Electrospinning/ Electrospray System

Operating Manual

(ESR200R2D, eS-robot®)

## NanoNC

www.nanonc.co.kr

Operating System

This system (ESR200R2D, eS-robot®) has the following specification:

-.Input Power : 110VAC, Single-Phase
   : transformer : 110VAC ->220VAC±10%, 60Hz, Single-Phase

-.Power Consumption(W) : ~2kW

-.Size(WxDxH):950(W)x650(D)x1,650(H)(unit: mm)

-.Weight(kg):300kg

The equipment consists of;

① high voltage generator:~(+)30kV
①-1 high voltage generator:~(-)30kV
② precision fluid metering pump I : CH1, 0.01$\mu\ell$/min,10ml installation
②-1 precision fluid metering pump II :CH2, 0.01$\mu\ell$/min,10ml installation
③ X-axis moving robot : ball screw, stroke 400mm, servo motor 100W
④ Y-axis moving robot : ball screw, stroke 400mm, servo motor 100W
④-1 flat collector 400mmx400mm installation
⑤ LM slider: stroke 150mm
⑥ angle contoller :0~90°
⑦ drum collector : roll size:Φ90xW200, min 10 ~max 2,700rpm, servo motor 400W
⑧/⑧-1   heating collector : cartridge heater, 250Wx3EA /controller
⑨/⑨-1 heating roll : 1.2Kw /controller
⑩/⑩-1 electrospin vision system : EV200L / controller

 (The equipment may be changed depending on an equipment specification.)
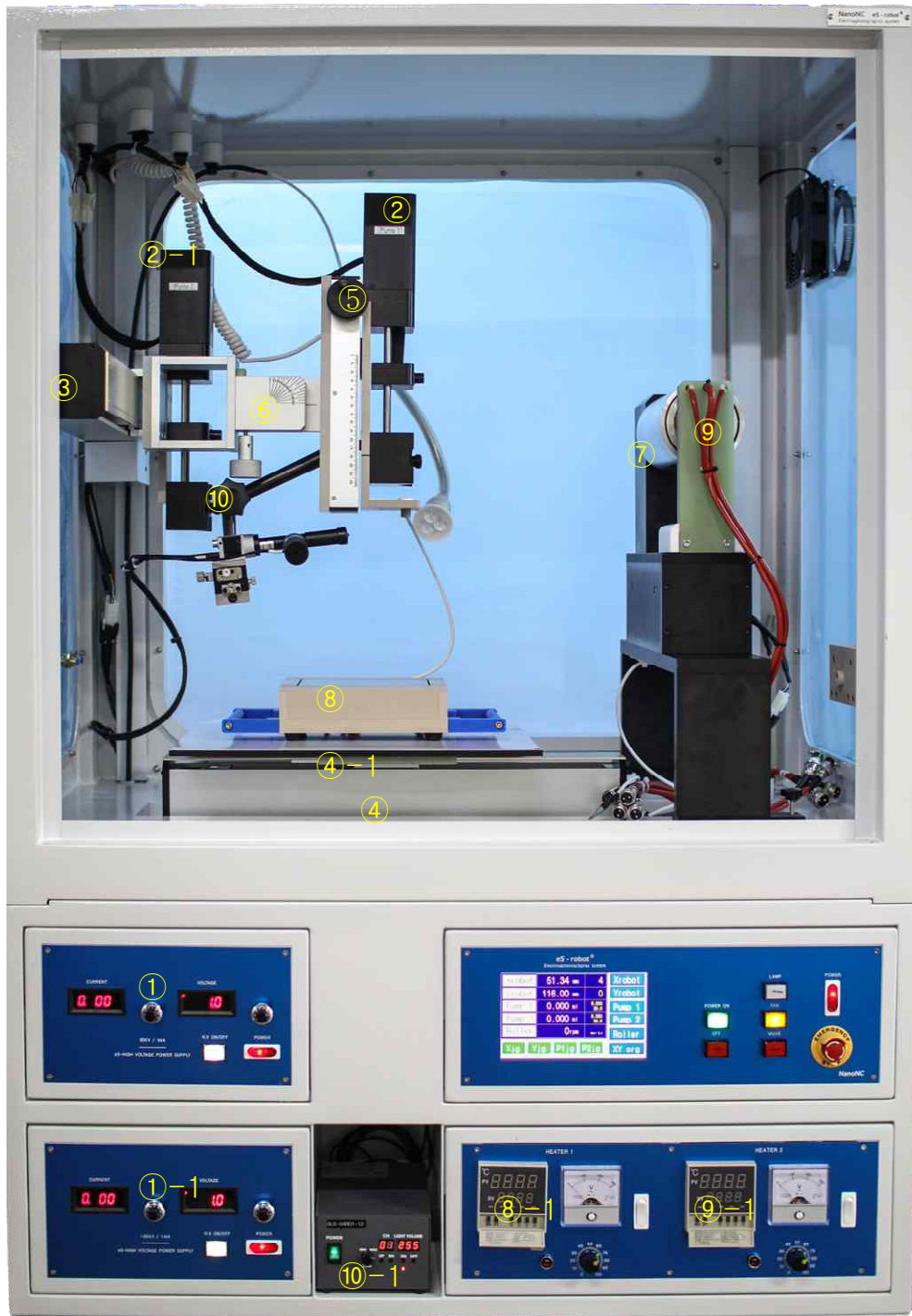
①(+)High voltage generator device, ①-1 (-)High voltage generator device ②pump 1(left side), ②-1 pump 2(right side), ③X-axis robot(left side), ④Y-axis robot(right side) ⑤LM slider ⑥angle controller ⑦ drum collector, ⑧ flat heating collector ⑨heating roll, and ⑩electro vision system

 (The above image may be changed depending on an equipment specification.)

