

Catalogue

Nanofiber machines Electrospinning/Electrospray system



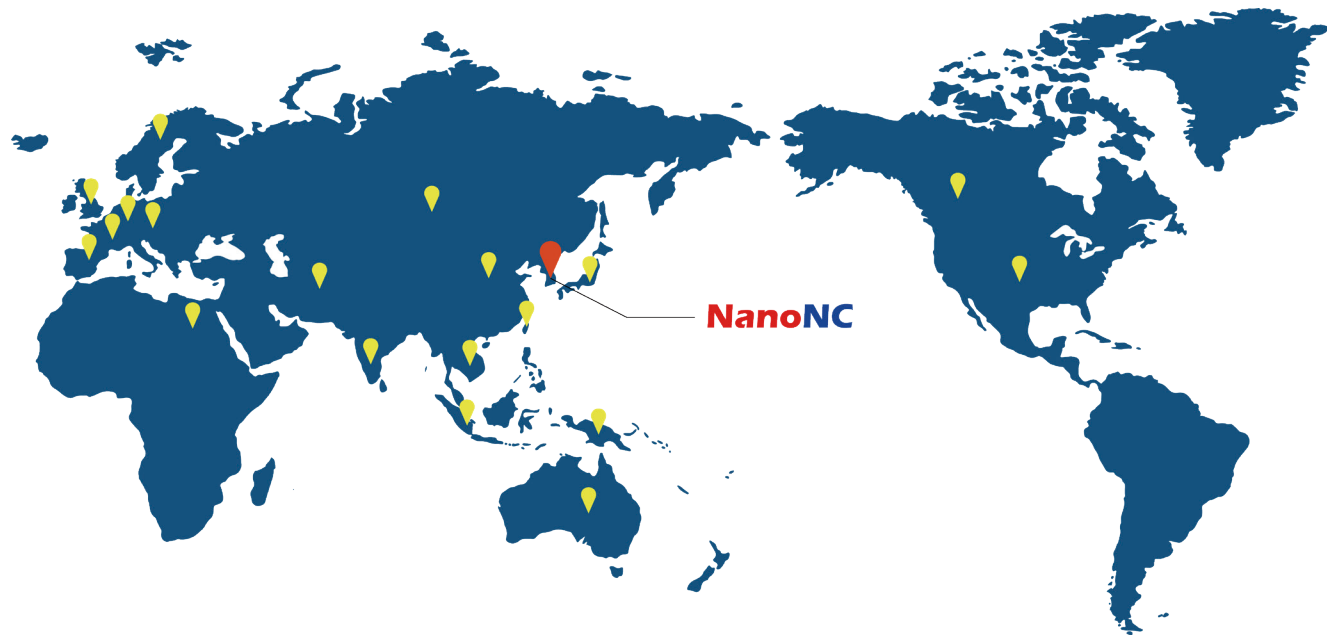
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NanoNc.Co.,Ltd
www.nanonc.com

NanoNC

Electrospinning & Electrospray System | Syringe Pump | HV Generator
| Collectors | Nozzles | Accessories | Other components

NanoNC is working for researchers around the world in the field of electrospinning / electrospray process.

Application fields of Electrospinning & Electrospray system



Domestic



Furthermore, many other universities, public research institutions, and companies R&D institutions

Overseas

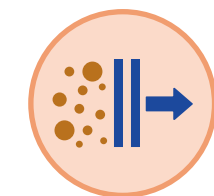


ETC.



Bio&medical

- tissue engineering
- wound dressing
- pharmaceutical
- DDS (drug delivery systems)



Filtration

- filter media (HEPA~ULPA)
- functional clothing
- Water treatment



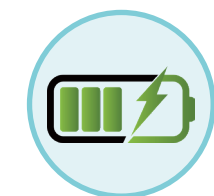
Cosmetics

- face mask
- skin care
- eye patch



Household products

- Air purifier
- Disposable filter
- VOCs capture



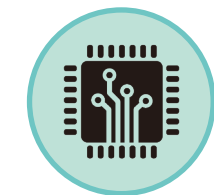
Energy

- Li-Batteries
- Fuel-Cell
- Energy harvesting



Sensor

- Gas Sensors
- Electrochemical Biosensors
- Piezoelectric Sensor
- Highly Sensitive Optical Sensors



Electronics

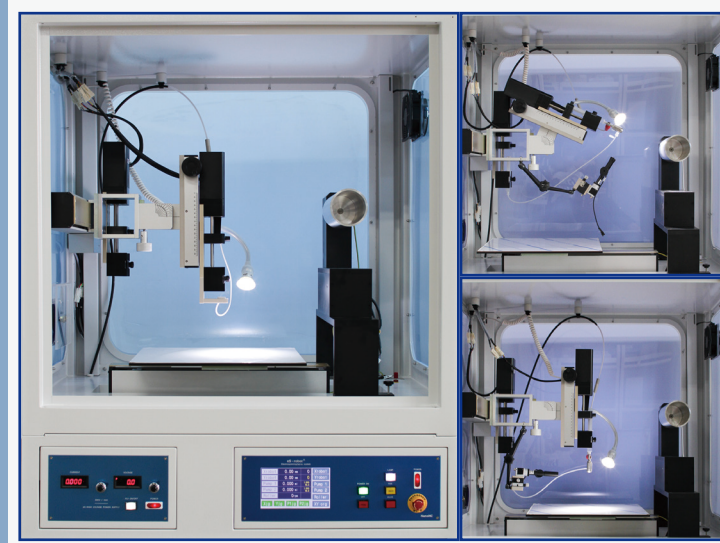
- wearable electronics
- flexible electronics
- EMI Shielding



Military technology

- EMI Shielding
- functional protective clothing
- Gas mask filter

Contents



Introduction

ABOUT OUR COLLECTION

NanoNC Co., Ltd. specializes in nanotechnology-enabled systems, specifically the design and manufacture of customized electrospinning/electrospray laboratory systems. Its product line consists of electrospinning/spray systems and various nozzles for creating nano-structures like nanofibers and nanoparticles.

NanoNC Co., Ltd. aims to become a global enterprise specializing in the development of electrospinning/spray systems for fabricating nano-structures.

Introduction 04

ABOUT OUR COLLECTION

Equipments for ESP 08

eS-ROBOT®

Components for ESP 17

SYRINGE PUMP, HV POWER SUPPLY, COLLECTOR

Nozzles for ESP 25

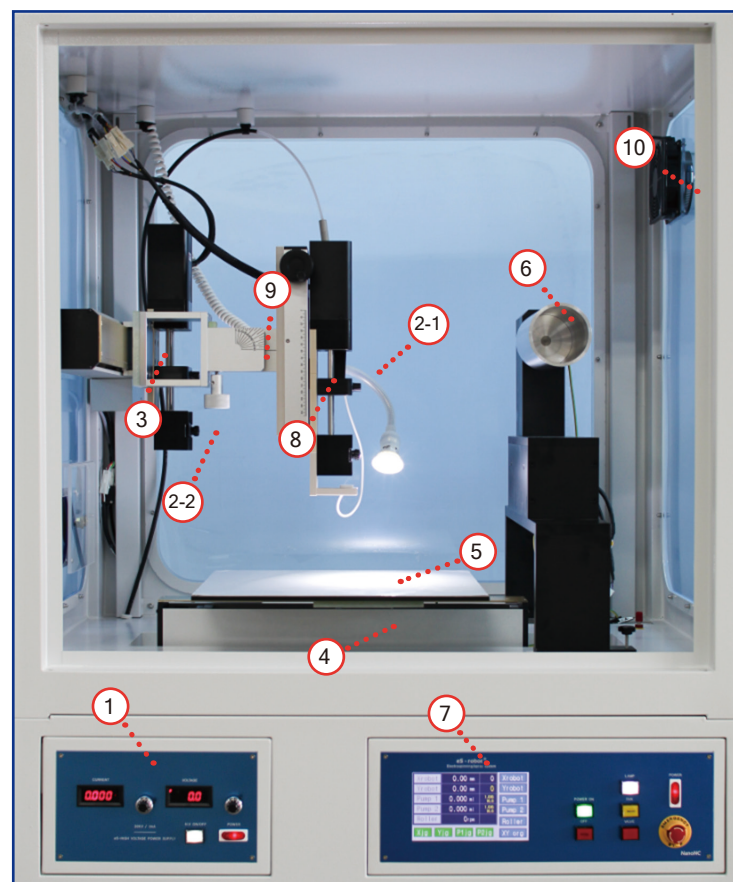
SPECIAL NOZZLES & ACCESSORIES

Roll-to-roll Systems 35

CONTINUOUS & LARGE-SCALE WEB

Electrospinning / Electropray Machine

ESR200 Series



ESR200R2D, M3

Components

1. HV power supply(30kV or 60kV)
2. syringe pump
 - 2-1. syringe pump 1
 - 2-2. syringe pump 2
3. X-robot
4. Y-robot
5. plate collector(flat)
6. drum collector
:(ϕ 90 or ϕ 120) x W200~300mm
7. touch screen
8. LM slider
9. angle controller
10. ventilation fan

Common specification

Component	Specification
HV power supply	30kV or 60kV
Syringe pump	min. 0.01ul/min (10ul syringe), or syringe 1ml~200ml
2-axis robot	X&Y-robot(2-axis) stroke: 300 or 400mm max speed: 150mm/s
Flat collector	300mmx300mm or 400mmx400mm or 500mmx500mm
Drum collector	ϕ 90 x 200mm(W) (size A4), or ϕ 90~120 x500mm(W)
Case(+table)	950(W)x650~750(D)x1,150(H)+[table:750(H)]
Nozzle	single metal nozzle(21G, 23G, 25G, 27G)x1pk
Syringe	10ml x 100ea
Option	coaxial nozzle(17G-23G or 18G-25G)x1ea, vision camera, (-) HV power supply

Electrospinning / Electropray Machine

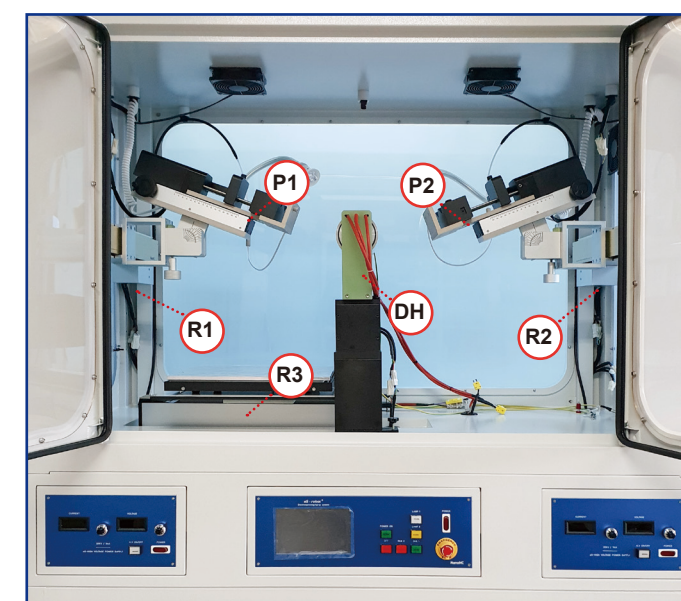
Model notation

ESR 200 P **R** **(D)** *

name	series number	syringe pump	robot system	collector
ESR (with case)	100 • independently control • Al profile case	• P \square , P2 =2ea(option) (*PR2: pump 2ea, robot 2ea) (*RDP2: robot 1ea, drum 1ea, pump 2ea)	• R1 = X-axis • R2 = X&Y-axis or X&X'-axis	D: drum DH: heating drum H: heating plate B: bath RTR: roll-to-roll
ES (without case)	200 • integrated control • painted metal case	• P3 =3ea(option)	• R3 = X, X'&Y-axis	

* HV power supply & syringe pump 1ea: No notation as basic components.

Example



ESR200P2R3DH

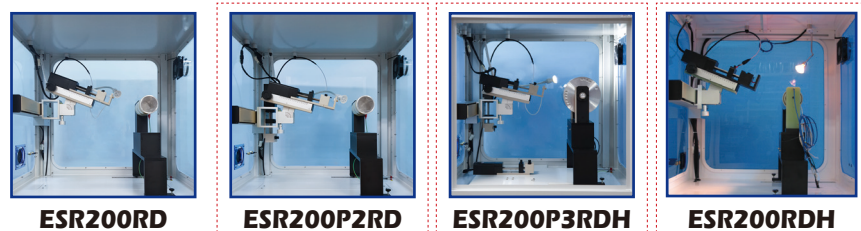
Component	Qty	Notation
syringe pump	2	P2
robot system(X, X'&Y-axis)	3	R3
collector(heating drum, flat plate)	1	DH
HV power supply: positive(+) & negative(-)	-	No notation

Electrospinning / Electrospray Machine

Electrospinning / Electrospray Machine

Machine 1

: 1-axis robot with drum collector

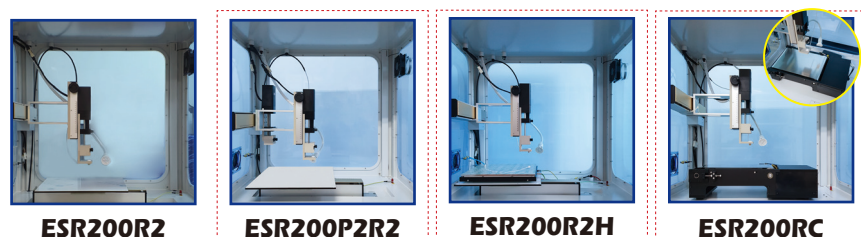


ESR200RD **ESR200P2RD** **ESR200P3RDH** **ESR200RDH**

- HV generator: 30kV/60kV(option)
- 1-axis robot: ball screw, servo motor, 160mm/s
* working distance(max): 200mm/300mm/400mm(option)
- Syringe pump: min 0.01μl/min
- Drum collector: 5~2,800rpm, servo motor
- Spinning direction angle control: 0~90°
- No tubing: minimum dead volume

Machine 2

: 2-axis robot with flat plate collector

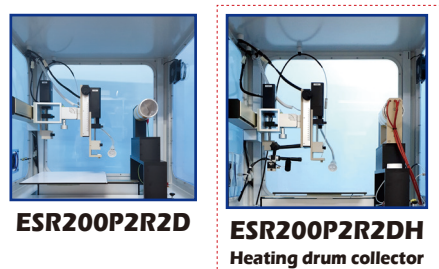


ESR200R2 **ESR200P2R2** **ESR200R2H** **ESR200RC**

- HV generator: 30kV/60kV(option)
- 2-axis robot: ball screw, servo motor, 160mm/s
* working distance (max):200mm/300mm/400mm(option)
- Syringe pump: min 0.01μl/min, dual syringe pump (option)
- Flat collector: stroke 300mm/400mm(option)
- No tubing : minimum dead volume
(option) heating collector: ~180°C, ~250°C, ~350°C
(option) dual concentric nozzle for ultra – atomization
: 22G-30G/23G-32G

Machine 3

: 2-axis robot with flat plate collector & drum collector

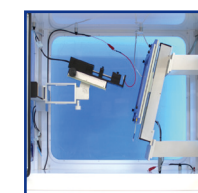
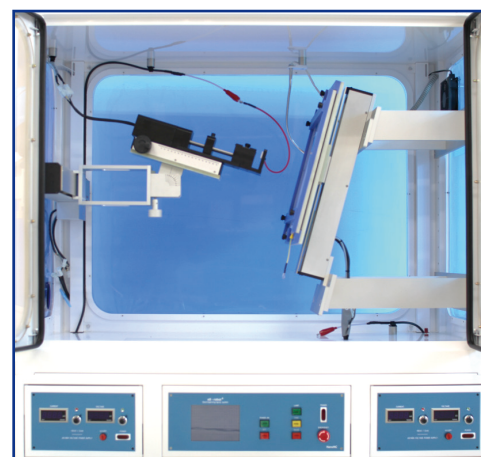


ESR200P2R2D **ESR200P2R2DH**
Heating drum collector

- HV generator: 30kV/60kV(option)
- 2-axis robot: ball screw , servo motor,160mm/s
* working distance(max):200mm/300mm/400mm(option)
- Dual syringe pump: min 0.01μl/min
- Drum collector: 5~2,800rpm, servo motor
- Flat collector: stroke 300mm/400mm(option)
- Spinning direction angle control: 0~90°
- No tubing: minimum dead volume

Machine 4

: 2-axis robot with vertical collector

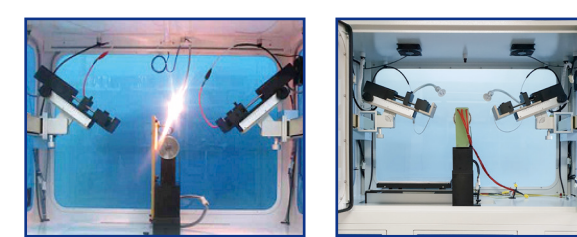
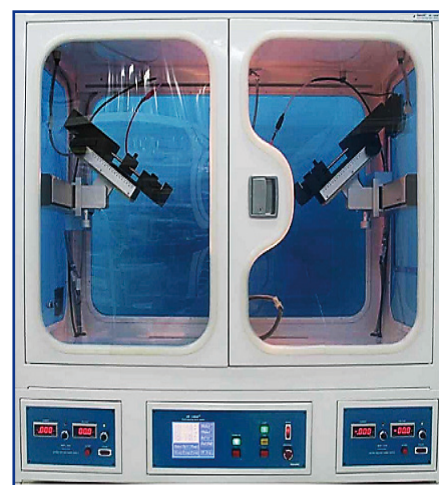


