For your safety, please read the instruction manual carefully before operating the product.

※The appearance and the specification of the products are subject to change without notice for improvement.

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EYELA

Streamlined design standard type
Programmable high-class type

Convection Oven

model **NDO** series

Forced Air Flow Oven

model **WFO** series



TOKYO RIKAKIKAI CO., LTD.
TOKYO, JAPAN

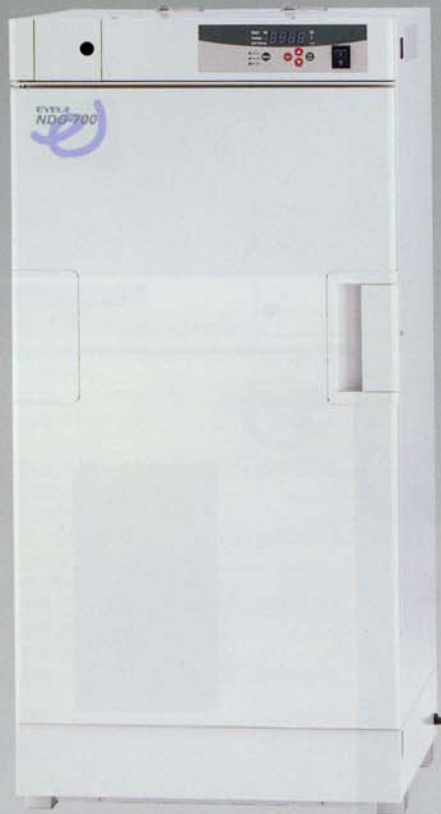
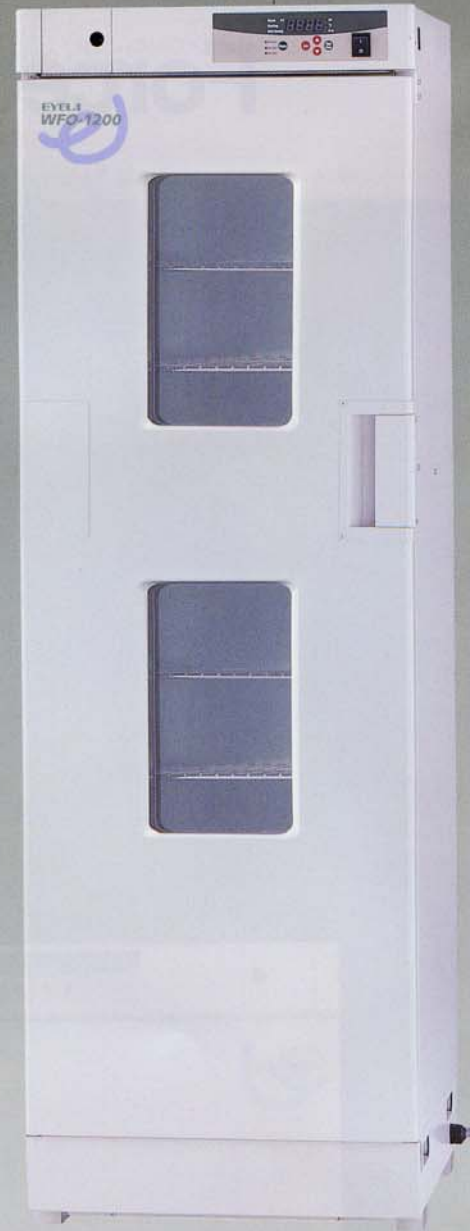
Standard Type Oven pursuing the operability

Specifications are shown on page 3.

WFO-1200W

NDO-700

NDO-400



Alarm indication

Visible and audible alarm

Display	Description of alarm	Buzzer
door	Door open	Sounds after 5 minutes ●
SEnS	Sensor fault	●
Cont	Temperature control fault	●
Set temperature	Upper/Lower limit temperature buzzer	●
POff	Power failure	—

Microprocessor-based alarm indication and buzzer notify the trouble

Timer set range is 0~99h59min.
Auto-start/stop mode enhances the work efficiency by operating the ovens unattended.

Convection Oven NDO-400·400W·700·700W

Forced Air Flow Oven WFO-400·400W·700·700W·1200·1200W

Control Panel

Easy-to-read LED display



Big and bright LED with the size of 8 x 14mm in the temperature indication part. Easy to check the temperature from distance.