2. The system is operated in the following order.
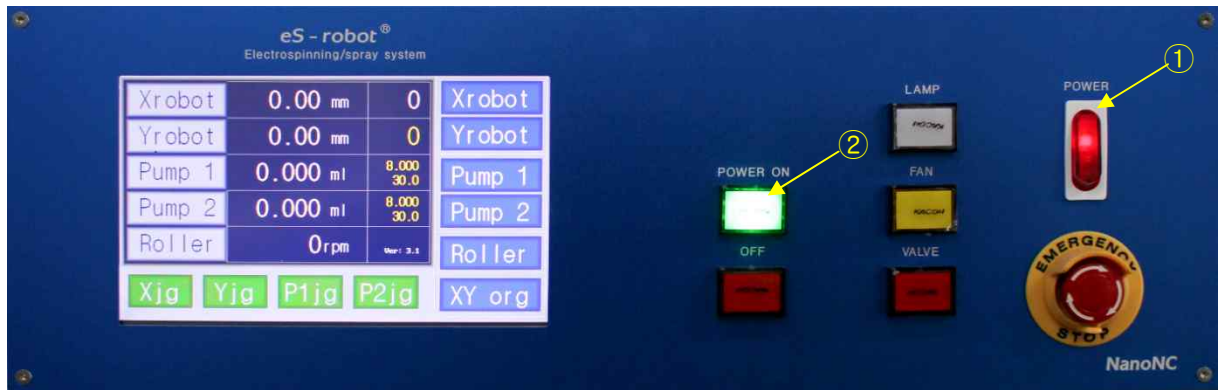
1) Power On

First, please turn on the POWER switch (①), and then press the POWER ON button(②).

. Equipment operation: [XY Org] => [X ORG Point]=> [Y ORG Point]
When touching [X ORG Point], the X-axis robot moves inside the equipment to set the origin. Here, As soon as X-axis driving part set the origin, [X ORG Point] on the display turns off automatically.
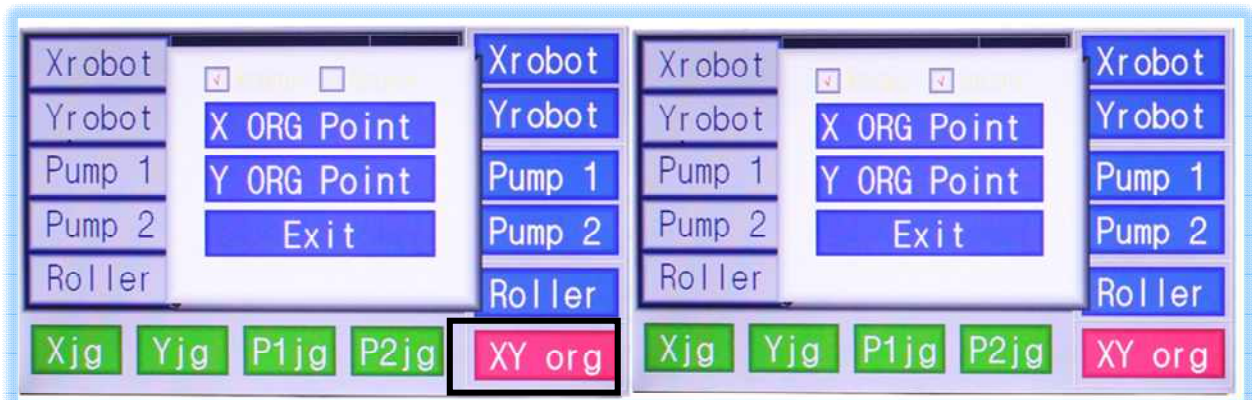
Afterwards, [Y ORG Point] go through the same process.

2) Robot actuation value setting and actuation

On equipment actuation, please above all set the robot origin first.
When the initial display appears on the touch screen, touch [XY org]. And after, touch [X ORG Point]. When X-axis robot origin is set, [X ORG Point] display returns back to the original state.
And then, continue by touching [Y ORG Point]. When Y-axis robot origin is set, [Y ORG Point] display returns back to the original state.

After the origin of X-axis robot and Y-axis robot is all set, touch [Exit] to change to the initial display. But when only X-axis robot is comprised, [Y ORG Point] of Y-axis robot does not change even when touched.
After all origin setting, touch [Exit] to move to the display by touching [Exit].

3) Setting of parameter values for driving X-robot, Y-robot, Pump1, Pump2, and Roller

After ORIGIN is set, please various set values for driving x-robot, y-robot, pump 1, pump2, and roller.

For setting conditions of the driving device, please touch the left square box on the initial display below.
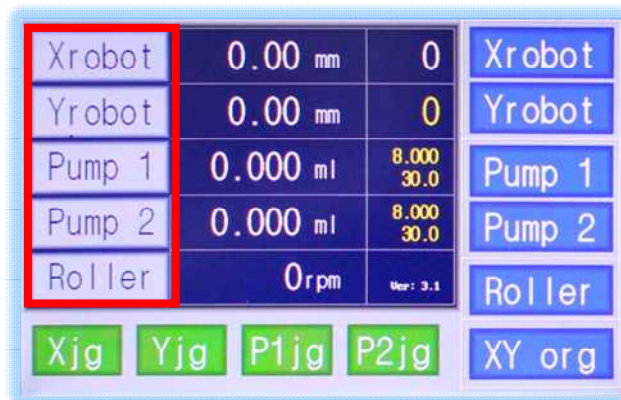
A. [Robot]

X-axis robot and Y-axis robot driving value is set by touching [Xrobot] and [Yrobot] on the left.
First, when you touch [Xrobot], the display below is shown.

In the X-axis robot parameter, Run speed (input in 1~300 scale), Start point
(Coordinate of starting point in robot origin), End point (Coordinate of end point in robot origin),
Repetition (Number of robot turning cycle) value is input.

If you are to repeat endlessly the X-axis robot, set the repetition value in 0(zero).
When all settings are finished, save the window and exit.

Then, when you touch [Yrobot], the display below is shown.

Input of Run speed(mm/sec), Start point, End point is same as the input method of X-axis robot.