ESR200R2V

- HV generator: (+/-) 30kV/60kV (option)
- 2-axis robot: ball screw , servo motor, 160mm/s
- Syringe pump: min 0.01μl/min
- Flat collector: vertical type 300mm/400mm(option)
- No tubing: minimum dead volume
(option) heating collector: ~180°C

Machine 5

: 2-axis robot with drum collector for 2-solutions

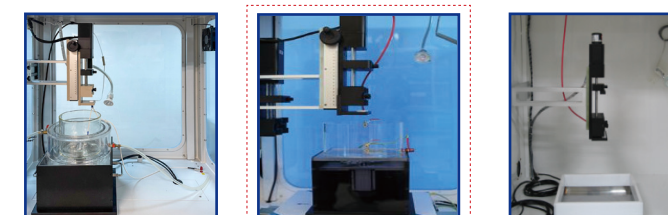
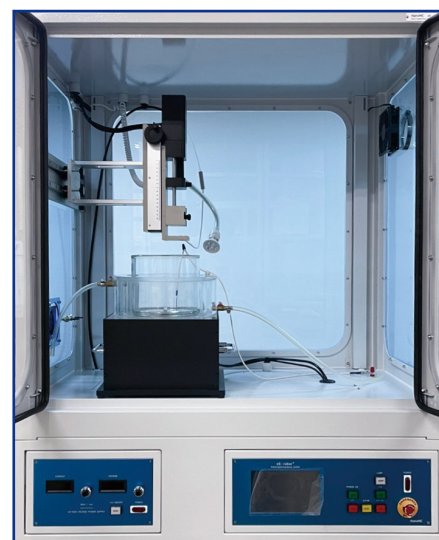


ESR200PR2D **ESR200PR3D**

- 2-solution composite electrospinning
- HV generator: (+/-) 30kV/60kV(option)
- 1-axis robot: x2ea, ball screw, servo motor
- Syringe pump: min 0.01μl/min
- Drum collector: 5~2,800rpm, servo motor
- No tubing: minimum dead volume

Machine 6

: Bath collector



ESR200B **ESR200P2B**

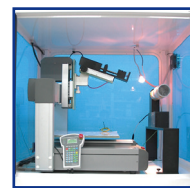
- HV generator: 30kV/60kV(option)
- Syringe pump: min 0.01μl/min
- Bath collector : for particle / nanofiber fabrication
- CW/CCW repetition stirring during particle preparation
- Spray nozzle for the fabrication of nano/ microparticle
: 22G-30G (ID 0.15mm) / 23G-32G (ID 0.10mm)

Electrospinning / Electropray Machine

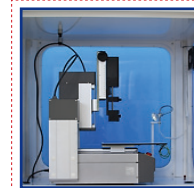
Electrospinning / Electropray Machine

Machine 7

: desktop robot system with drum collector



**ESD300(D)
ESD400(D)**



ESD200(D)

ESD300(D), ESD400(D)

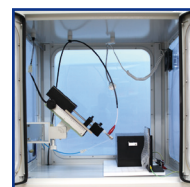
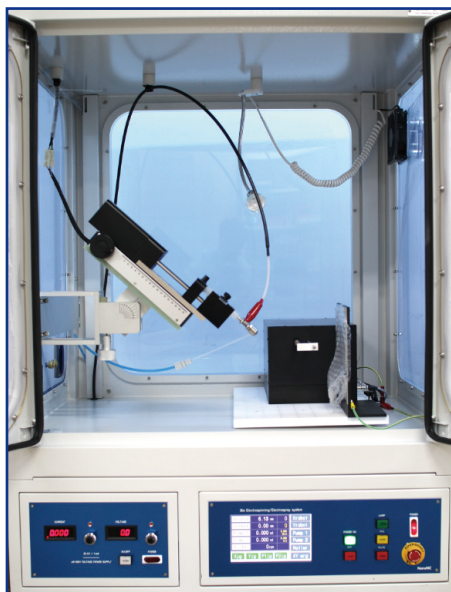
- HV generator: 30kV/60kV (option)
- 3(2)- axis robotic system: ball screw, servo motor, loader
- Syringe pump: min 0.01 $\mu\text{l}/\text{min}$
- (option) Drum collector: 5~2,800rpm, servo motor
- 1-solution, (option)2-solution spinning
- No tubing : minimum dead volume

ESD200

- 3(2)-axis robotic system : step motor, belt type, loader

Machine 8

: stent coating system



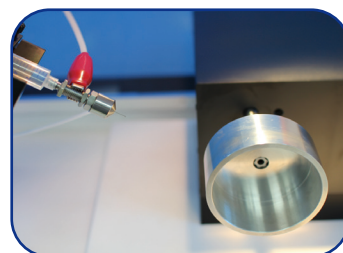
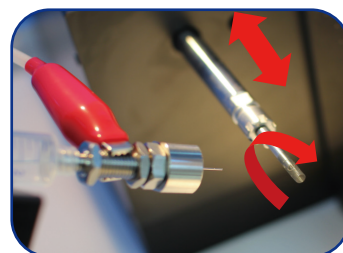
ESB200



ESB100

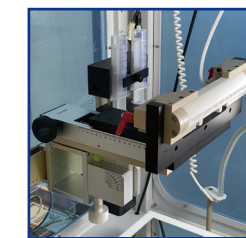
Stent coating only

- Stent coating / electrospinning on drum, disk and rod collector
- HV generator: 30kV
- Syringe pump: min 0.01 $\mu\text{l}/\text{min}$
- Linear & rotating motion system : servo motor
- Working distance (max) : 80mm
- No tubing: minimum dead volume
- (option) dual concentric nozzle for ultra – atomization
- : 22G-30G (ID 0.15mm / 23G-32G (ID 0.10mm)

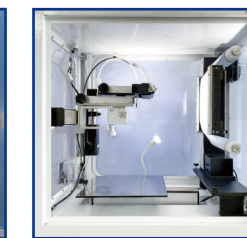


Machine 9

: roll-to-roll collector



ESR200RTR300MN



ESR200RTR300ACN



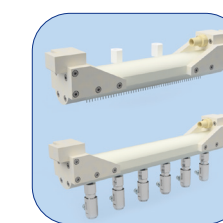
ESR200RTR300AJN

ESR200RTR300

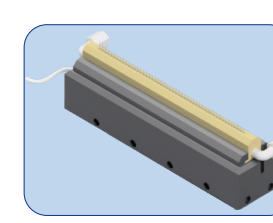
- HV generator: 30kV/60kV(option)
- 1-axis robot: ball screw, servo motor, 160mm/s
- Syringe pump: min 0.01 $\mu\text{l}/\text{min}$
- Syringe pump or injection pump with solution tank
- Roll-to-roll collector: width 200~500mm
- Multi-nozzle: 50~100 hole, anti-clogging type



Injection pump



multi-nozzle



roll-to-roll collector

Machine 10

: electrospray coating system



Electrospray Coating System

- Air-assisted electrospray coating system
- Tank(1L) type syringe pump
- Substrate size: 500~1,000mm
- Heating flat collector: ~150°C



Electrospray Coating System

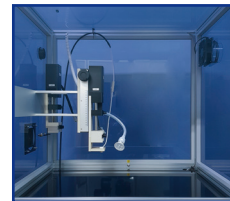
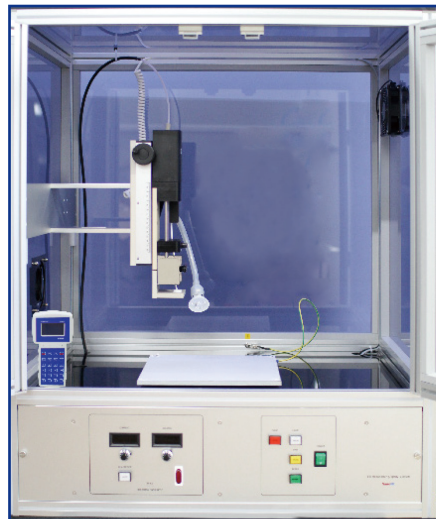
- Air-assisted electrospray coating system
- Atomizing spray nozzle: ID 0.36mm
- 2-Axis linear moving system for thickness uniformity
- Thin layer coating
- Substrate size: 500~1,000mm

Electrospinning / Electropray Machine

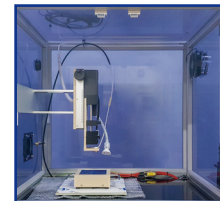
Electrospinning / Electropray Machine

Machine 11

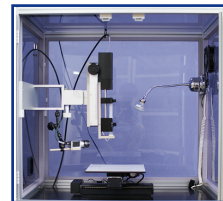
: not movement with flat plate collector



ESR100P2



ESR100H
heating collector



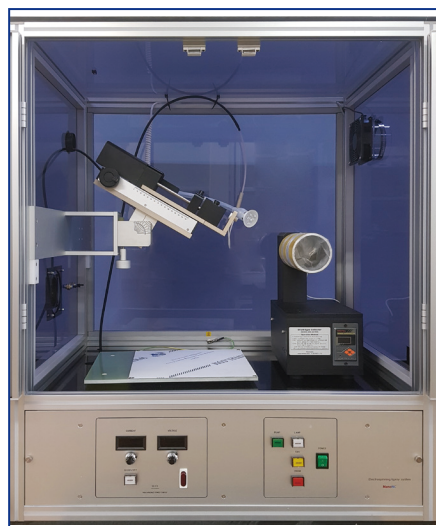
ESR100R2-V
Flat collector :stroke ~200mm,
2-axis driving system
Electrospin vision system

ESR100

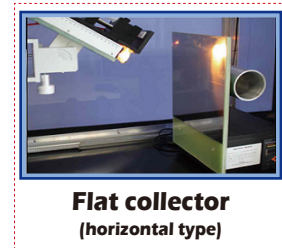
- HV generator: 30kV/60kV (option)
- Syringe pump: min 0.01 μ l/min, EP100 (loader type)
- Flat collector: 300(mm) x 300(mm)
- (option) X-Y moving collector: stroke 150mm (manual type)
- (option) heating collector: ~180°C, ~250°C, ~350°C
- No tubing: minimum dead volume

Machine 12

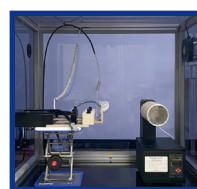
: not movement with drum collector



ESR100P2D



Flat collector
(horizontal type)



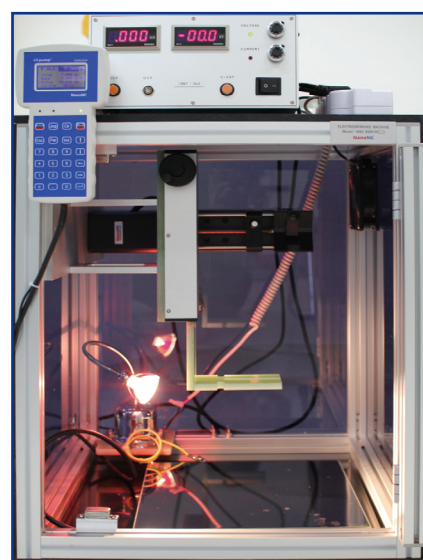
ESR100DHO

ESR100D

- HV generator: 30kV/60kV (option)
- Syringe pump: min 0.01 μ l/min, EP100 (loader type)
- Spinning direction angle control :0~90°
- Drum collector : 30~500 rpm / 200~2,700rpm (option)
- No tubing : minimum dead volume

Machine 13

: small case

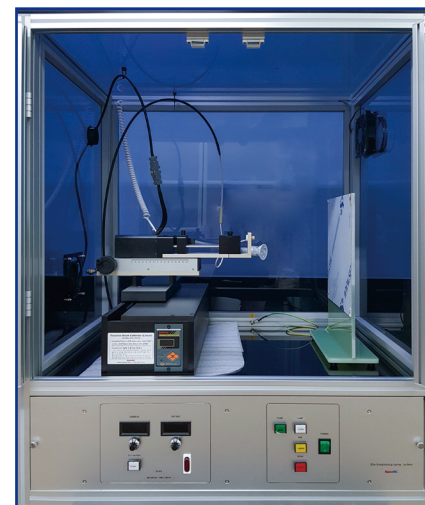


ESR100S

- HV generator: 30kV/60kV (option)
- Syringe pump: min 0.01 μ l/min, EP100 (loader type)
- Tubing / nozzle adapter
- Small case: setting inside hood
- Minimum case size: 550mm(W) x 550mm(D) x 600mm(H)
- (option) X-Y table: manual/auto control

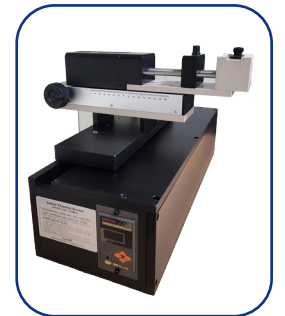
Machine 14

: traverse syringe pump



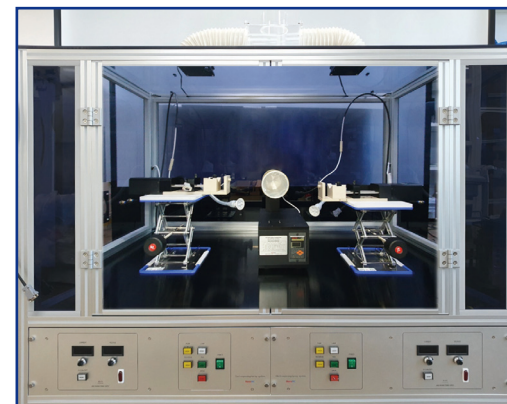
ESR100TRA

- H.V. generator: 30kV/60kV(option)
- Syringe pump:
 - flow rate: min 0.01 μ l/min
 - Syringe No. : 1ea ~ 4ea
- Drum collector / Flat collector : horizontal
- Traverse drive unit for syringe pump:
 - speed: 12~209mm/s
 - stroke: min 50~200mm



Machine 15

: 2-solution with drum collector

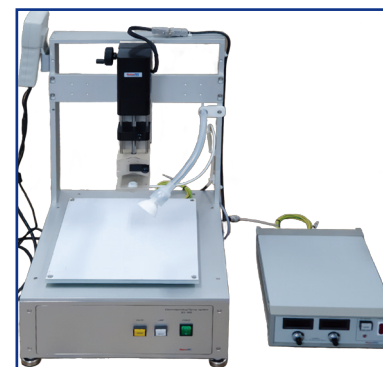


Model: ESR100P2D

- H.V. generator: 30kV/60kV(option)
- Syringe pump:
 - flow rate: min 0.01 μ l/min
 - Syringe No. : 1ea ~ 4ea
- Drum collector: 30~500rpm or 200-2,700rpm (option)
- Traverse drive unit
- Spinning direction: horizontal

Machine 16

: simple machine with low price

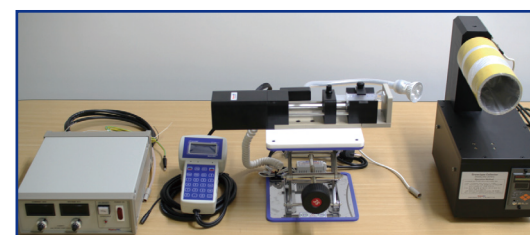


ES100

- HV generator: 30kV/60kV (option)
- Syringe pump: min 0.01 μ l/min, EP100 (loader type)
- No tubing : minimum dead volume
- without case
- low price

Machine 17

: simple machine with low price



ES100D

- HV generator: 30kV/60kV (option)
- Syringe pump: min 0.01 μ l/min, EP100 (loader type)
- Drum collector : 30~500 rpm / 200~2,700rpm (option)
- No tubing : minimum dead volume
- without case
- low price

Electrospinning / Electropray Machine

Machine 20

: nanofiber yarn system

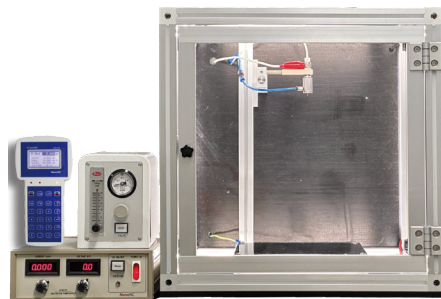


ESY100P2

- Electrospun yarn fabrication
- Funnel collector
- HV generator: (+) 30kV / (-) 30kV
- Syringe pump x2ea: EP100 (loader type)
- Nozzle adapter / Tubing
- Traverse winding unit

Machine 21

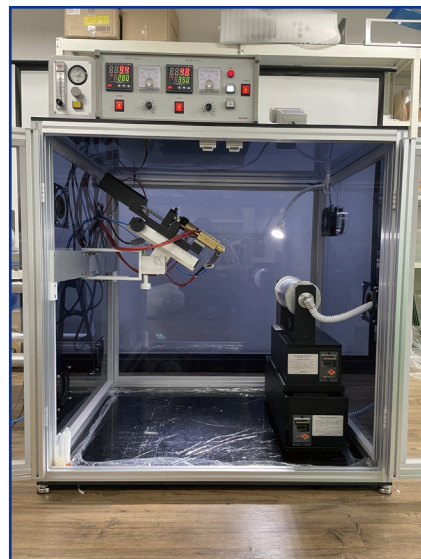
: large discharge amount with air-jet blowing nozzle