Easy to input with a few key operations.

Control panel and overheat protector are located in the upper front enabling easy setting and viewing.

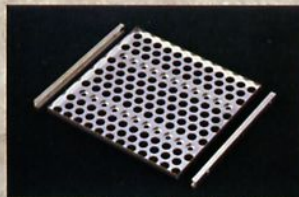
User Adjustment Mode

Auto-tuning	Temperature can be controlled by auto-tuning depending on how much load is in the chamber.	
Temperature indicator compensation	Temperature can be compensated with the range of $\pm 20^{\circ}\text{C}$ of chamber temperature measured by other sensor.	
Recovery from power failure	Operation mode after the recovery from the power failure can be set as required.	
	Continuous recovery	Resumes the control in the status before the power failure.
	Stop	Does not start the control after the recovery from the power failure.
Restart	Resumes the control from the initial status.	
Upper/lower limit temperature alarm	Upper/lower limit temperature alarm can be set between the range of operation temperature $+0$ to 30°C .	

Inside the Chamber

Detailed design

Shelves have 4 mounting holes. Clear view helps to prevent mis-handling.



U-shaped shelf supports ensure easy setting/removing of shelf without floating or tilting.

Setting environment

Door (right side open)



Door (left side open)



※ At the time of shipment, door opens right side.

Newly designed thermal insulation structure provides the slim feature with the uniform width of the products 526mm. The depth of 400 and 700 series are 550mm and 1200 series is 590mm. The weight is also reduced. Opening side of the door can be changed with a little replacing work. Door handle does not stick out so it's convenient for installation.

Safety features

Double safety mechanism



• Independent overheat protector
Cuts off the heater circuit independently from the microprocessor circuit.

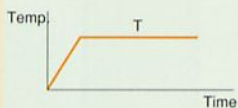


• Breaker for leakage and excess current
Cuts off the power supply circuit in case of electrical leakage or excess current.

• Battery backup mechanism

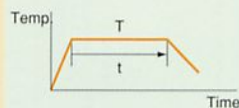
Timer Mode

Continuous operation



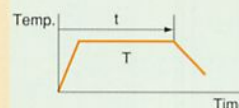
■ Continues operation at the preset temperature.

Auto-stop 1



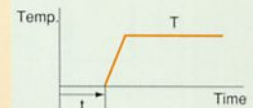
■ Automatically stops operation at the preset temperature after the preset time elapses.

Auto-stop 2



■ Automatically stops operation after the preset time elapses.

Auto-start



■ Automatically starts operation after the preset time elapses.

Specifications

Convection Oven

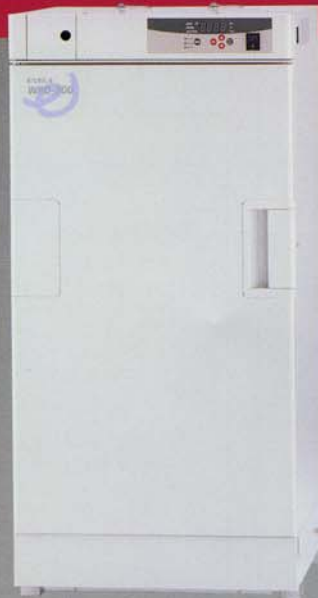
NDO-400 · 400W · 700 · 700W

◀ The pictures are shown on page 1.

Forced Air Flow Oven

WFO-400·400W · 700·700W · 1200·1200W

◀ The pictures are shown on page 1.