In XY Robot Mode [0~3], when the input value is 1 and 2, the X-axis robot and Y-axis robot operate interlocked. Therefore, when X-axis robot(or Y-axis robot) converts direction, Y-axis(or X-axis) collector move in the step distance specified. Step Distance value is 1 step movement distance(mm).

When the input value is 1, X-axis robot drives repetitively along X-axis, and Y-axis robot   moves in the step distance specified. Here, the [Yrobot] key on the initial window is not operated even though it is touched.
When the input value is 2, Y-axis robot drives repetitively along Y-axis, and X-axis robot   moves in the step distance specified.
When the input value is 3, X-axis and Y-axis robots draw a lattice pattern.

In the XY Robot Mode [0~3], when the input value is 0, X-axis robot and Y-axis robot each operate independently in their respective input value.

Starting point and end point of the X-axis robot and Y-axis robot can be input directly by checking the location of the robot. It is set by touching Xjg and Yjg in the initial window.
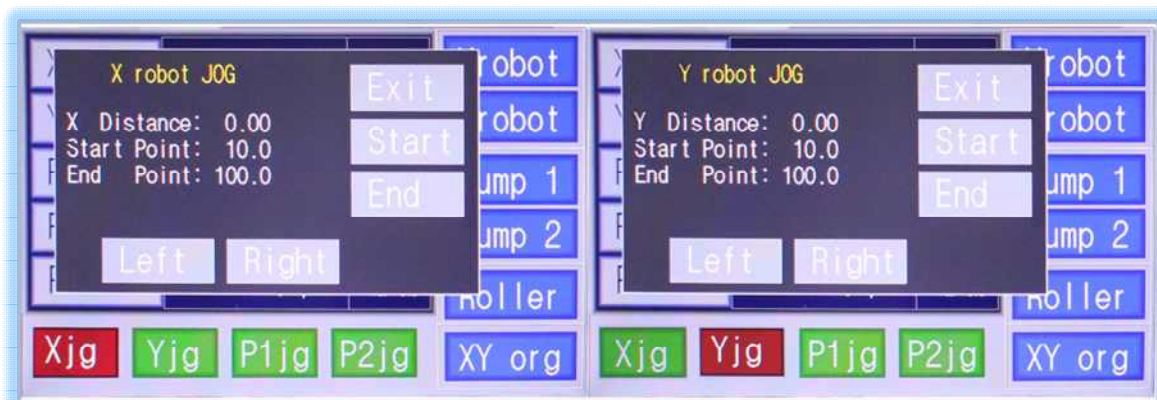
When inputting while checking the X-robot coordinate visually, press the [Right] key and [Left] key to find the coordinate, and touch the [Start] key to set [Start Point]. [End Point] coordinate is set in the same method.

The conditional setting for syringe pump for fluid transfer is set by touching [Pump1] in the initial display.
The syringe pump sets the conditions for syringe size and pumping speed.

When you touch [Pump1], the display below is shown

*InJectVolume: sets an entire discharge amount of solution.
        This represents a volume of the solution to be discharged, and only a set amount is carried.
*InjectRate Unit: selects the unit of a discharge rate.
        Please select one of three units: uL/m, nL/hr, nl/min. This is the unit of a carrying amount per time, and the unit may be selected as a number.
*InjectRate: is a transfer amount per time, and inputs a transfer value.
*SyringDiameter: shows a syringe size (inner diameter) set in [Maker]. Syringe selection is done by touching [Maker]. Shown in the display below, you can select syringe company and its volume.

After selecting syringe per company, select syringe size, and touch [OK]. And touch [Exit] to return to the previous display.   When all values are inputted, save and exit.

For example,

When it is the 10ml syringe supplied by our company, first select the syringe company.
Touch [Nanonc (HSW)]. Then select syringe size. If the volume is 10cc, touch 10/15.89. After finishing selecting, press [OK] below, touch [Exit] to move to the upper display.

Meanwhile, the condition setting of Pump2 is same as the condition setting of above Pump1.

Operating Pump manually:
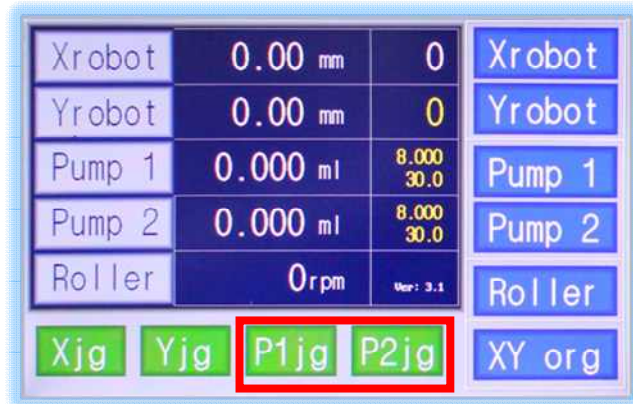
After touching [P1jg] or [P2jg] on the lower part of the initial display, it is operated using [Back] or [Front].

Pump Jog function can be mainly applied before normal operation of the experiment, after installing the syringe on the pump, on precedent discharge the test solution from the nozzle, or when checking the normal operation of the syringe pump.

C. [Roller]

A rotating speed of the drum collector is set by touching [Roll]. The rotating speed is set within the range between a low speed (5 rpm) and a high speed (2,500 rpm).
Touch the roller on the left box in the initial display.
When the parameter input window appears, set the revolutions per minute (*5~2,700rpm), save and exit.