AJB100

- Air-jet blowing nozzle
- Electrospinning system
- HV generator: 30kV / 60kV
- Syringe pump: EP100 (loader type)
- Air flow controller
- Compressor

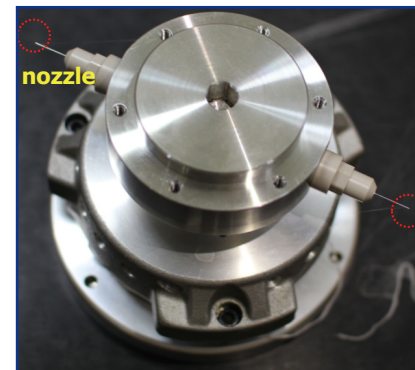
Other Spinning Machines



Melt Blowing Spinner (melt)

NMC-MBS100

- coaxial nozzle
- heating barrel: 10cc, 25~300°C
- heating method: cartridge
- hot air blowing : air heater
- melt / solution



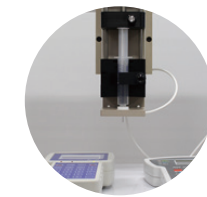
**RS 100
Rotary jet spinning machine**



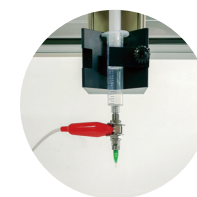
**WS100
Wet spinning machine**

Electrospinning / Electropray Machine

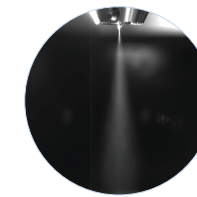
Desktop Robotic Electrospinning / Electropray System



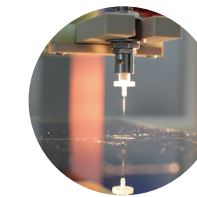
Electrospinning



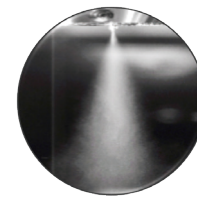
Electropray



**Air-assisted
electropray
(coaxial nozzle)**



**Direct-write
electrospinning**

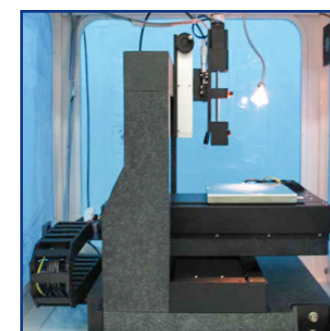


**Spray coating
(coaxial nozzle)**



ESDR300/ESDR400

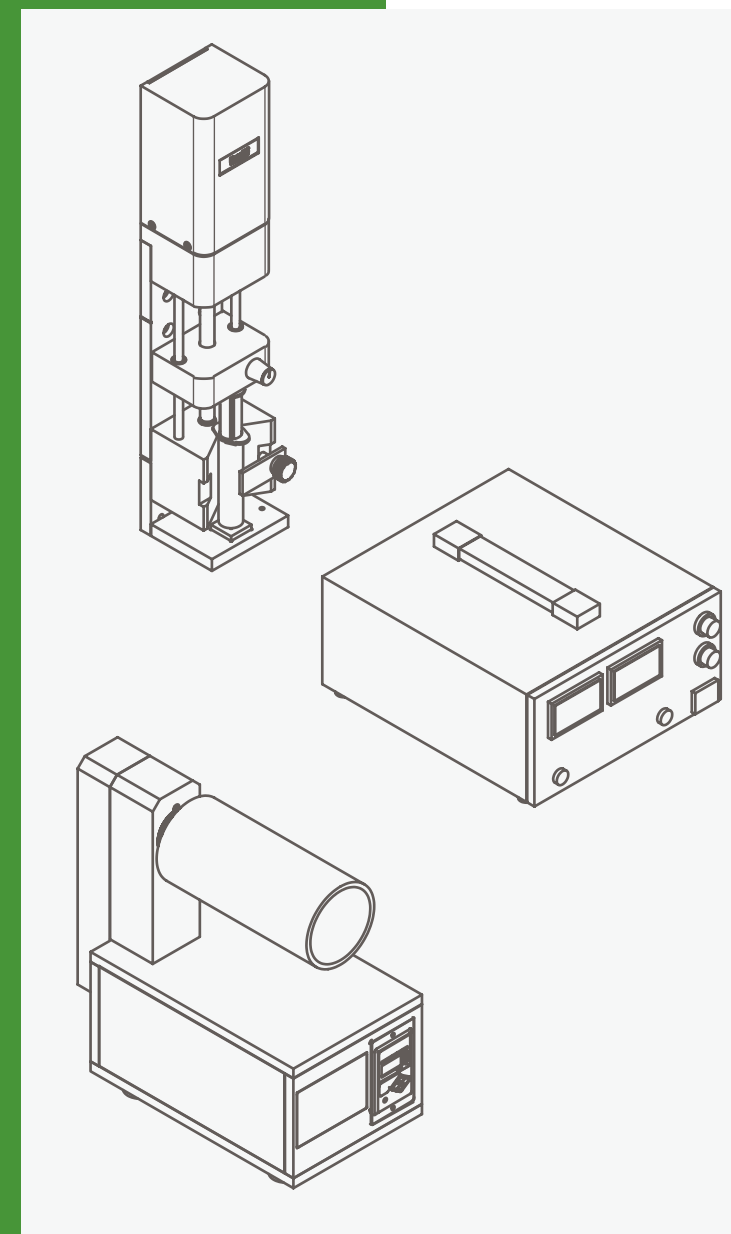
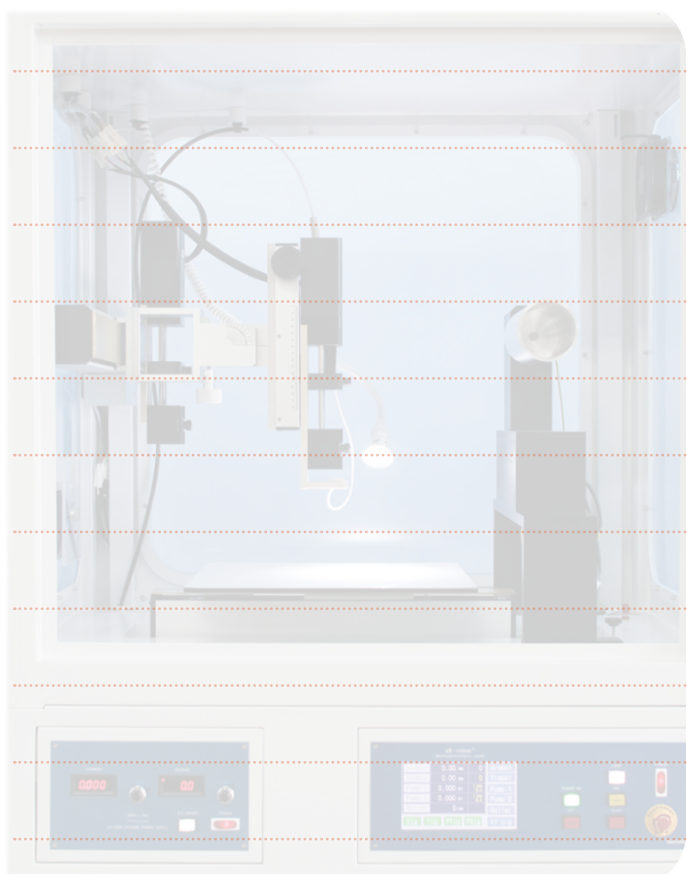
- 2-axis robot
stroke: X-axis & Y-axis: ~300mm (~400mm)
speed: X-axis & Y-axis: 500mm/s (under no load)
- Syringe pump: EP100
- HV generator: 30kV
- Windows based S/W
- Controller: teaching pendant



DR200H

- High speed 2-axis robotic system
(200mm X 200mm, speed 500mm/s)
linear servo motor
- (option) Syringe pump (EP100)
- (option) HV generator

Memo



Various Components for ESP

OPTIONAL ADDITIONAL COMPONENTS

- **Syringe pump** for dispensing precise amounts of a solution.
- **HV generator** for applying high voltage to the nozzle.
- **Collector** to collect the generated nanofibers or nanoparticles.
- **Vision system** to observe nozzle and electrospinning behavior at the tip of nozzle.
- **Components** for experiments.

Syringe Pump

Syringe Pump for Electrospinning / Electropray



NNC-EP100 D

- 100: basic
- 120: 2ch
- 140: 4ch
- D: dual
- T: triple
- M: multi-channel
- R: rotation

NNC-EP100

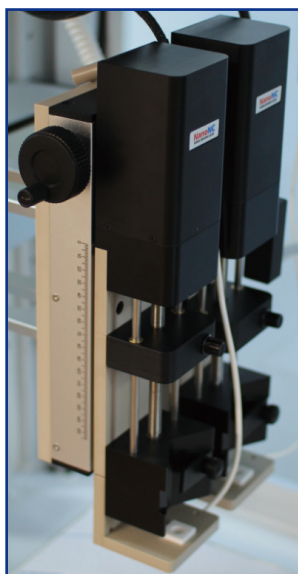
Syringe Pump for Electrospinning / Spray

- ring guide: stable taylor cone in a higher voltage
- high voltage resistance: 30kv
- flow rate: min 0.01 $\mu\text{l}/\text{min}$ ~ 100ml/min
- no tubing
- syringe no. : 1~4ea (changeable)
- base plate : PEEK or teflon coated AL
- (option) syringe cover for HV protection : teflon



formation of a stable taylor cone on nozzle tip in applying a higher voltage

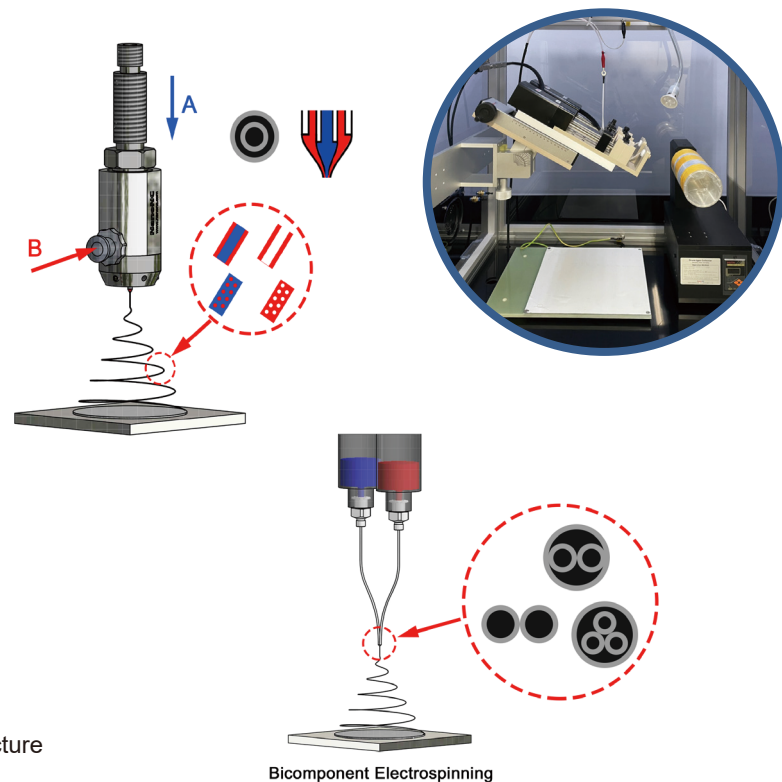
Dual Syringe Pump



NNC-EP100D

Dual Syringe Pump

- dual syringe pump : 2~3ea
- for the fabrication of core-shell structure
- two controller

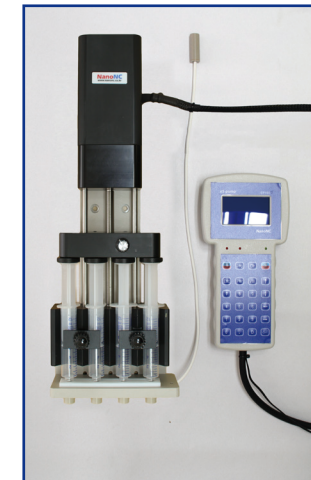


Syringe Pump

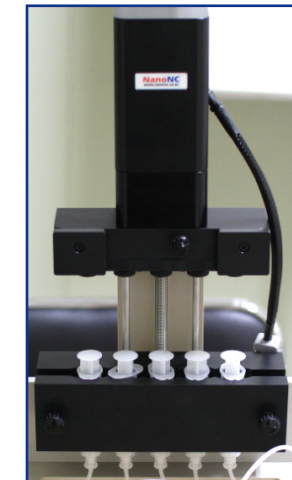
Multi-channel Syringe Pump



NNC-EP120
(syringe No. : 2EA)



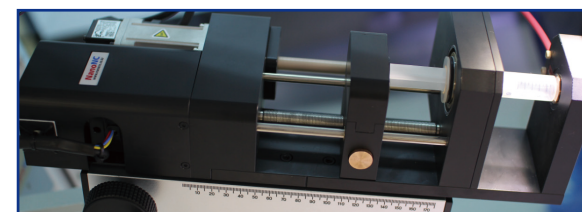
NNC-EP140
(syringe No. : 4EA)



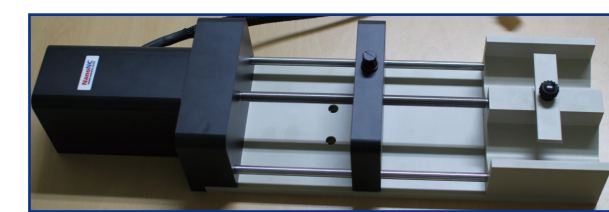
NNC-EP100M
syringe No.: 5EA(10cc)~10EA(1cc)
multi-syringe pump for multi-nozzle

Multi-channel Syringe Pump Series (Syringe No. : 2~10EA)

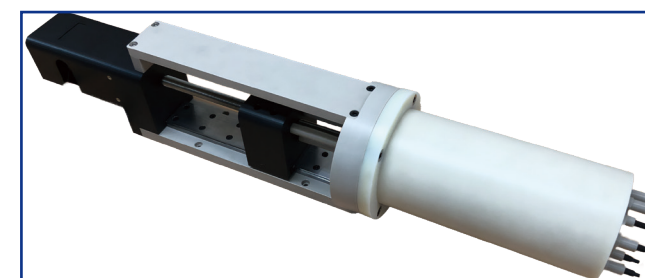
Special Syringe Pump



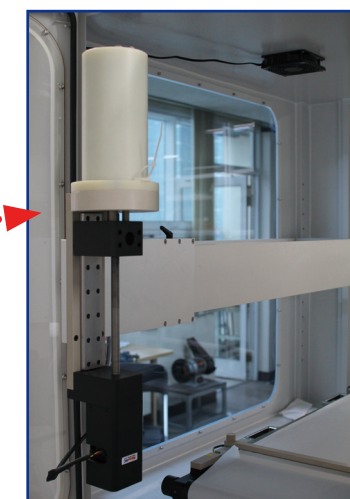
NNC-EP100R
Rotary Syringe pump for rotation of syringe



NNC-EP200
Syringe pump for a syringe of 200cc



NNC-EP1000
Injection (Infusion) Pump
with Solution Tank above 1L



Devices

HV generator for ESP



NNC-HV 30

- Voltage(kV) (P): positive
N: negative
- 30kV
 - 60kV
 - 100kV

HV Generator for Electrospinning/spray (Model: NNC-HV 30)

- input voltage : 110 ~ 240VAC, 50/60Hz , single phase
- output voltage : DC 1kV ~ 30kV
- out current : 0 ~ 1mA
- dimensions(mm) : 250(W) x 310(D) x 95(H)
- weight(kg) : ~ 5.1Kg

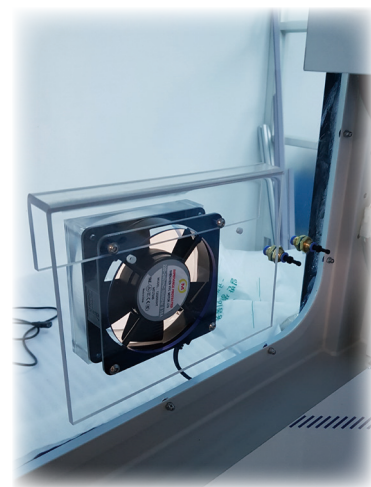
HV Power Supply (HV generator) (30kV/60kV/ 100kV)
(Model: NNC-HV30 / NNC-HV60 / NNC-HV100)

Dehumidifier System



Model: DH100K
Dehumidifier Kit

Model: DH100
Dehumidifier 19L/day



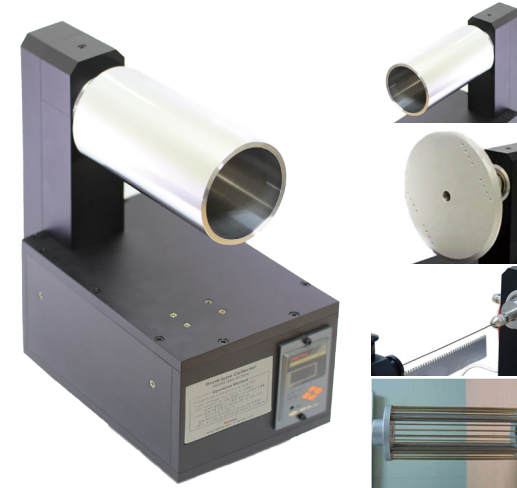
Installation of the
Dehumidifier Kit

Dehumidifier System for Electrospinning/spray (Model: NNC-DH100)