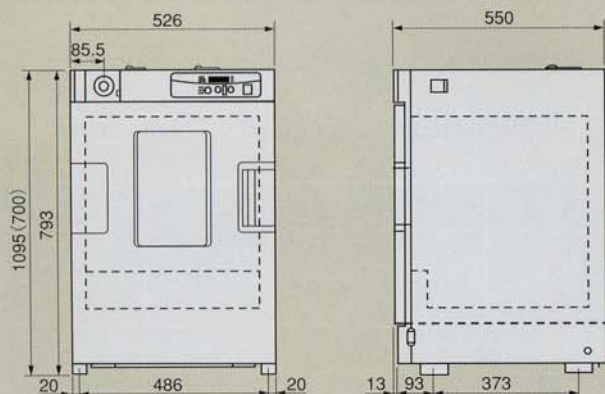
Product	Convection Oven		Forced Air Flow Oven		
	NDO-400/400W	NDO-700/700W	WFO-400/400W	WFO-700/700W	WFO-1200/1200W
Air flow	Gravity Convection		Forced Air Flow		
Temperature range	RT+10°C~250°C		RT+10°C~210°C		
Control accuracy	±1°C		±1°C		
Temperature uniformity	10°C/12°C or less (at 100°C) 20°C/25°C or less (at 200°C)	10°C/12°C or less (at 100°C) 20°C/25°C or less (at 200°C)	5°C/7°C or less (at 100°C) 10°C/15°C or less (at 200°C)	5°C/7°C or less (at 100°C) 10°C/15°C or less (at 200°C)	5°C/7°C or less (at 100°C) 10°C/15°C or less (at 200°C)
Temperature rise time	45/60 min.	75/80 min.	45/50 min.	50/60 min.	50/60 min.
Temperature control	Microprocessor P.I.D. control				
Temperature setting	Membrane key pad, Digital readout				
Timer function	Auto-start, Auto-stop				
Safety features	Door open alarm, Upper/Lower limit buzzer alarm, Sensor alarm, Temperature control fault alarm, Power failure alarm Breaker for electrical leakage and excess current, Independent overheat protector				
Heater capacity	1.2kW	1.35kW	1.2kW	1.35kW	2.2kW
Heater material	Nichrome wire heater				
Temperature sensor	K thermo-couple (CA)				
Chamber dimensions (mm)	450W×450D×400H	450W×450D×700H	450W×450D×400H	450W×450D×700H	450W×450D×1215H
Capacity	81L	142L	81L	142L	246L
View window (mm)	None/180W×300H (double glass)				None/180W×300H (double glassx2)
Ventilation port	2 ports on top surface, dia.37mm				
No. of shelves	2	3	2	3	5
Mountable positions	8	12	8	12	20
Shelf maximum load	Uniform load Max. 15kg/shelf				
Ambient temperature for operation	5~35°C				
Overall dimension (mm)	526W×550D×795H	526W×550D×1095H	526W×550D×795H	526W×550D×1095H	526W×590D×1600H
Net weight (approx.)	45/47kg	55/57kg	46/48kg	57/59kg	98/102kg
Input power source	1.25kVA	1.4kVA	1.3kVA	1.45kVA	2.3kVA
Rated power source	AC115V 60Hz	AC115V 60Hz	AC115V 60Hz	AC115V 60Hz	AC200V 50/60Hz
	AC230V 50/60Hz	AC230V 50/60Hz	AC230V 50/60Hz	AC230V 50/60Hz	AC230V 50/60Hz

※Specifications are room temperature 20°C, AC100V (AC200V for WFO-1200/1200W), 50Hz, no load, and ventilation ports closed.

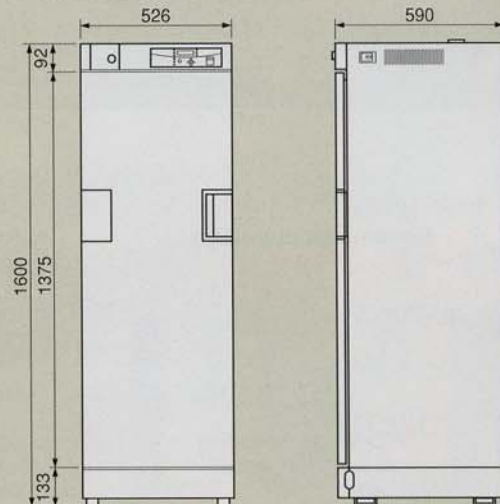
※WFO-1200, 1200W are not equipped with the mains plug.

Convection Oven NDO-400 · 400W · 700 · 700W

Forced Air Flow Oven WFO-400 · 400W · 700 · 700W



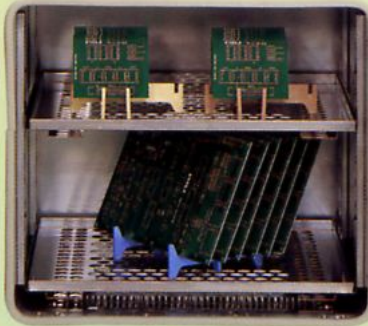
Forced Air Flow Oven WFO-1200 · 1200W



Example of use



Dry the glassware or various containers promptly.
Can be used as dry heat sterilizer for glassware and metal instruments



Heat treatment such as baking the printed-circuit board and drying the semiconductor. Suitable for constant temperature test in the electronic field.