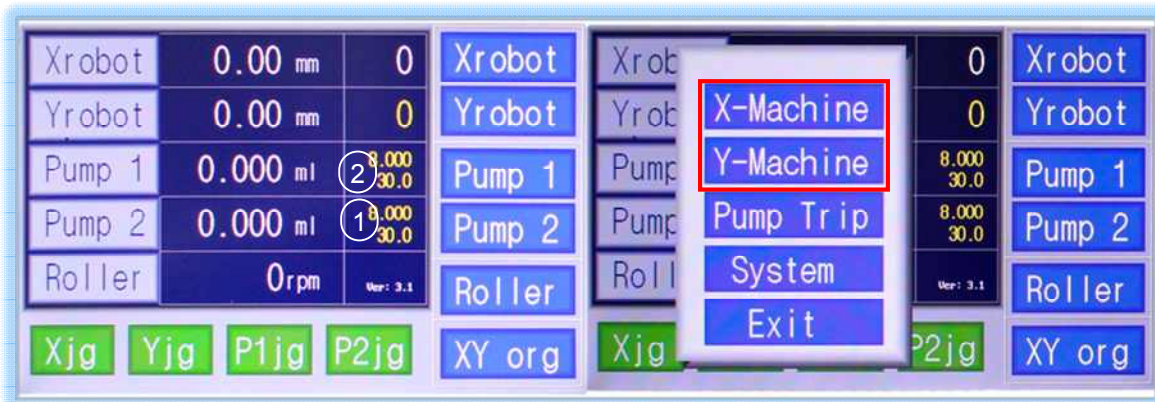**++++++ All setting is completed. ++++++**

5) Driving of Equipment

After setting various values for driving ESR200R2D equipment, touch [XRobot], [YRobot], [Pump1], [Pump2], [Roller] on the right side of the initial display to drive the equipment.

6) System Parameter Setting

In the above display, touch ①, and touch ② to show system parameter set window
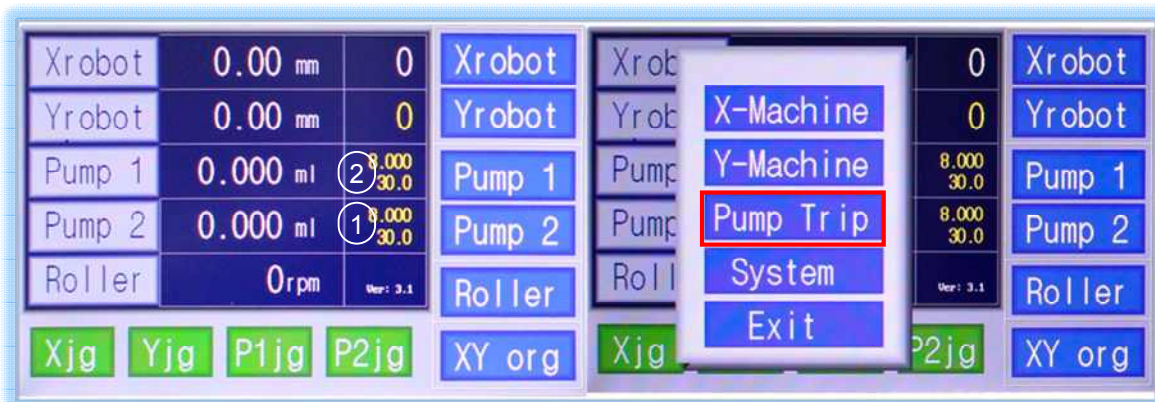
The basis default setting is as follows.

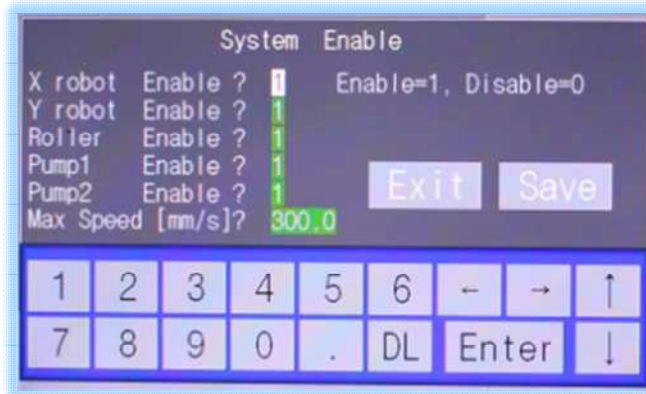## <<Caution: Do not change the parameter value randomly. >>

※ Pump "Trip" Message

When pump trip message shows as in the above display, touch ①, touch ②, and then touch [pump trip] on the initial display as shown below. Afterwards, cancel the pump trip function.

In the above display, to deactivate pump trip function, change the set value "0"=>"1".

Meanwhile, to deactivate each device function, change the set value "1"=>"0".

7) High voltage generator(H.V. Power Supply) operation

High voltage generator generates DC power with positive (+) or negative (-) polarity.

7-1. operation sequence

a) First, check whether the current lever number is turned to the maximum value, or the median value (current lever number about "5").
b) Second, check **whether the [H.V. OFF] button is in a pressed down state(light on).**

※ When the [H.V. OFF] button is pushed out, the voltage do not increase even though the voltage lever is raised.

c) Turn on [POWER] s/w
d) Raise the voltage lever slowly and set the optimal value for solution discharge or solution injection.

7-2. On power OFF

a) Turn the voltage lever counter clockwise to make zero.
b) Afterwards, check whether the [H.V.OFF] button is pulled off, and turn off the power switch.

※ *About [H.V.OFF]......*
When [H.V.OFF](or [EXT-V]) button is set to protrude, the voltage value shown in the voltage indicator window falls down to "0". When the button is pressed again, it recovers the original voltage value set.
[H.V.OFF](Or [EXT-V]) button is used on equipment actuation, cleaning the nozzle part, and when temporally blocking the power for another task.

※ *About current value......*
Current is a disturbance current of DC power applied on the solution, and most solutions apply very small currents below 1mA.
If the current value shows more than 0.5mA value, there is a current flowing in an unnecessary place, therefore equipment inspection must be done.

※ The alligator clip must rest on insulated materials, in other words, part where electricity do not pass. If the metal part is in contact with high voltage applied line, *and is discharged somewhere else with small noises (tic, tic, tic), or shows momentary spark effect, the equipment must be inspected immediately.*

8) electro vision system operation
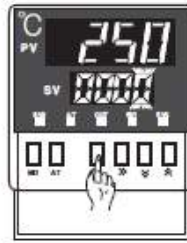*CH:1, Light Volume : 255*

9) flat heating collector / heating roll in drum collector operation
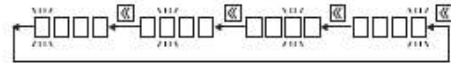
■ How to change the set value

① In case of changing the set value at status of RUN, press ≪ key.