- dimension: 290(W)x380(D)x590(H) / 18kg
- dehumidification capacity: 19L/day
- for humidity below RH 40%(ESR100 / 200)

Collectors

Drum Type Collector



Drum Collector (Ø90)
(Model: NNC-DC90)

Drum Collector (Model: NNC-DC90)

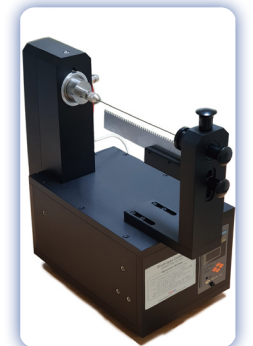
- motor: 90W (speed control motor)
- drum size: ø90xW200mm
- rpm: 30~500rpm(basic) / 200~2700rpm(high speed)
- dimension: 335(W)x180(D)x356(H) (mm)
- the above drum can be replaced by the collector below
 - * disk size: ø180xW3mm
 - * rod size: ø1~ ø4
 - * wire drum size: ø90xL210

NNC-DC 90

- Diameter (mm)
- ø90 or ø 120

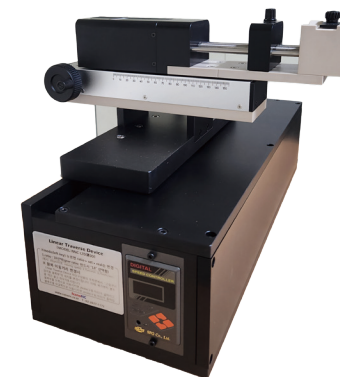


Disk Collector
(for alignment)
Model: NNC-AC180



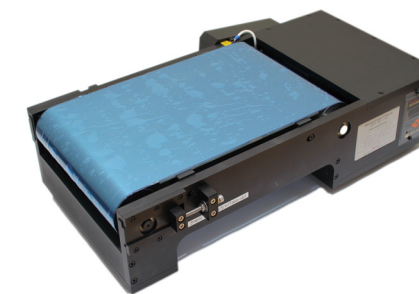
Rod Collector
(for tube)
(Model: NNC-RC15)
(Ø1, 1.5, 2, 3, 4mm)

Various Type Collector



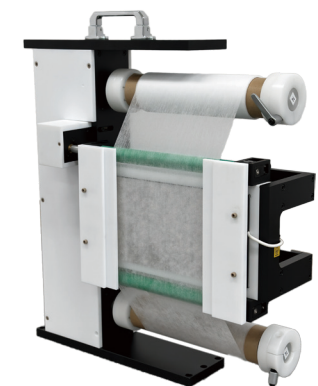
Traversal Drum Collector
(Model: NNC-TDC90)

- drum size: ø90xW200mm
- speed: 12~209mm/s
- stroke: min 50~200mm
- dimension: 580(W)x195(D)x482(H)



Conveyor Collector
(Model: NNC-CC250)

- speed: 3~30 RPM
- SUS belt size: W250 x L600(mm)
- dimension: 610(W)x345(D)x156(H)

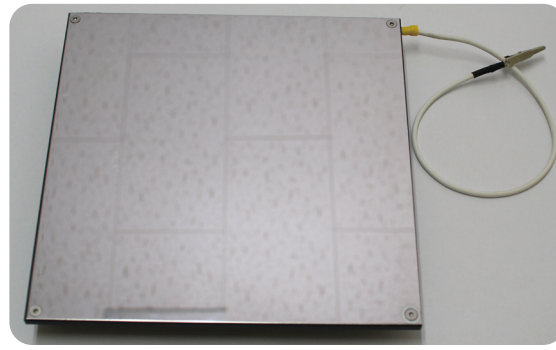


Roll-To-Roll Collector
(Model: NNC-RTR□C)

- width: 300mm
- mounting type: vertical or horizontal
- unwinder-winder
- rod diameter: ID ø10 x 8ea
- paper tube: ID 2"(ø50mm)
- speed: 0.05~3m/min
- dimension: 550(W)x150(D)x680(H)

Collectors

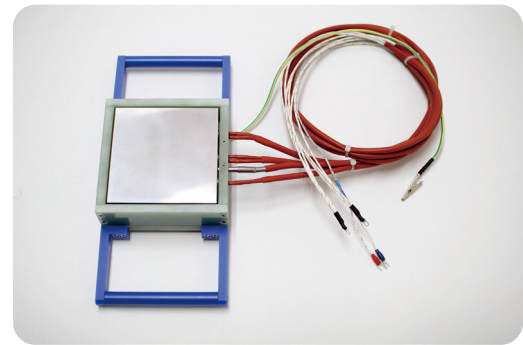
Flat Collector



NNC-FC300 / FC400

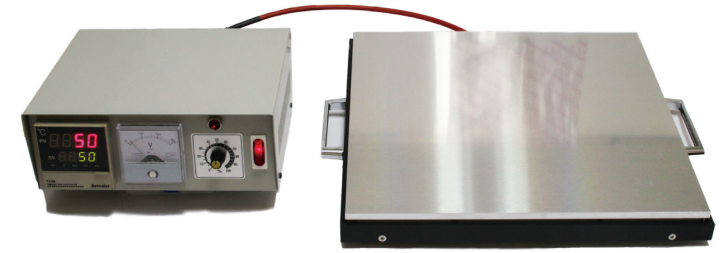
- material: SUS
- size: 300mm x 300mm / 400mm x 400mm

Heating Collector



NNC-HC100

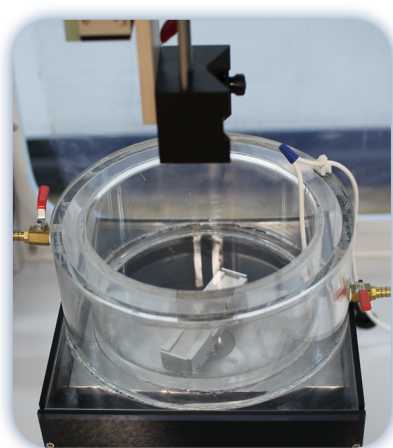
- flat collector: *100(mm)x100(mm) / 150(mm)x150(mm) (option)
- cartridge heater
- temp range: ~250°C



NNC-HC350

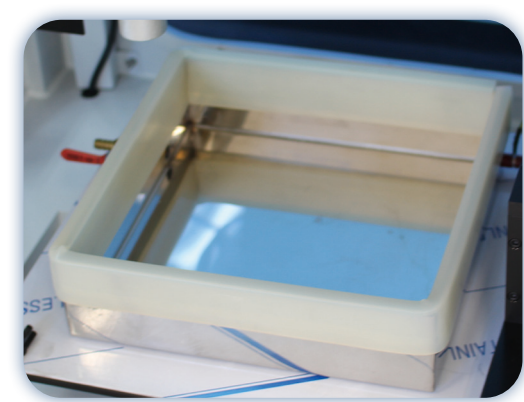
- flat collector: 350(mm)x350(mm)
- silicone heater / AL plate
- temp range: ~180°C

Bath Collector



NNC-BC200S

- ø200x100(H) mm
- stirring method : magnetic stirrer(CW/CCW)
- cooling media circulation

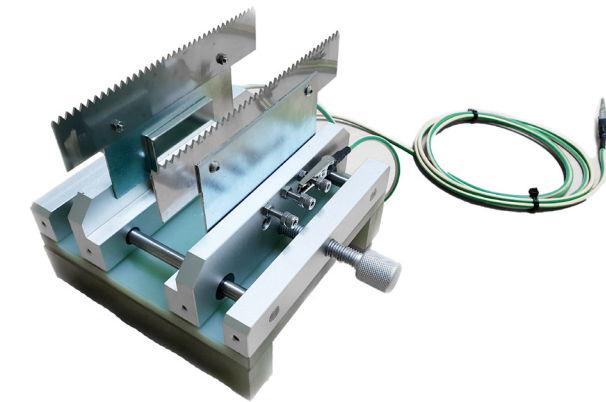


NNC-BC300R

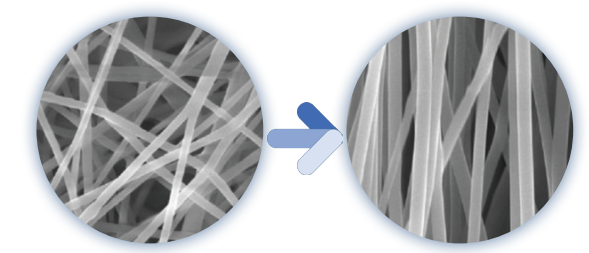
- 300(W)mm x 300(D)mm x 50(H)mm
- material: SUS

Other Components

Alignment Collector



Alignment Collector



NNC-AC150

- tooth spacing: 4mm
- length: 160mm
- distance can be changed: 12~80mm

LM Slider



NNC-LM150

- stroke: 150mm

Angle Controller



NNC-AC090

- angle: 0~90°

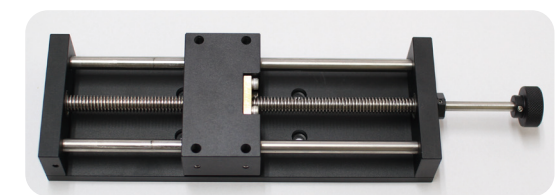
Spray Controller



NNC-SC04

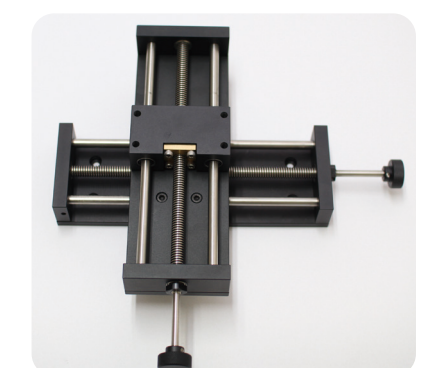
- Air flow controller
- for air-assisted electrospinning/electrospray

Linear Moving Stage



NNC-LS1S150

- 1-axis linear stage
- stroke: 100~150mm



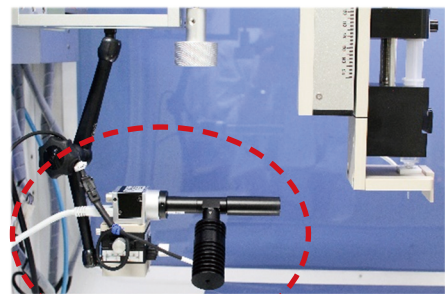
NNC-LS2S150

- 2-axis linear moving stage
- stroke: 100~200mm

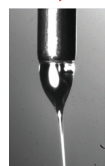
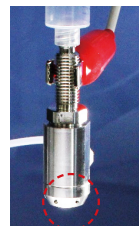
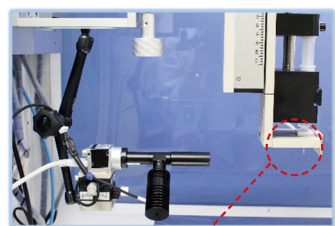
Vision System



Vision System for Electrospinning
(Model: NNC-EV200, Lens X1)



Installation in ES machine



single electrospinning



coaxial electrospinning

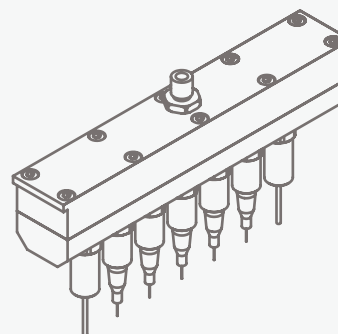
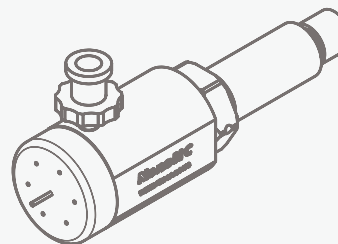
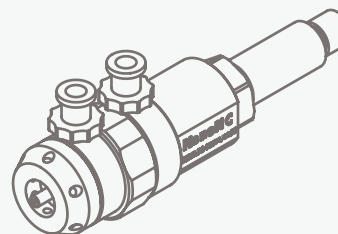
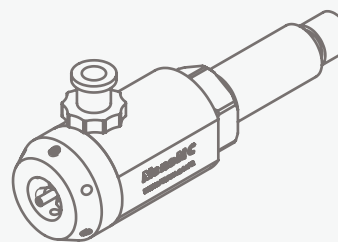
Specification		
Camera	Manufacturer	Basler
	Optical size	1/2.9"
	Resolution	1440x1080 (227fps)
	Pixel size	3.45um x 3.45um
Lens	Interface	USB 3.0
	Mag	1.0x
	FOV	6.47mm x 4.84mm
	W.D	110mm
	Field of Depth	1.6mm



Wide-angle Vision System
for Electrospinning
(Model: NNC-EV100)



Stand type Vision System

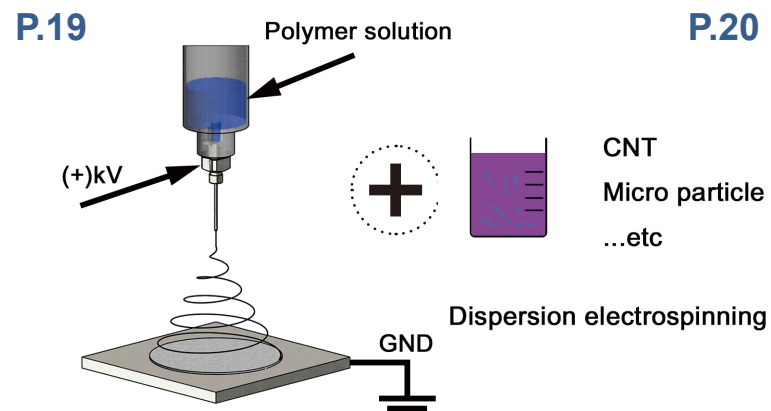


Various Nozzles for ESP

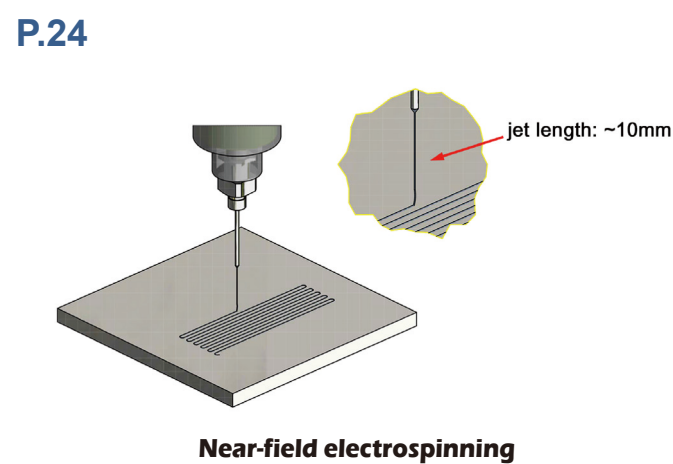
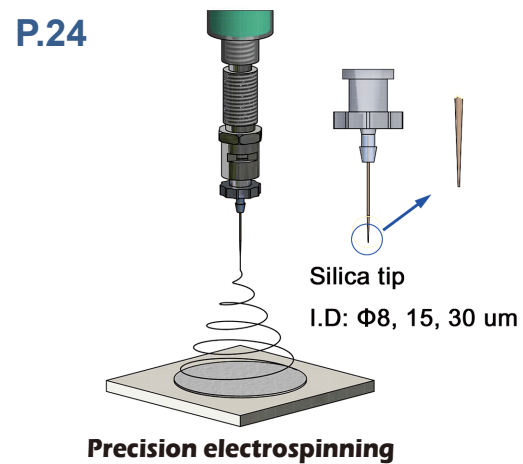
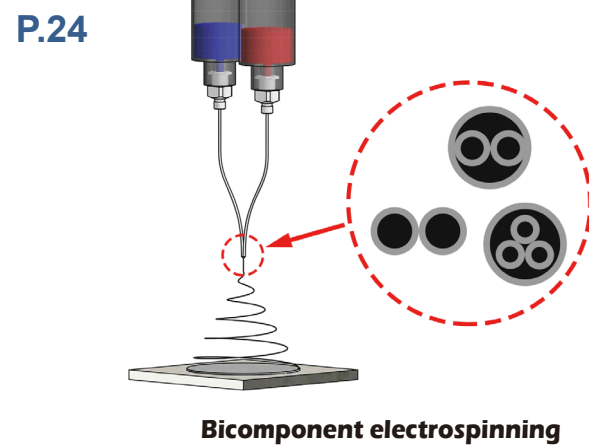
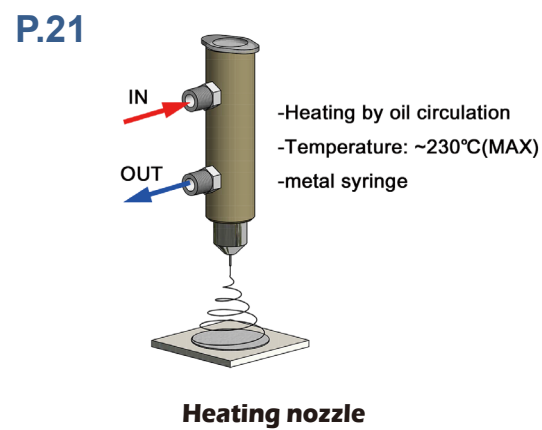
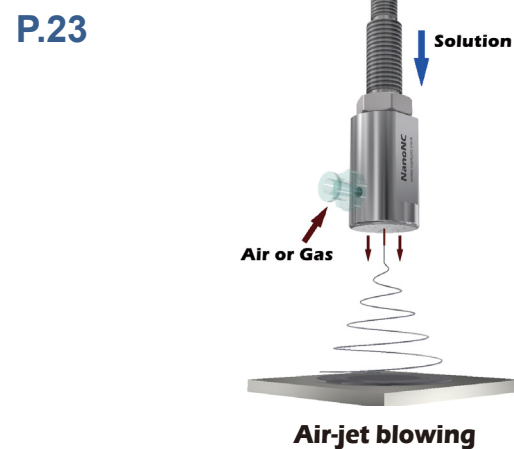
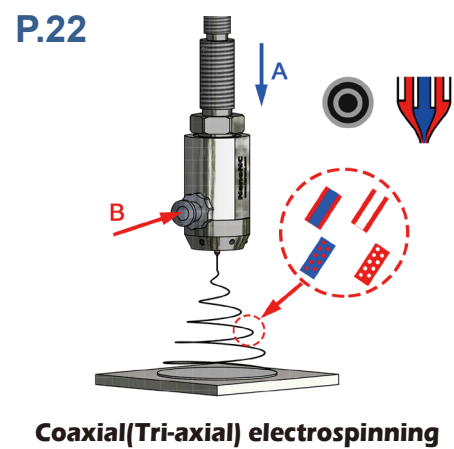
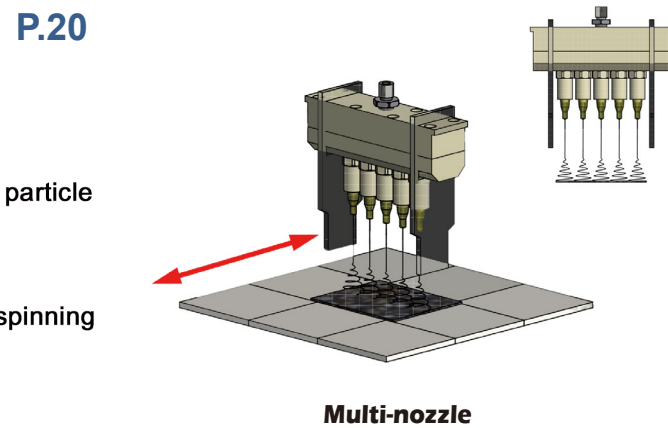
OPTIONAL ADDITIONAL COMPONENTS