To be used in the new material field such as drying or degasification of the powder of ceramic, magnetic substance, ore and etc.

Test methods

Field	Test description	Conditions	Applicable model			
			NDOseries		WFOseries	
			Standard	SD type	Standard	SD type
Electronics	Voltage test of printed circuit board	168h for every 10°C between 70~120°C		●		●
	Drying process of printed circuit board	60~80°C~120°C	●	●	●	●
	Hardening test of resin printed circuit board	0~4h at 80→150→80°C		●		●
Machinery/ Metal	Durability test of compressor	1000h at 60°C	▲	●	▲	●
	Heat treatment of metal part	0~72h at 150°C	●	●	●	●
	Acceleration test of metal part	50°C~100°C	●	●	●	●
Synthetic fiber	Stability test for resin/rubber material	1000h at 80°C	●	●	●	●
	Heat load test of synthetic fiber	100°C~125°C	●	●	●	●
	Measurement of moisture level in oil	1~3h at 135/150°C	●	●	●	●
Medicine/ Food	Drying of labware	Overnight at 105~120°C	●	●	●	●
	Measurement of moisture level in the food	20h at 105°C, 1h at 130°C	●	●	●	●
	Dry heat sterilization	3~5h at 135~145°C	●	●	▲	▲
		2~4h at 160~170°C 0.5~1h at 180~200°C	●	●	●	●
	Drying of glassware (with scale)	60~80°C	●	▲	●	▲
Drying of glassware (without scale)	105~120°C	●	▲	●	▲	
Agriculture/ Soil	Measurement of moisture level in the vegetation, seeds and feed	1h at 130°C→3h at 70°C		●		●
	Measurement of moisture level in micro volume sample for water quality	100~120°C	●	●	●	●

Applicable Field

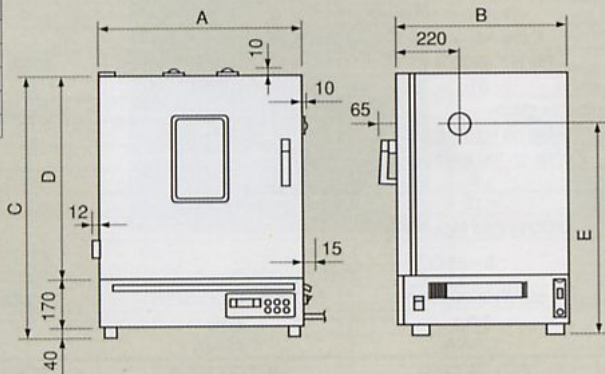
New materials	Alumina ceramics, zirconate titanate, barium titanate, Sic (silicon carbide) etc.
Semiconductor	IC, LSI, liquid crystal, chemical semiconductor gallium arsenide semiconductor, organic semiconductor, amorphous semiconductor material for molding, material for magnetic bubble memory etc.
Biology	Enzyme, culture solution, yeasts, etc.
Food engineering	Meat, fish, soy beans, red beans, rice, butter peanuts, bananas, tomatoes, grains, starches, glucose, eggs etc.
Medicine/ agricultural	Antibiotics, vitamins, insecticide, herbicide, etc.

Material Field

High polymer	Heat-hardening resin, photosensitive resin, superabsorbent resin, thermoplastic resin, engineering plastic, photo-hardening resin, etc.
Dye, pigment, perfume	Dye for fabrics, paints, pigment, ginger etc.
Organic compound	Acetate, calcium propionate, sodium benzoate, sodium phenolate, cacodylic acid, fatty acid, ammonium nicotinate, chelate, styrene, butadiene etc.
Inorganic compound	Aluminum, ammonium, calcium, barium, iron, lead, lithium, magnesium, nickel, potassium, titanium, manganese, molybdenum, zinc etc.
Petrochemistry/ Oils and fats	Rubber, painting, adhesive agent, detergent, etc.

Convection Oven NDO-451SD · 601SD
Forced Air Flow Oven WFO-451SD · 601SD

Dimension	Model	
	NDO-451SD	NDO-601SD
A	550	700
B	560	610
C	820	920
D	610	710
E	645	745



Forced Air Flow Oven WFO-1001SD