10° digit will flash at SV.

② Press ≪ key, and then the flicker will be shifted step by step.

③ Press ≫ or ≪ at the flicker digit, and then change the set value.

④ Press MD key when the setting is completed. It will stop flickering, then return to RUN mode.

- Product Support & Call Center –

The term of warranty is one year from the date of purchase. Within this period, the warranty does not apply to damage caused by consumer, and repairs or replacement due to the damage will be made at a charge to the customer for parts or labor, provided the customer shall be responsible for any transportation cost.

NanoNC

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Electrospinning System(Model:ESR200R2D)

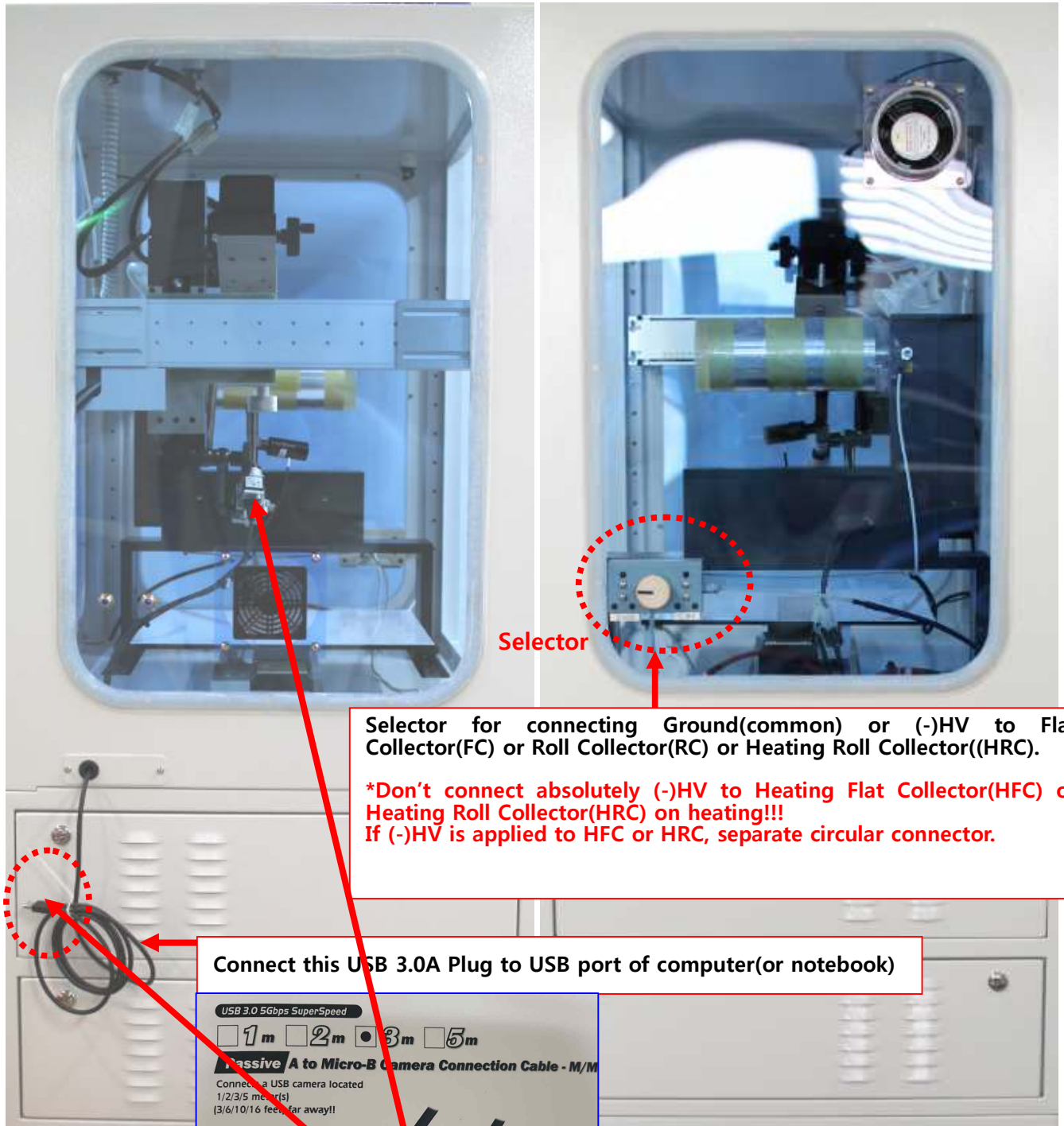**Transformer**
110V(main electric power)=>220V(machine)
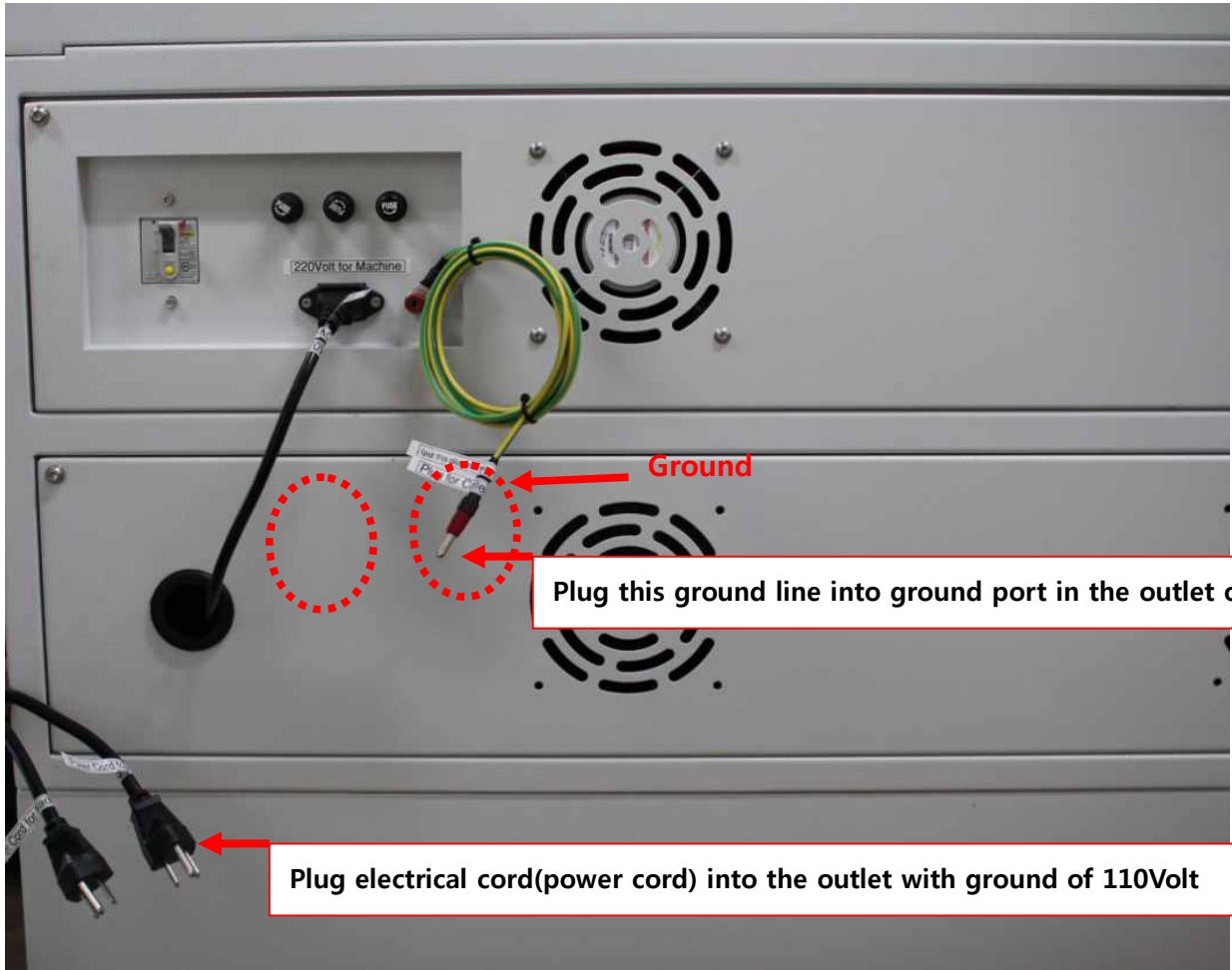
Ground