- Single Nozzle
- Multi-Nozzle
- Dual Concentric Nozzle (coaxial nozzle)
- Triple Concentric Nozzle (triaxial nozzle)
- Air-Jet Blowing Nozzle
- Heating Nozzle
- Atomizing Spray Nozzle
- Other Concentric Nozzle
- Precision Micro Nozzle
- Accessories For Nozzle

Nozzles

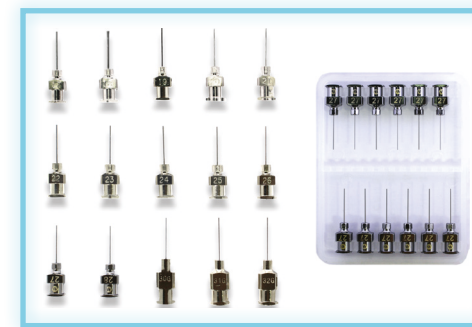


Single nozzle



Nozzles

Single Nozzle



Metal Nozzle
:10G~32G (I.D 3.5~0.10mm)



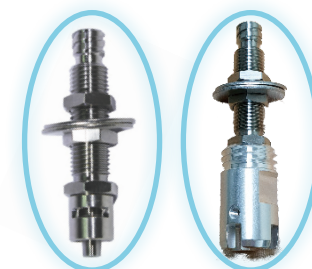
Plastic Nozzle
:15G~34G (I.D 1.9~0.08mm)

gauge	diameter		metal nozzle				gauge	plastic nozzle			C.W	
	ID size(mm)	OD size(mm)	length					color	length			
			1/4"	1/2"	1"	1.5"			1/4"	1/2"		1"
10	3.50	4.00		O			10				1.00	
11	3.00	3.50		O			11				1.00	
12	2.40(2.27)	2.90(2.77)		O			12				1.00	
13	1.90(1.94)	2.40(2.40)		O			13				1.00	
14	1.60(1.64)	2.10(2.10)		O			14				1.00	
15	1.40(1.43)	1.80(1.83)		O			15				1.00	
16	1.26(1.25)	1.66(1.65)	O	O	O		16		O	O	1.00	
17	1.07(1.11)	1.47(1.49)	O	O	O		17		O	O	1.00	
18	0.90(0.92)	1.26(1.28)	O	O	O		18		O	O	0.60	
19	0.67(0.72)	1.07(1.08)	O	O	O		19		O	O	0.60	
20	0.62(0.61)	0.90(0.91)	O	O	O		20		O	O	0.50	
21	0.51(0.52)	0.82(0.82)	O	O	O		21		O	O	0.40	
22	0.41(0.42)	0.73(0.72)		O	O	O	22		O	O	0.35	
23	0.33(0.34)	0.63(0.64)	O	O	O	O	23		O	O	0.30	
24	0.30(0.31)	0.55(0.57)		O	O		24				0.25	
25	0.25(0.26)	0.51(0.52)	O	O	O	O	25		O	O	0.20	
26	0.24(0.25)	0.45(0.46)		O	O		26				0.18	
27	0.21(0.21)	0.40(0.42)	O	O	O	O	27		O	O	0.18	
28	0.19(0.18)	0.35(0.36)		O	O		28				0.14	
30	0.16(0.14)	0.30(0.32)	O	O	O	O	30		O	O	0.12	
32	0.11(0.10)	0.23(0.23)		O			32		O	O	0.08	
34	0.06	0.22					34		O	O		

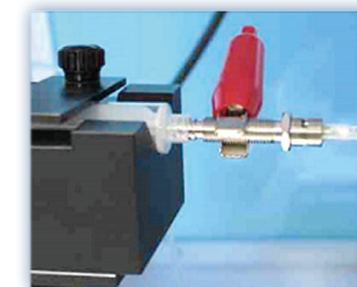
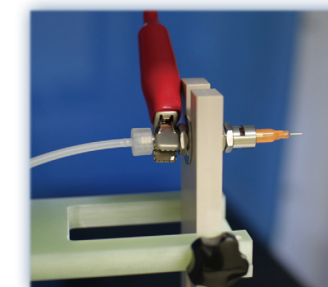
* Tolerance within ± 0.01

* O: on sale, C.W: cleaning wire

Nozzle adapter

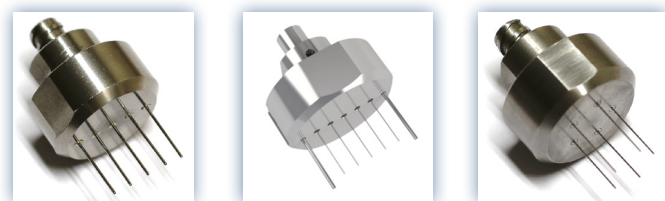


Nozzle Adapter
with positioning cap



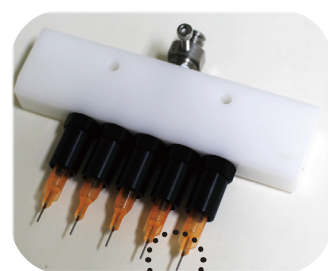
Nozzles

Multi Nozzle I



- MTN5H4F**
- fixed type
 - material: SUS
 - number of nozzles: 5~6hole
 - hole to hole distance: 4mm

Multi Nozzle II (changable type)



- MTN5H16U**
- changeable type
 - material: PEEK / acetal
 - number of nozzles: 5hole
 - hole to hole distance: 12mm ~




- MTN5H16S**
- changeable type
 - material: PEEK
 - number of nozzles: 5hole
 - hole to hole distance: 12mm ~
 - guide pin



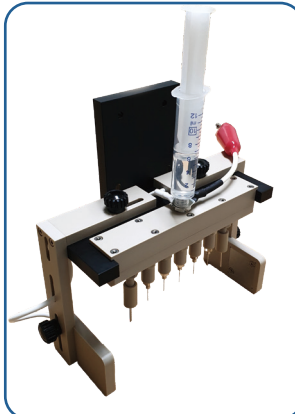
Collection guide for the alignment of taylor cone



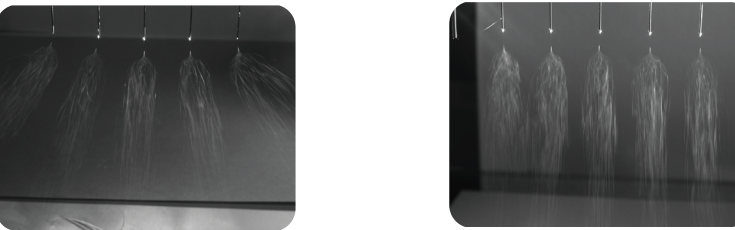
- collection guide**
- material: PEEK
 - stroke
 - * horizontal: max 35mm
 - * vertical: max 35mm



Before installing the collection guide



After installing the collection guide



installation of the collection guide

Nozzles

Multi Nozzle III (exchangeable type)



MTN10H12-1L



MTN10H12-2L

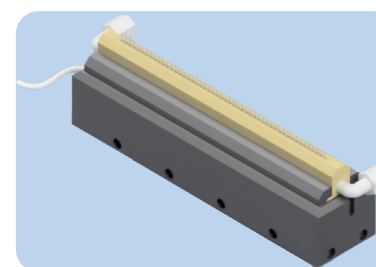


MTN4H32

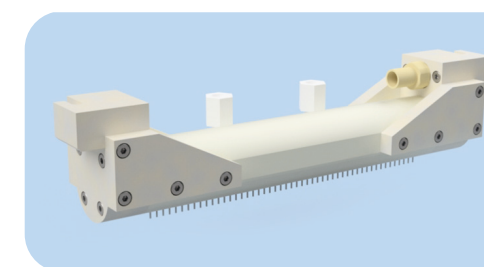
- Material : PEEK



Multi Nozzle III (fixed type)



- Anti-clogging multi-nozzle with piercing**
- needle: 16G~25G
 - needle no. : 10~50 hole
 - hole to hole distance (min.4mm)
 - material : PEEK
 - multi-nozzle pack
 - ex) 150hole= 50hole x 3pack (option)



- MTN50H40**
- fixed needle: 16G~32G (gauge)
 - material: PEEK, PTFE
 - number of nozzles: 10 ~ 50hole
 - hole to hole distance: min. 4mm~

Example

< syringe pump feature >

- volume: 10~50mℓ, 100~200mℓ
- number of channels: 1~4ch
- connection method: direct or tube connection

< High Voltage(H.V) >

- nozzle part: positive(max.30/60 kV)
- collector part: negative(max.30kV)

<LM slider & angle controller>

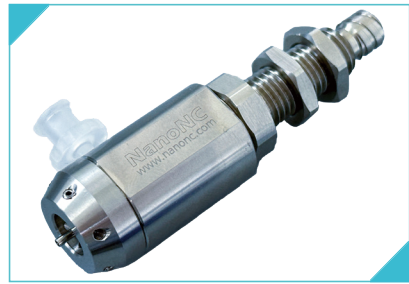
- Angle and distance adjustment between nozzle and collector

<collector type>

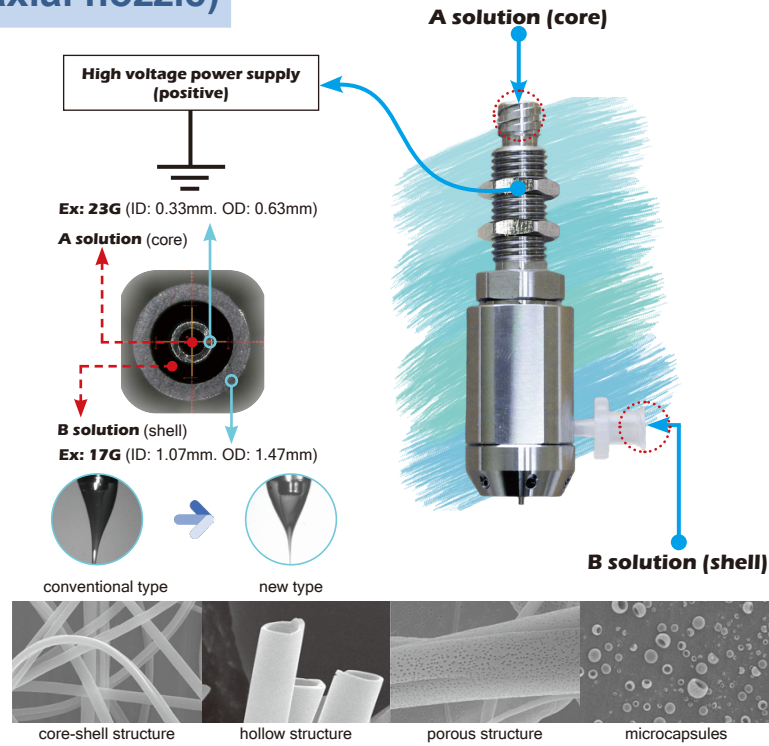
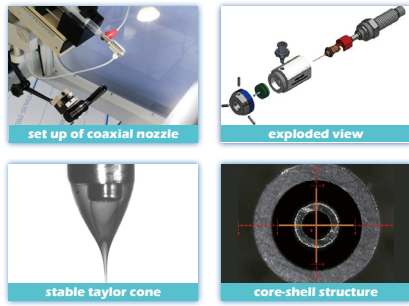
- : rod or flat plate

Nozzles

Dual Concentric Nozzle (Coaxial nozzle)

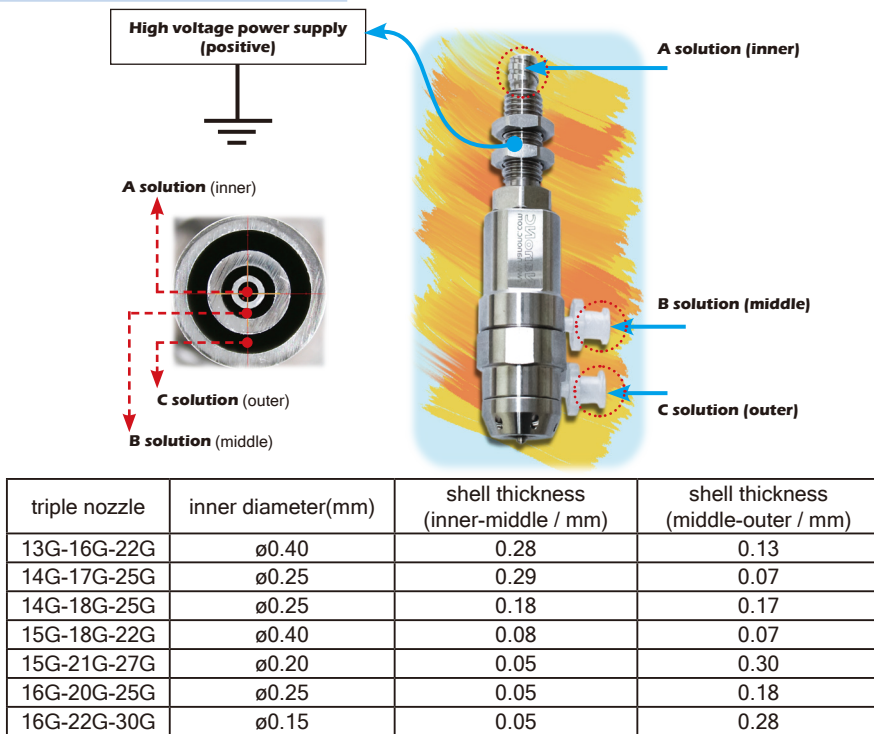
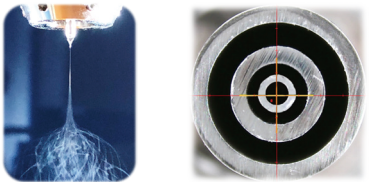


- formation of stable taylor cone on nozzle tip even in applying a higher voltage & fabrication of optimal core-shell structure
- stable electrospinning at a higher voltage
- easy control of core-shell concentricity
- a replaceable nozzle of core part



- coaxial nozzles can also be manufactured by a customized combination

Triple Concentric nozzle (Triaxial nozzle)



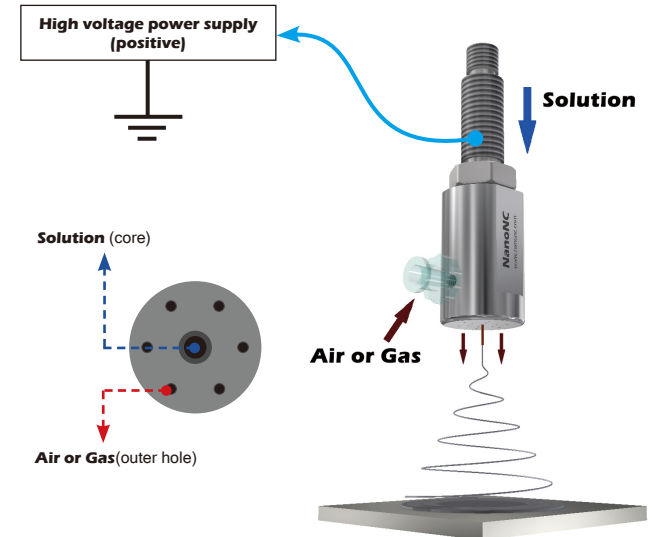
- triple nozzles can also be manufactured by a customized combination

Nozzles

Air-jet blowing nozzle

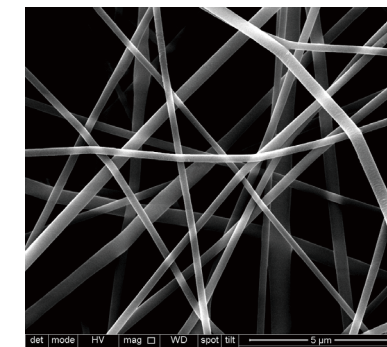


- High discharge electrospinning even at lower applied voltages than before.
- denser and more intense web production than conventional ones
- air-jet blowing is also suitable for aqueous polymers (PVA, gelatin, etc.)

