



Flagship Benchtop Platform

TL-Ultra

Electrospinning System

Multi-channel delivery and versatile spinnerets
for composite fibers, yarns and 3D structures

SHENZHEN TONGLI TECH CO LTD



A Complete Benchtop Platform

Tongli's most extensively equipped, high-performance benchtop laboratory model

01

Advanced Membrane Fabrication

Meets demanding application needs in research and production.

02

Uniform Electric Field

External components reduce field interference and thickness variation.

03

Versatile Configuration

Spacious chamber for Tongli spinnerets, collectors and accessories.

04

Easy-Clean Chamber

Accessible inner surfaces minimize dust buildup and hard-to-clean areas.

05

Touchscreen & Button Control

Centralized settings via touchscreen and quick-access buttons.

06

Warranty & Lifetime Support

Three-year warranty and lifetime maintenance with after-sales support.

4 Channels

Independent feed

4 Needles

V-shaped layout

30+

Collector options

10-inch

Touchscreen

Enclosure Design

External components support a clean chamber and a uniform electric field

01

Protective Construction

Metal housing, corrosion-resistant coating and insulated inner walls.

02

Two Viewing Windows

Windows and integrated lighting allow direct observation of spinning.

03

Temperature & Humidity

Chamber temperature and humidity display and adjustment.

04

Uniform Airflow

Inlet and exhaust systems optimize airflow within the chamber.

10-inch Touchscreen + Quick-Access Buttons



Bipolar High-Voltage Supplies

Stable high-voltage output for reliable, repeatable electrospinning

Bipolar HV Control

Selectable polarities to suit different processes.

Multi-Output Configuration

One negative supply with multiple positive supplies.

Stable HV Output

Automatic voltage compensation with real-time monitoring.

Comprehensive Protection

Overvoltage, overcurrent, arcing and short-circuit protection.

Industrial-Grade Insulation

Touchscreen and button control for reliable, convenient operation.



$\pm 30-50$ kV

Bipolar high-voltage configuration

Touchscreen Control System

Centralized parameter logging and coordinated motion control

Imported 10-inch Touchscreen

Touchscreen and quick-access buttons provide dual control.

Centralized Component Control

Controls HV supplies, syringe pumps, spinneret motion and collector rotation.

In-Process Parameter Adjustment

Logs all operating parameters for repeatable experiments.

Side-Stowing Display

The touchscreen stows at the side of the enclosure when not in use.



Four-Channel Servo Syringe Pump

Independent delivery for multicomponent and high-viscosity materials



Four Independent Channels

Set the plunger speed separately for each channel.



Precision Servo Drive

High precision and thrust for high-viscosity liquids.



High-Voltage Insulation

Electrical isolation for reliable operation and long service life.



Internal or External Installation

Select the pump position to suit the process.



4

Independent channels

Servo

Motor drive

6–8

Channel upgrade

Optional upgrade: 6–8 pump channels

Dehumidification System

Continuous dry-air delivery stabilizes the spinning environment

01

Compact Compressor

Powerful dehumidification rapidly lowers chamber humidity.

02

Gentle Dry-Air Supply

Regulates humidity in the spinning zone for a stable environment.

Standard dehumidifier

Approx. 30% RH

Enhanced unit (optional)

Down to 20% RH



Mist-Free Humidifier

Evaporative humidification reduces droplet deposition on the collector

01

Uniform Humidification

Maintains uniform chamber humidity without mist deposition.

02

Quiet & Energy-Efficient

Quiet operation with germicidal protection.

Humidity control range **50–80% RH**

Dimensions **214 × 214 × 545 mm**



External Chamber Heater

External heating preserves chamber cleanliness and electric-field uniformity

01

Visible-Light Heating

Provides uniform heating over a large area.

02

External Heat Source

Avoids dust-trapping structures inside the chamber and field interference.

03

Adjustable Heating Power

Set heating output to suit the process.

04

Optional Collector Heating

A collector with a heating plate provides additional heat.

Temperature range

Ambient to 45°C



Rotating Collector Heating System

Independent heating for low-volatility solvents and high-temperature collection

Mandrel Heating

Maximum heating temperature:
approx. 60°C

Drum Heating

Maximum heating temperature:
approx. 140°C

Independent Heating

Heat the mandrel and drum independently
to suit process requirements.