Plug this ground line into ground port in the outlet of 110Volt

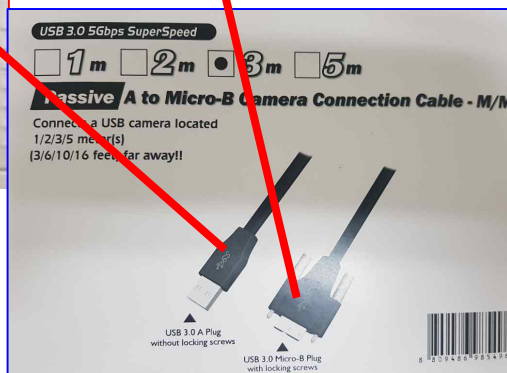Plug electrical cord(power cord) into the outlet with ground of 110Volt

Selector

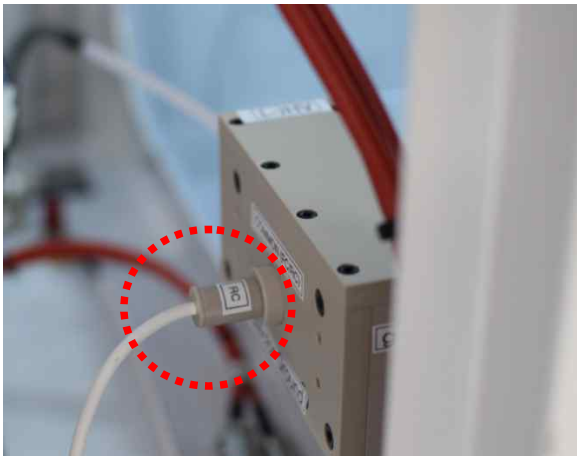Selector for connecting Ground(common) or (-)HV to Flat Collector(FC) or Roll Collector(RC) or Heating Roll Collector((HRC).
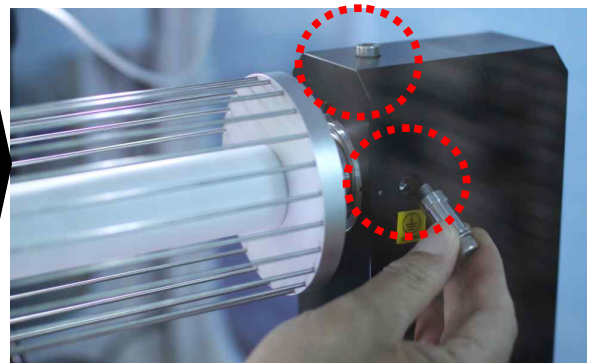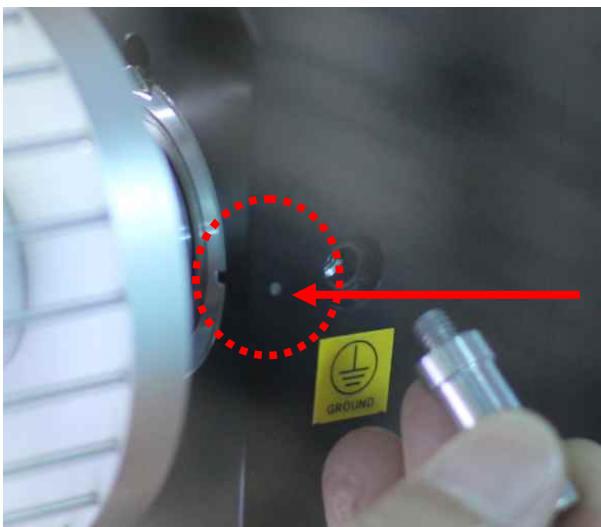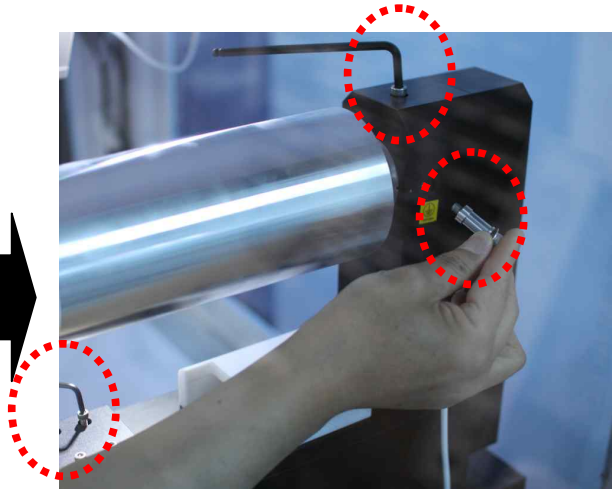
*Don't connect absolutely (-)HV to Heating Flat Collector(HFC) or Heating Roll Collector(HRC) on heating!!!
If (-)HV is applied to HFC or HRC, separate circular connector.