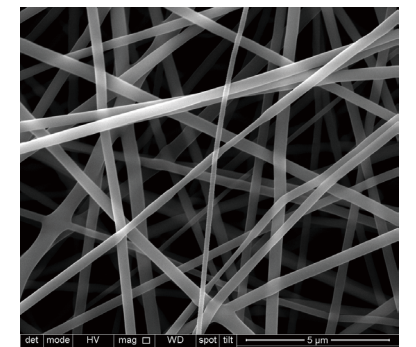


air-jet blowing

- Polymer : PVDF
- Solvent : DMAc+Acetone
- Flow rate : 100~700ul/min
- Voltage : 8~18kV
- T.C.D : 20cm~
- Air pressure : 3~5bar



Fiber diameter : M 268nm

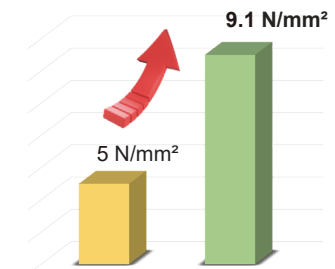


Fiber diameter : M 295nm

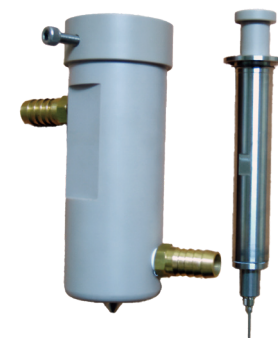
Tensile Strength

nozzle type	N/mm ²	
common needle type nozzle	S/N	5
Air-jet blowing nozzle	S/N	9.1

unit: N/mm²(=MPa), 1kgf/mm² = 9.8N/mm²



Heating Nozzle for Electrospinning



Heating Nozzle for ESP

- at elevated temp.



Oil Circulator

- ~230°C

NNC-HN200

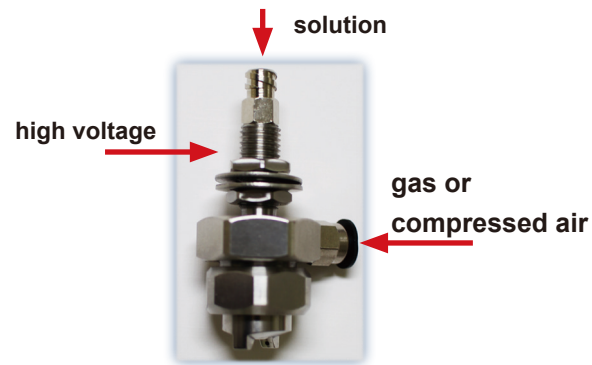
- heating nozzle
- metal syringe: 10ml, SUS
- operation temp. : ~200°C
- heating method: silicone oil circulation



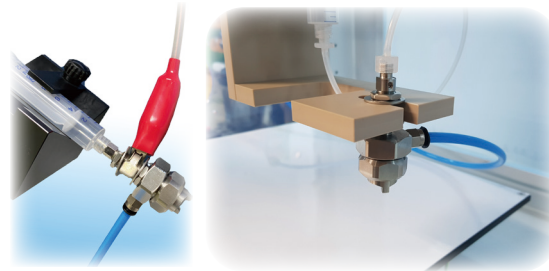
Heating Nozzle Setting

Nozzles

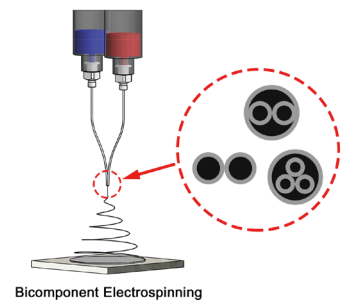
Atomizing Spray Nozzle



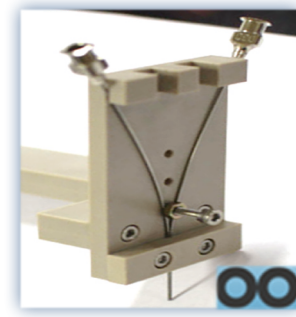
•Atomizing Spray Nozzle
- I.D 0.36mm



Other Concentric Nozzle



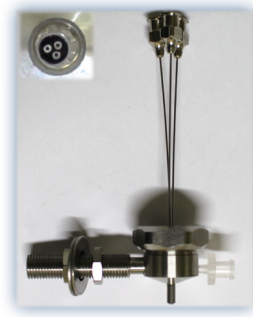
Bicomponent Electrospinning



Conjugated Nozzle

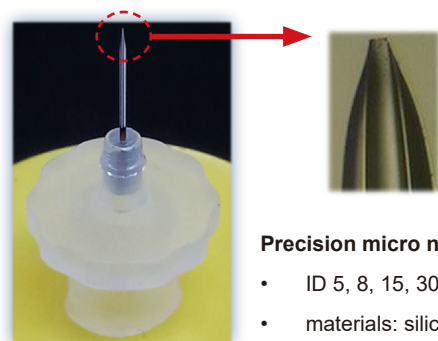


Tri-axial Nozzle



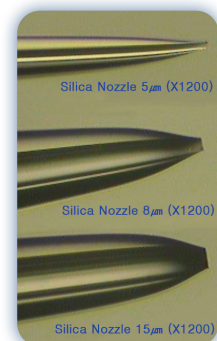
Tetra-axial Nozzle

Precision Micro Nozzle



Precision micro nozzle

- ID 5, 8, 15, 30µm
- materials: silica

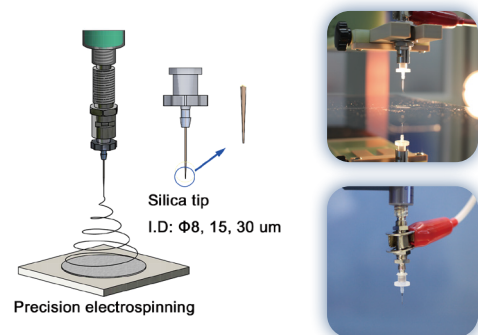


5µm 8µm 15µm 30µm



Nozzle Adapter

- near field electrospinning writing(NFEW)
- electro spray ionization(ESI)
- ultra-atomization
- ultra-small volume dispensing
- micro-dropping



Silica tip
I.D: Ø8, 15, 30 µm

Precision electrospinning

Other Accessories.

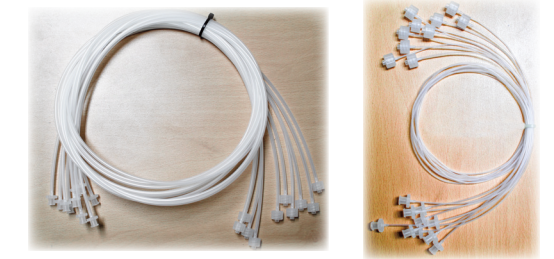
Accessories



•Plastic Syringe (PP)
(1, 2, 5, 10, 20, 50cc)



•Gastight Syringe
(30ul~100ml)



•Tubing with Female-Male fitting
-PE (ID 2.0mm)
- PTFE (ID 0.8mm)



Female Fitting : 10ea / 1pk

Fitting	Size	Package
	1/16 " hose barb	10EA / 1PK
	3/32 " hose barb (for coaxial nozzle)	
	1/8 " hose barb	

Male Fitting : 10ea / 1pk

Fitting	Size	Package
	1/16 " hose barb	10EA / 1PK
	3/32 " hose barb (for coaxial nozzle)	
	1/8 " hose barb	

Fitting (female-male) 1/16"



•Tubing, 10m
-PE (ID 2.0mm)
-PTFE (ID 0.8mm)



T Connector



Male Luer-lock Plug



Male-Female Plug



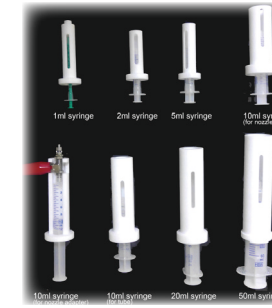
•Elbow tube fitting / Reduction fitting
-Tube ID : 1/8"(3.2mm) - 3/32"(2.4mm)
-Tube ID : 1/16"(1.6mm)-3/32"(2.4mm)



•Cleaning Wire
(17G ~ 32G)



•SUS sheet
-1m(L)X0.3m(W)X80um(T)
(on collector)

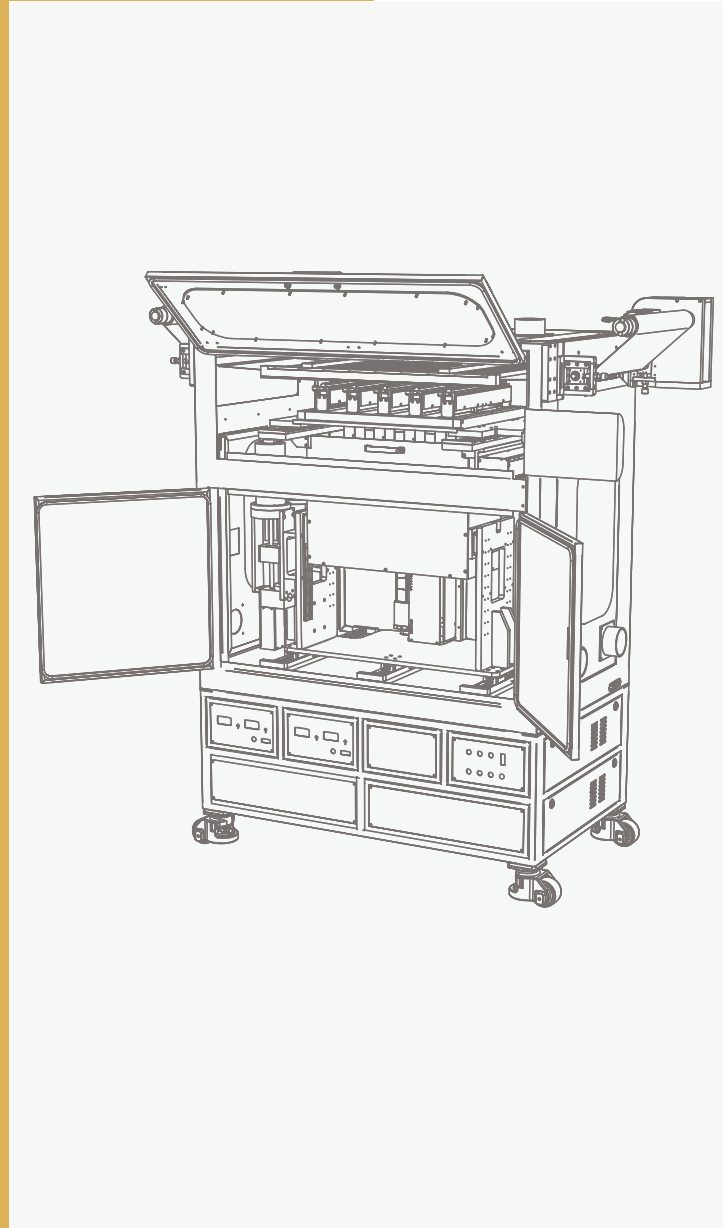
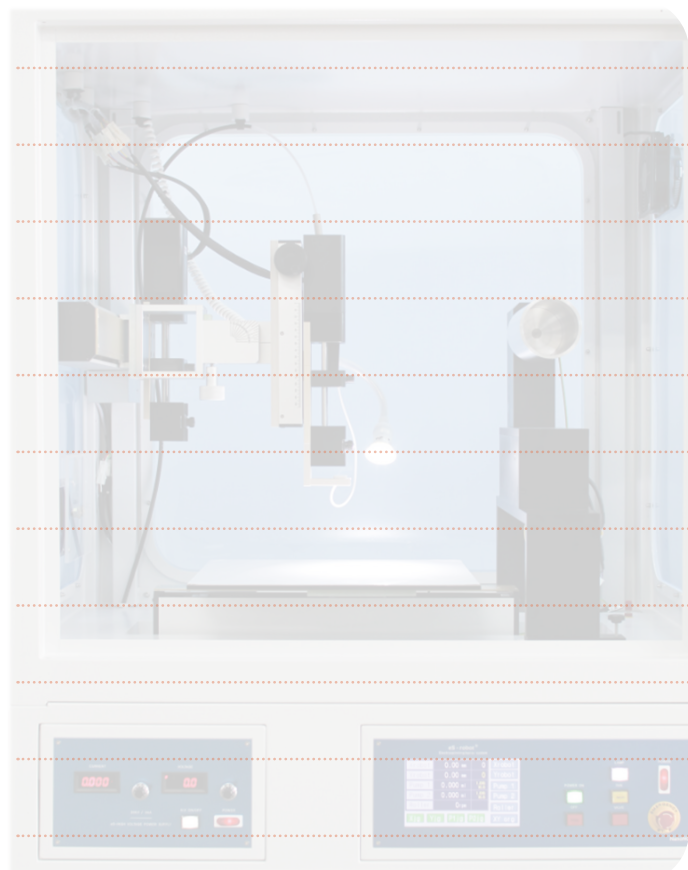


•Syringe Cover
for HV Protection
(1, 2, 5, 10, 20, 50cc)



•Female Luer Plug

Memo



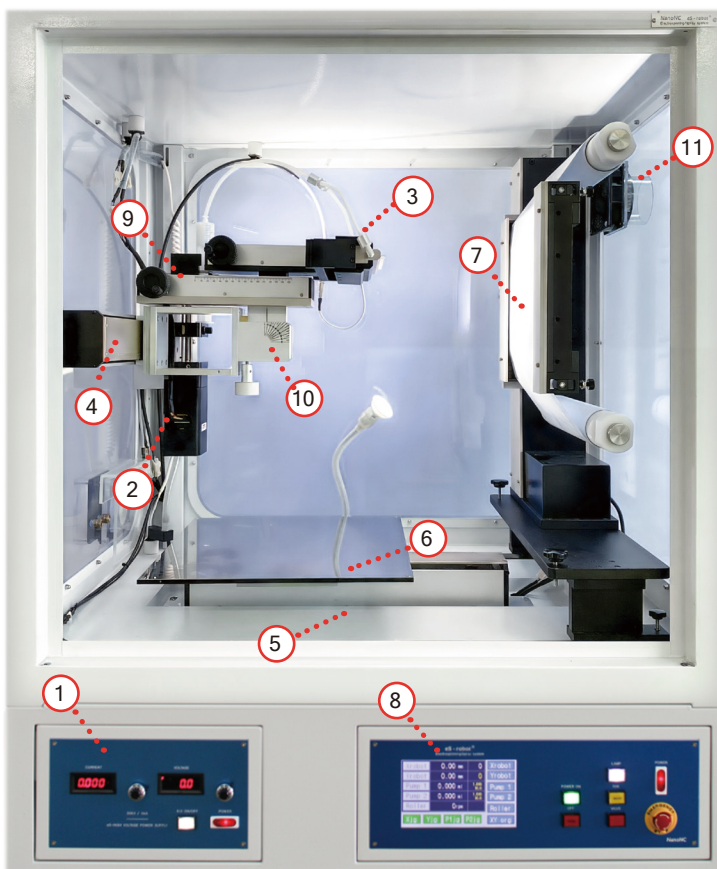
Roll-to-roll Systems for ESP

CONTINUOUS & LARGE-SCALE MANUFACTURING

- RTR Machine I
- RTR Machine II
- RTR Machine III

Roll-to-roll Systems

RTR machine Series



Components

1. HV power supply(30kV or 60kV)
2. syringe pump I/II
3. multi-nozzle
4. X-robot
5. Y-robot
6. flat plate collector
7. roll-to-roll(RTR) collector
:length 1m~20m x W100~300mm
8. touch screen
9. LM slider
10. angle controller
11. ventilation fan

Common specification

Component	Specification
HV power supply	30kV or 60kV
Syringe pump	min. 0.01ul/min (10ul syringe), syringe 1ml~200ml
2-axis robot	X-robot(1-axis) or X&Y-robot(2-axis) stroke: 300 or 400mm max speed: 150mm/s
Flat plate collector	300mmx300mm or 400mmx400mm
RTR collector	100~300mm(W) x length 1m~20m, paper tube: 2"(ø50mm), speed: 0,05~3m/min
Case(+table)	950~1,200(W) x 650~800(D) x 1,900(H) [1,150(H)+table:750(H)]
Nozzle	single metal nozzle(21G, 23G, 25G, 27G)x1pk multi-nozzle (5hole ~ 50hole) x1set
Syringe	10ml x 100ea, 20ml x100ea, (or 50ml x20ea)
*Option	coaxial nozzle(17G-23G or 18G-25G)x1ea, vision camera, (-) HV power supply(-30kV)

Roll-to-roll Systems

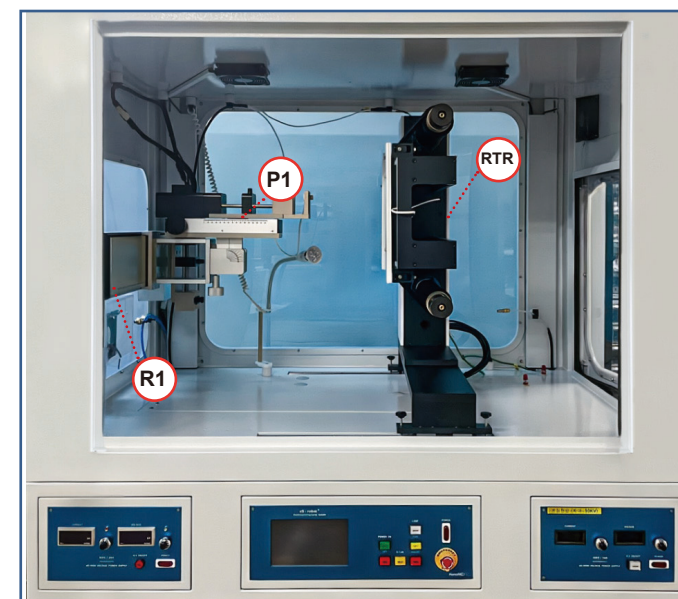
Model notation

ESR 200 RTR300 (MN) □ *

name	series number	roll-to-roll	nozzle
ESR (with case)	200 • integrated control • painted metal case	Substrate width • 300 = 200~300mm	•MN = needle type multi-nozzle •AMN = Anti-clogging multi-nozzle •SAJN = Air-jet blowing nozzle
	1000 • roll-to-roll	• 500 = ~500mm • 1000 = 1m	

* HV power supply & syringe pump 1ea: No notation as basic components.

Example



ESR200RTR300

Component	Qty	Notation
syringe pump	1	-
roll to roll system (width 300mm)	1	RTR300
multi-nozzle (5 hole / exchangeable)	1	-
HV power supply: positive(+) & negative(-)	-	No notation

Roll-to-roll Systems

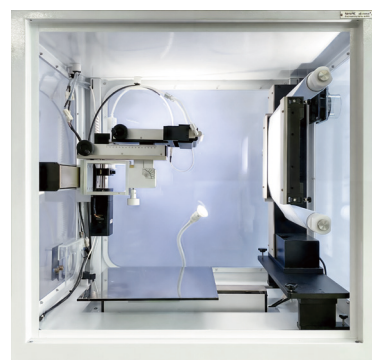
Roll-to-roll Electrospinning System I (~ W 300mm). RTR machine 1



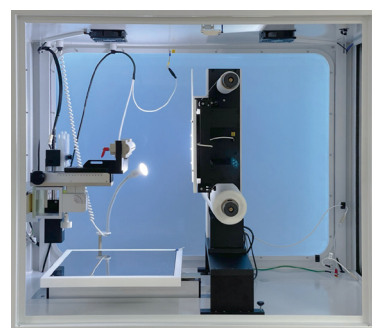
Model: ESR200RTR300

- HV generator: 30kV/60kV/(-)30kV (option)
- 1-axis robot
: ball screw, servo motor, 150mm/s
- syringe pump: min 0.01 μ l/min, 1~4channel(CH)
- (option) injection pump with solution tank above 1L

- roll-to-roll collector
 - web width: 200~500mm
 - length: 1~20m
 - speed: 0.05~3m/min
 - multi-nozzle: 5~10 hole
 - exchangeable type
 - anti-clogging type
- *air regulator for air-assisted type multi-nozzle (option)



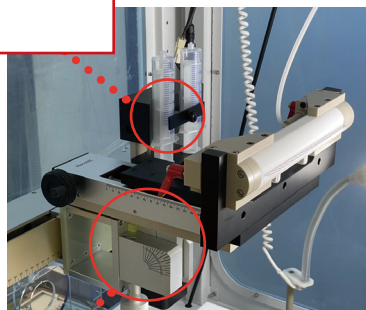
anti-clogging multi-nozzle



fixed type multi-nozzle

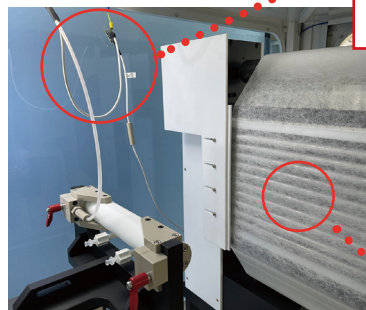
< syringe pump feature >

- volume: 10~50ml, 100~200ml
- number of channels: 1~4ch
- connection method: direct or tube connection



< High Voltage(H.V) >

- nozzle part: positive(max.30/60 kV)
- collector part: negative(max.30kV)



<LM slider & angle controller>

- Angle and distance adjustment between nozzle and collector



<collector type>

- : rod or flat plate

Roll-to-roll Systems

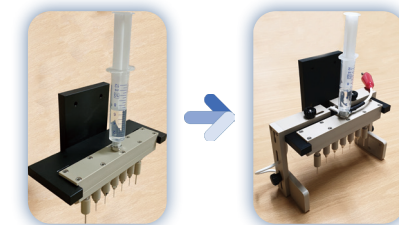
Components of RTR_m1

① Multi-nozzle

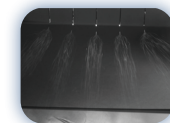


MTN5H16S

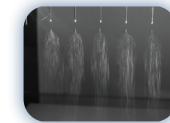
- exchangeable type
- material: PEEK
- number of nozzles: 5hole
- hole to hole distance: 12mm ~
- guide pin



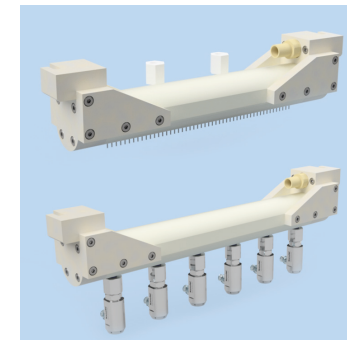
installation of the collection guide



before installing the collection guide



after installing the collection guide

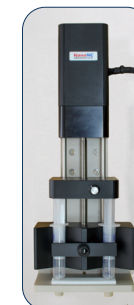


- fixed type, 10~50 hole
- material : PEEK, PTFE, etc
- hole to hole distance : min.4mm
- air-assisted type multi-nozzle: 5~10 hole

② Syringe pump or Injection pump

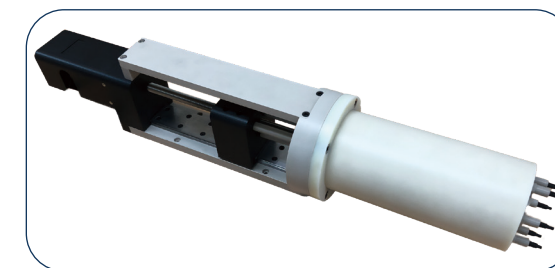


EP100(1ch)
(10~50ml)



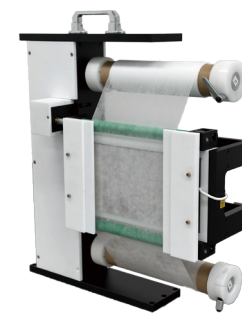
EP120(2ch)
(20~100ml)

Syringe pump: 1ch~4ch(option)

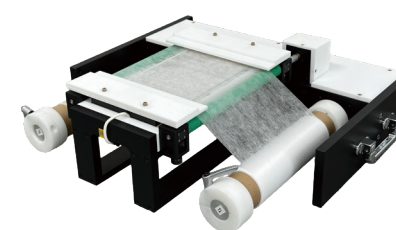


injection (infusion) pump
with solution tank above 1L
(model: NNC-EP100)

③ Roll-to-roll(RTR) Collector



Vertical direction



Horizontal direction

Roll-To-roll Collector
(Model: NNC-RTR□C)

- width: 100mm ~ 300mm
- mounting type: vertical or horizontal
- unwinder-winder
- rod diameter: ID ϕ 10 x 8ea
- paper tube: ID 2"(ϕ 50mm)
- speed: 0.05~3m/min
- dimension: 550(W)x150(D)x680(H)

④ HV power supply

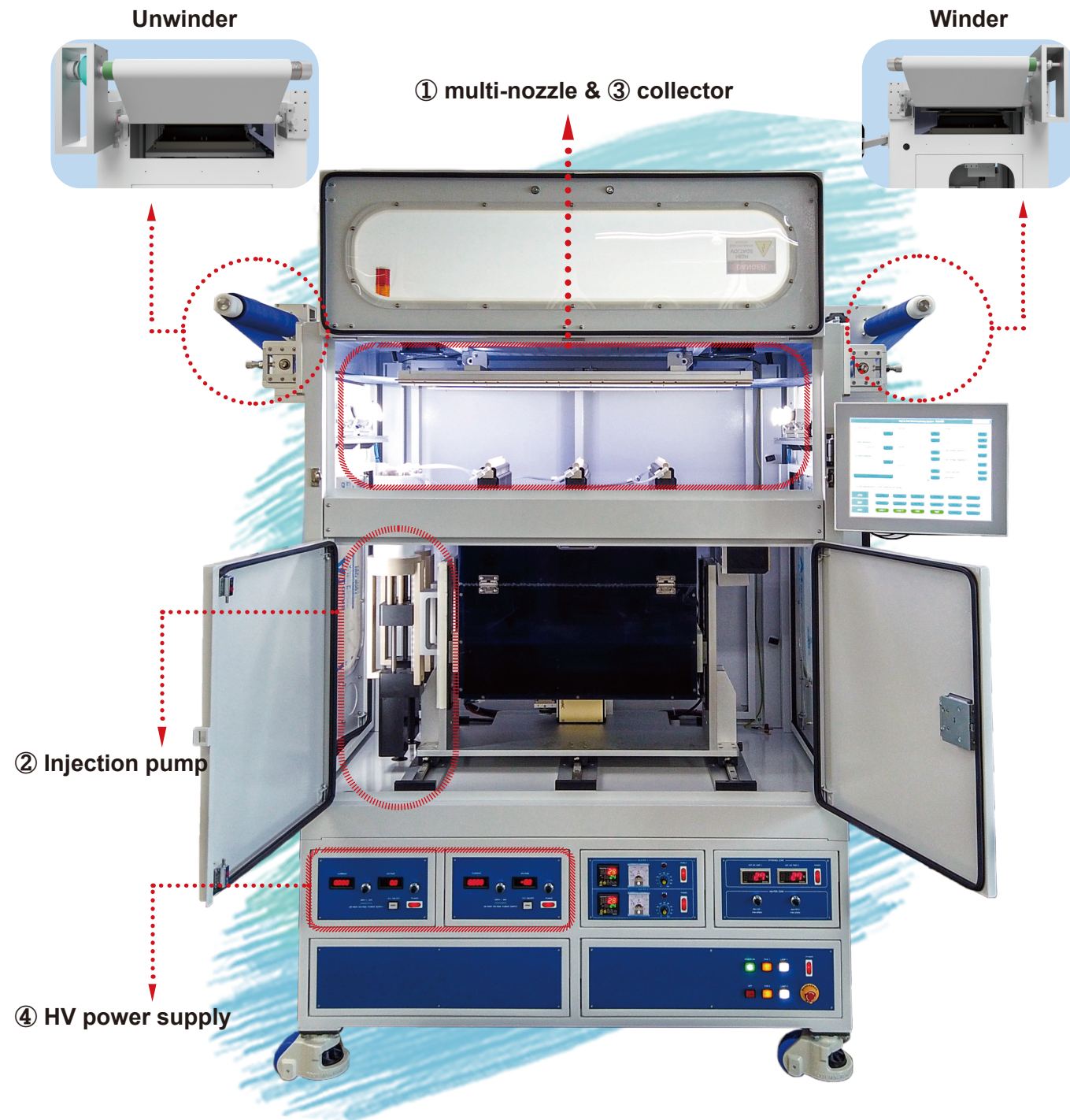


30kV / 60kV: (+) / (-) (option)

HV generator for electrospinning/electrospray
(Model: NNC-HV30 / HV60)

- input voltage : 110 ~ 240VAC, 50/60Hz , single phase
- output voltage : 1kV ~ 30kV / ~60kV
- output current : 0 ~ 1mA / 0~2mA

Roll-to-roll Electrospinning System II (~ W 500mm). RTR machine 2



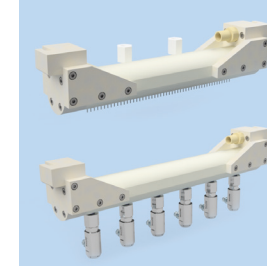
Model : ESR1000RTR500H

- roll-to-roll system : fabrication of a long-length nanofiber web
- 2 - axis robotic system
 - *TCD(tip-to-collector distance) control
 - *Nozzle traverse for the uniformity of web
- injection (infusion) pump with solution tank above 1L
- single nozzle and multi-nozzle (10~100 hole) / pack
- multi-pack: 100~500hole
- HV generator (+/-): 30kV / 60kV (option)
- web width: ~300mm / ~500mm (option)

Components of RTR_m2

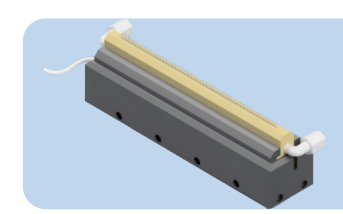
① Multi-nozzle

I. fixed & one-body type



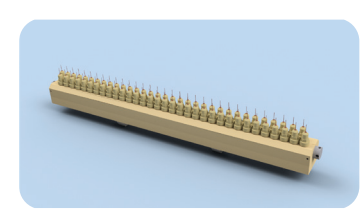
- fixed needle : 16G~32G(gauge)
- needle no. : 10~50 hole
- hole to hole distance : min.4mm
- material : PEEK, PTFE, etc
- ▶ air-assisted type multi-nozzle: 5~10 hole

II. fixed & anti-clogging type



- anti-clogging multi-nozzle with piercing needle: 16G~25G
- needle no. : 10~50 hole
- hole to hole distance (min.4mm)
- material : PEEK
- multi-nozzle pack
ex) 150hole= 50hole x 3pack (option)

III. exchangeable type

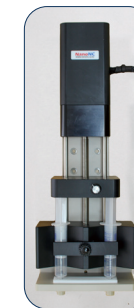


- exchangeable nozzle: 16G~32G
- needle no. : 20~50 hole
- hole to hole distance (min.16mm)
- material : PEEK
- multi-nozzle pack
ex) 60hole = 20hole x 3pack (option)

② Injection pump: 2 types

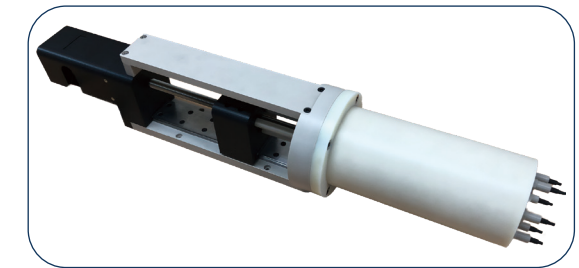


EP100(1ch)
(10~50ml)



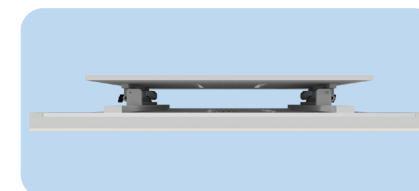
EP120(2ch)
(20~100ml)

Syringe pump: 1ch~4ch(option)

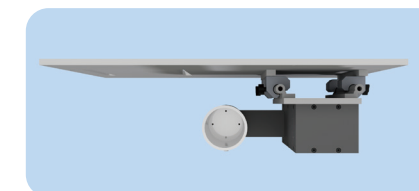


injection (infusion) pump
with solution tank above 1L
(model: NNC-EP1000)

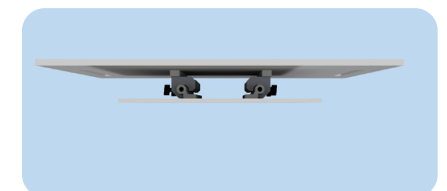
③ Collector: 3 types



1. multi-rod type (or roll type)



2. drum type (ø90 / ø120)



3. flat plate type

④ HV power supply



30kV / 60kV: (+) / (-) (option)

HV generator for electrospinning/electrospray (Model: NNC-HV30 / HV60)