Connect this USB 3.0A Plug to USB port of computer(or notebook)

USB 3.0 5Gbps SuperSpeed

☐1m ☐2m ☑3m ☐5m

Passive A to Micro-B Camera Connection Cable - M/M

Connect a USB camera located
1/2/3/5 meter(s)
[3/6/10/16 feet] far away!!

USB 3.0 A Plug
without locking screws

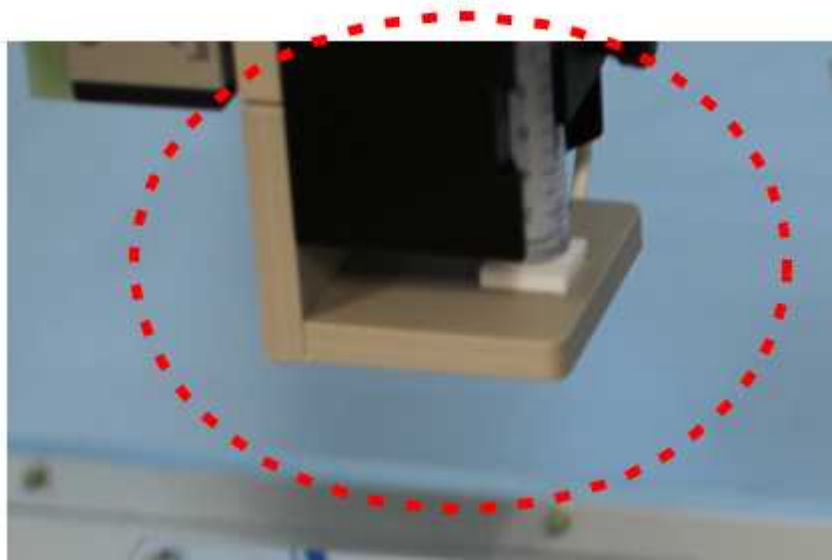USB 3.0 Micro-B Plug
with locking screws