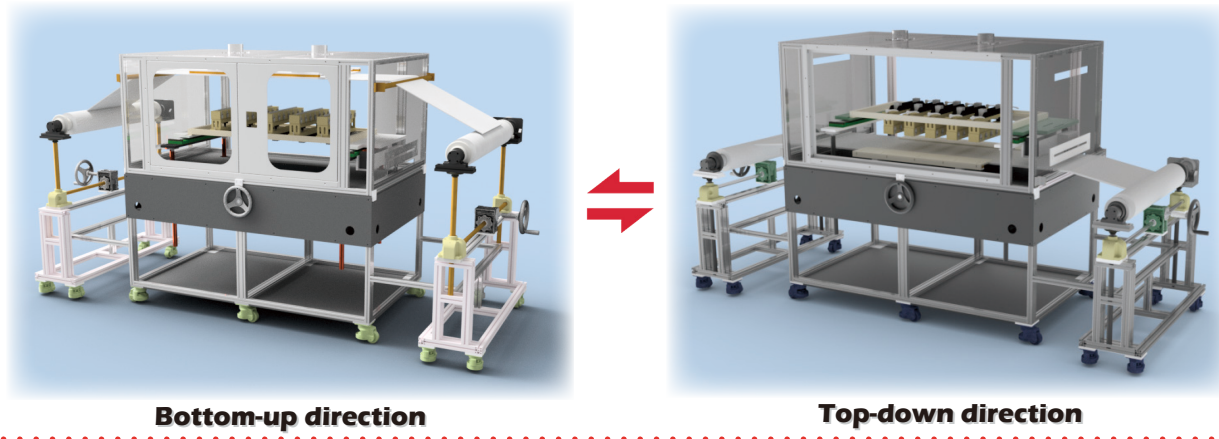
- input voltage : 110 ~ 240VAC, 50/60Hz , single phase
- output voltage : 1kV ~ 30kV / ~60kV
- output current : 0 ~ 1mA / 2mA

Roll-to-roll Systems

Roll-to-roll Electrospinning System III (~ W 500mm). RTR machine 3



Spinning direction



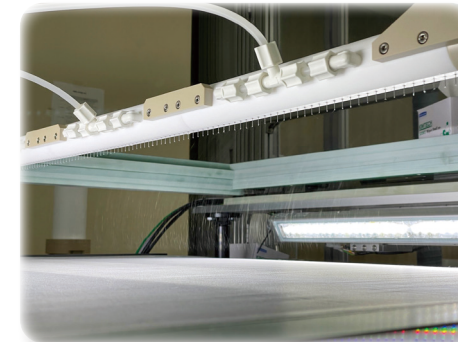
Model : ESR1000RTR500L

- roll-to-roll system : fabrication of a long - length web
- 1 - axis robotic system
 - * Nozzle traverse for the uniformity of web
 - * TCD(tip-to-collector distance) control (option: automatic or manual)
- injection (infusion) pump with solution tank above 1L
- single nozzle and multi-nozzle
 - * multi-nozzle spinneret: (50~100 hole) / pack
- multi-pack: 3 pack
- HV generator: (+) 60kV / (-) 30kV (option)
- web width: ~300mm / ~500mm (option)

Roll-to-roll Systems

Components for RTR_ m3

① Multi-nozzle



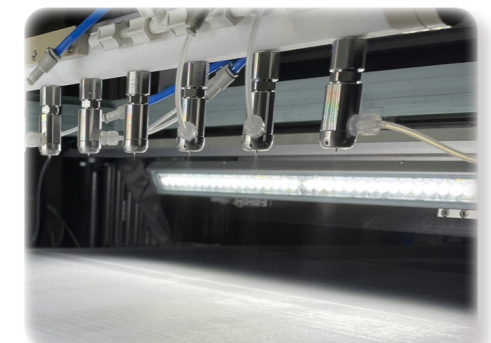
1. needle type multi-nozzle (without anti-clogging needle)



2. anti-clogging multi-nozzle

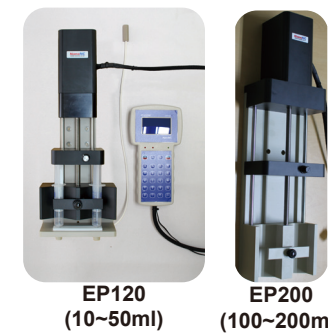


3. air-jet blowing multi-nozzle (electrospinning)

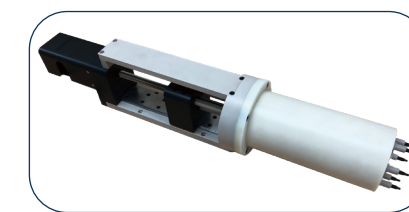


4. air-assisted type multi-coaxial nozzle (electrospray)

② Injection pump: 2 types



Syringe pump (model: EP100)



Injection (Infusion) Pump with solution tank above 1L (model: NNC-EP1000)



③ HV power supply

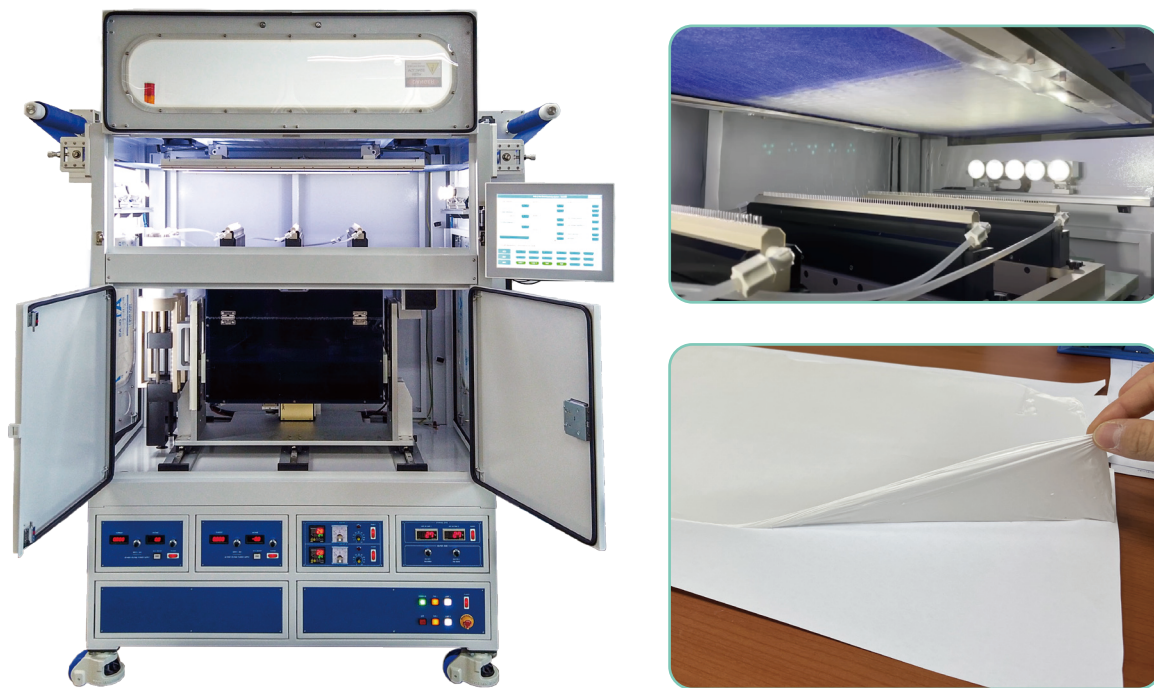


+30kV / +60kV / -30kV (option)

HV generator for electrospinning/electrospray (Model: NNC-HV30 / HV60 / HV100)

- output voltage : 1kV ~ 30kV / ~60kV / ~100kV
- output current : 0 ~ 1mA / 2mA / 5mA

Roll-to-roll Systems



Roll-to-roll system is a laboratory RTR electrospinning/electrospray equipment that can produce a long-length nanofiber-composed membrane. Also, the machine can be utilized to obtain thin layer coating with nanofiber or to coating fine particles on substrate such as nonwoven fabric, woven fabric, film, and paper.

The required items to be entered to receive a quotation

No.	items	example	etc
1	What is the component of solution?	PVDF/DMAc/acetone	
2	The degree of volatility of solvent (strong/medium/weak)	medium	
3	The degree of viscosity of solution (high/medium/low)	Medium(1,000~3,000cp)	honey
4	the purpose of the utility of machine (fabrication of nanofiber-composed membrane/spray coating on substrate/ /particle fabrication)	Nanofiber coating on filter media	nanofiber/electrospray
5	coating thickness (or, membrane thickness)	3~5um	
6	spinning direction (upward/downward)	upward	upward/downward/ horizontal direction
7	substrate materials	paper or nonwoven or PET film	(PP/PE)/PET/ paper/nonwoven
8	substrate width	40cm	
9	effective width of web	30cm	
10	effective length of web	10m	
11	range of winding speed	0.05~1m/min	
12	nozzle gauge	23Gauge	
13	flow rate/hole	30ul/min/hole 90g/hour/50hole	
14	hole no./pack & pack no.	50hole/1pack & 1pack	
15	total flow rate	90g/hour/50hole	
16	total solution volume	1L	
17	syringe(tank) pump no./1L	3ea/3L	
18	diameter of paper tube(tubing outer diameter/inner diameter)	ID 50mm	
19	daily production(8hour/1day)	240m/day	
20	high voltage power supply	30kV	
21	solution no.(A/B solution)	1 solution	
22	collector type	roll type	
23	whether to install a heater in collector	not	
24	size of machine	1,300(W)X850(D)X2,000(H) (mm)	
25	dehumidifier system	17L/day, LG Co.	

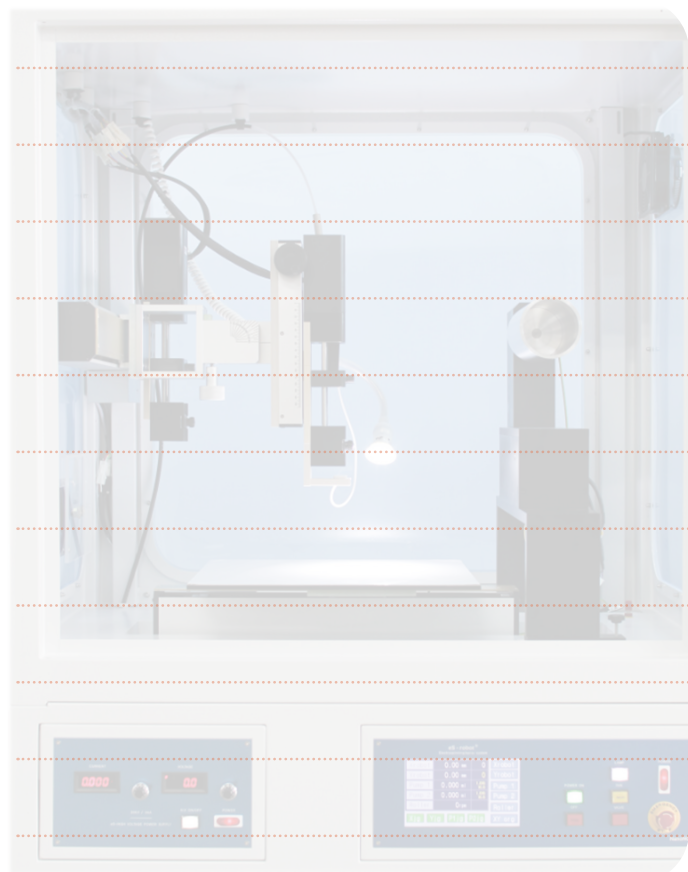
Please download the detailed document at NanoNC website to check the items to be entered.
website: www.nanonc.com

Roll-to-roll Systems

* Specification

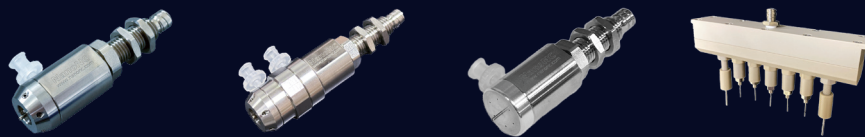
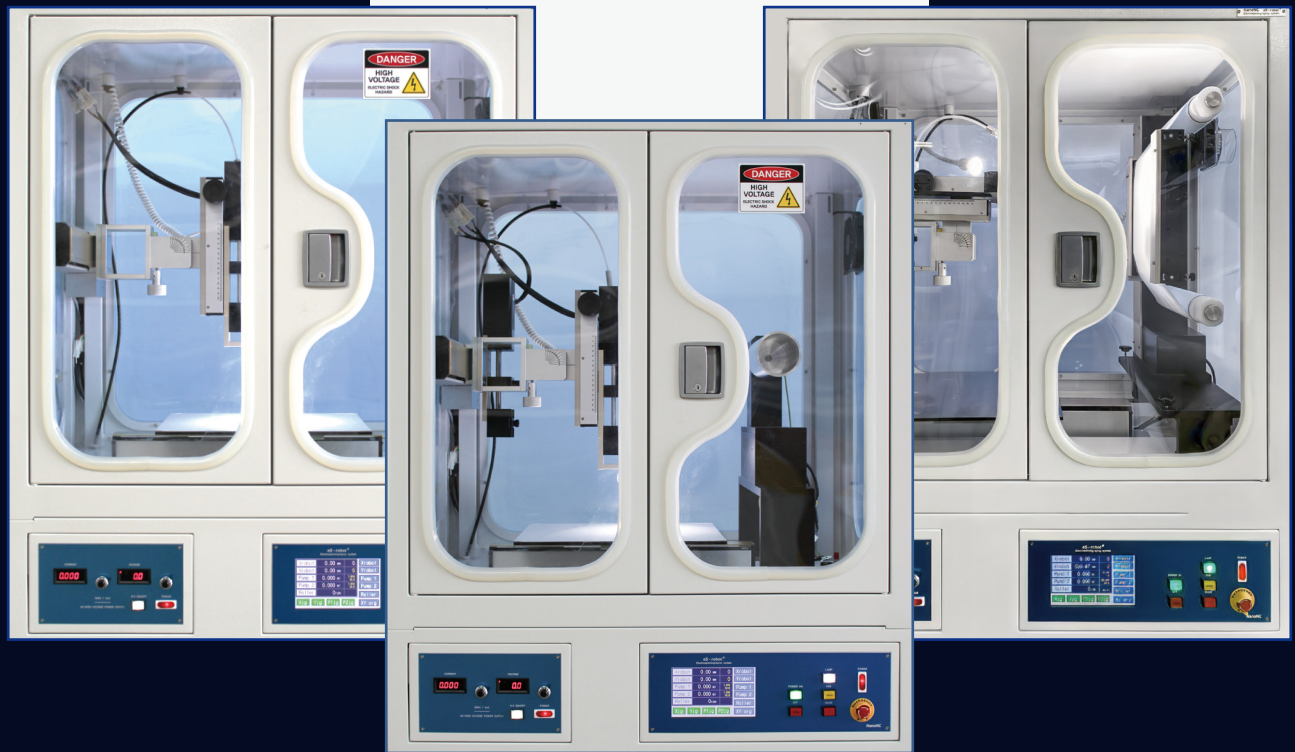
Components	Details
power	<ul style="list-style-type: none"> input power: 220VAC, 50~60Hz, single phase power consumption: ~3kW & heater 3kW
High-voltage power supply	<ul style="list-style-type: none"> voltage, current: ~30kV, ~1mA / ~60kV, ~2mA
Injection pump (or syringe pump)	<ol style="list-style-type: none"> solution tank(1L) type <ul style="list-style-type: none"> syringe type tank size: 1L flow rate: (10ul/min~200ml/min) /hole port: 6ea syringe pump type <ul style="list-style-type: none"> syringe size: 5, 10, 20, 50, 100, 200mL flow rate: min 0.01ul/min ~ 100ml/min syringe no. : 1~4ea
2-axis robot system (X-axis & Z-axis)	<ol style="list-style-type: none"> X-axis: repetition movement of nozzle pack for uniformity of web thickness <ul style="list-style-type: none"> stroke of X-axis: 0~200mm Z-axis: TCD(nozzle tip-to-collector distance) control <ul style="list-style-type: none"> stroke of Z-axis: 0~300mm(reduction ratio 10:1)
collector (interchangeable)	<ol style="list-style-type: none"> flat collector <ul style="list-style-type: none"> 300mm x 300mm ~ 400mm x 400mm drum collector <ul style="list-style-type: none"> rpm: min. 10 ~ max. 2,700 rpm drum(roll) size: ø90~ø120 xW200mm rod collector
unwinder-winder	<ul style="list-style-type: none"> cylinder diameter: ø50mm speed: 0.05~3m/min manual installation of paper tube - (ID: 2"(ø50mm), OD: ø56mm) web width: 500mm
nozzle	<ol style="list-style-type: none"> single nozzle system multi-nozzle, 100hole x max 3 pack <ul style="list-style-type: none"> fixed needle type anti-clogging type (option) hole-to-hole distance: min 4mm ~ materials: PEEK, PTFE
dimension	<ul style="list-style-type: none"> 950~1,300mm(W) x 750~1,000mm(D) x 1,950mm(H)
control of temperature & humidity	<ol style="list-style-type: none"> temperature controller <ul style="list-style-type: none"> PTC heater: ~2ea / 3kW / ~80℃ dehumidifier system <ul style="list-style-type: none"> LG dehumidifier x1~2ea / 17L/day / ~RH40%
operation, etc.	<ul style="list-style-type: none"> touch screen operation accessories: PE tubing(1/4"x10m) / fitting L-type 10ea / lamp / tools

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