(Electrospinning System : Left / Right)
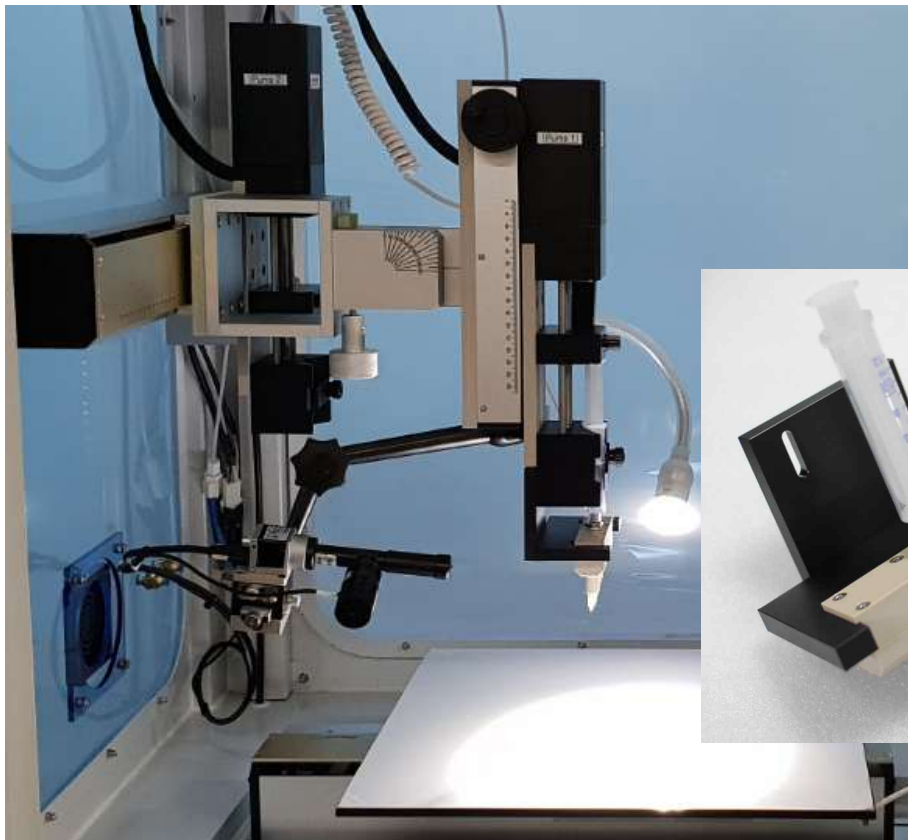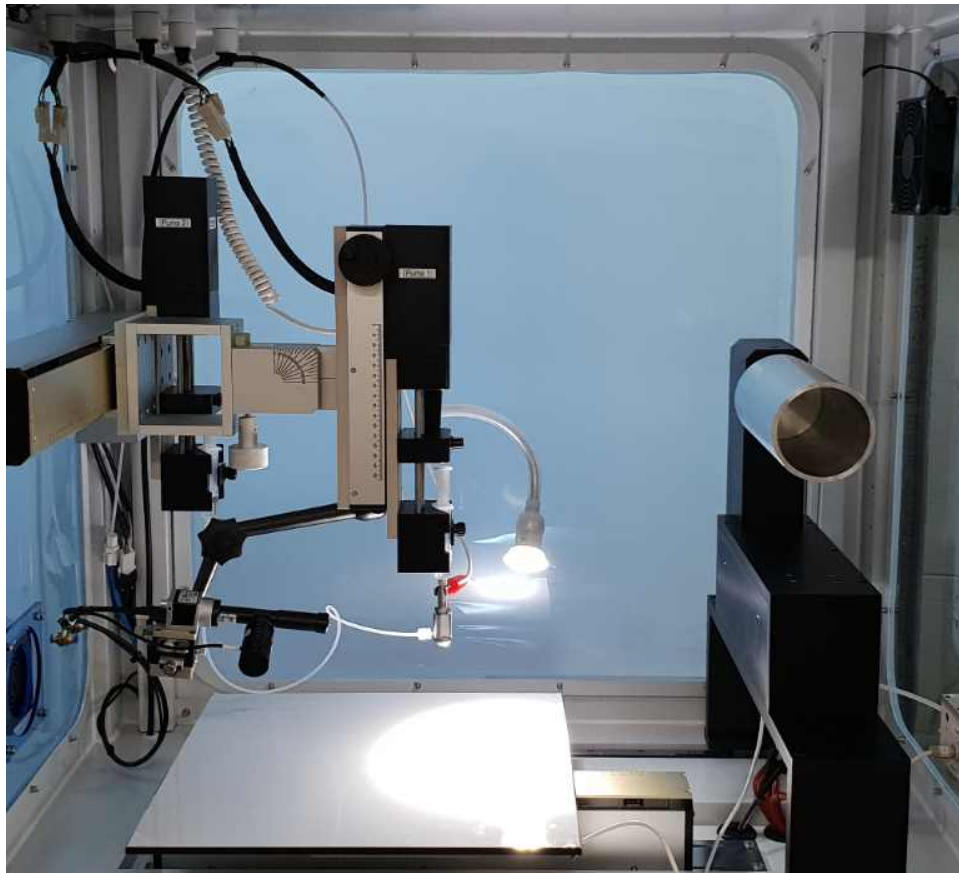
(Replacement of Collector)

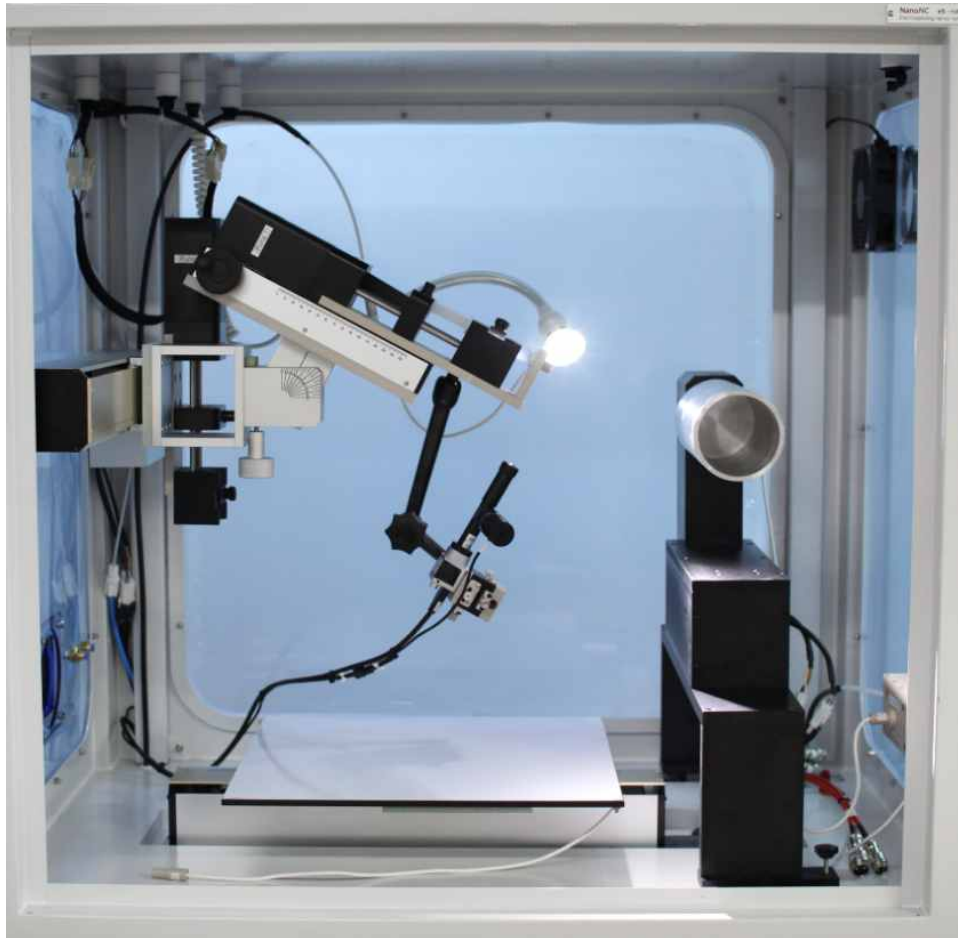**(Setup of Single Nozzle)**

(Setup of Multi-nozzle)

(Setup of Coaxial-nozzle-1)

(Setup of Coaxial-nozzle-2)

(Setup of Vision Camera)

(Setup of Vision Camera for Electrospinning with Coaxial Nozzle)