Thermally Assisted Electrospinning

For specialty materials and
thermally assisted electrospinning.



Versatile Spinneret System

Interchangeable configurations for low-volume experiments and multicomponent fibers

01 | Single & Low-Volume

Single-needle, glass microcapillary and low-volume spinnerets

02 | Coaxial & Triaxial

Interchangeable concentric needles for multilayer fibers

03 | Sea-Island & Side-by-Side

Independent multi-channel delivery for composite fibers

04 | V-Shaped & Conjugate

Four-needle platform for four-material process combinations

05 | Multi-Needle Arrays

Optional linear, ring and array layouts increase throughput

06 | Gas & Thermal Options

Heated spinnerets, gas-assisted electrospinning and other options

All spinnerets have dedicated insulating holders and intelligent motion control. Positions can be recorded.

Single-Needle Spinneret

Standard needle compatibility with adjustable spinning geometry

01

100 Stainless-Steel Needles

Includes various sizes and accepts standard metal needles.

02

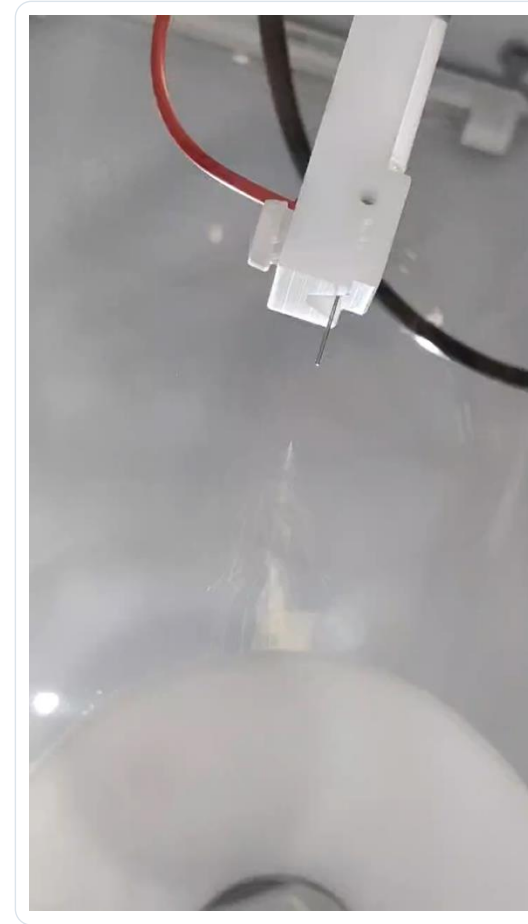
Dedicated Spinneret Holder

Secure needle mounting with insulating support.

03

Adjustable Angle & Distance

Adjust the spinning angle and spinneret-to-collector distance.



Glass Microcapillary Needles

Ultrafine fiber fabrication and near-field direct writing

01

Hollow Glass Needles

Needles available
in diameters from 1 to 45 μm .

02

For Low-Viscosity Fluids

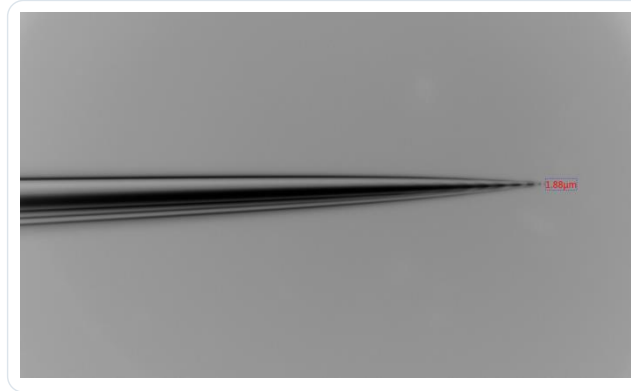
Small-bore needles
for low-volume fluid delivery.

03

Fine Fibers & Direct Writing

For ultrafine fibers and near-field
direct-writing experiments.

Minimum inner diameter **1 μm**



Tubeless Spinneret

Direct syringe-to-needle connection conserves valuable materials

01

Tubing-Free Connection

The syringe connects directly to the needle, reducing tubing consumables.

02

Low Sample Consumption

Electrospinning experiments require just 0.5 mL of solution.

03

Simultaneous Multi-Needle Spinning

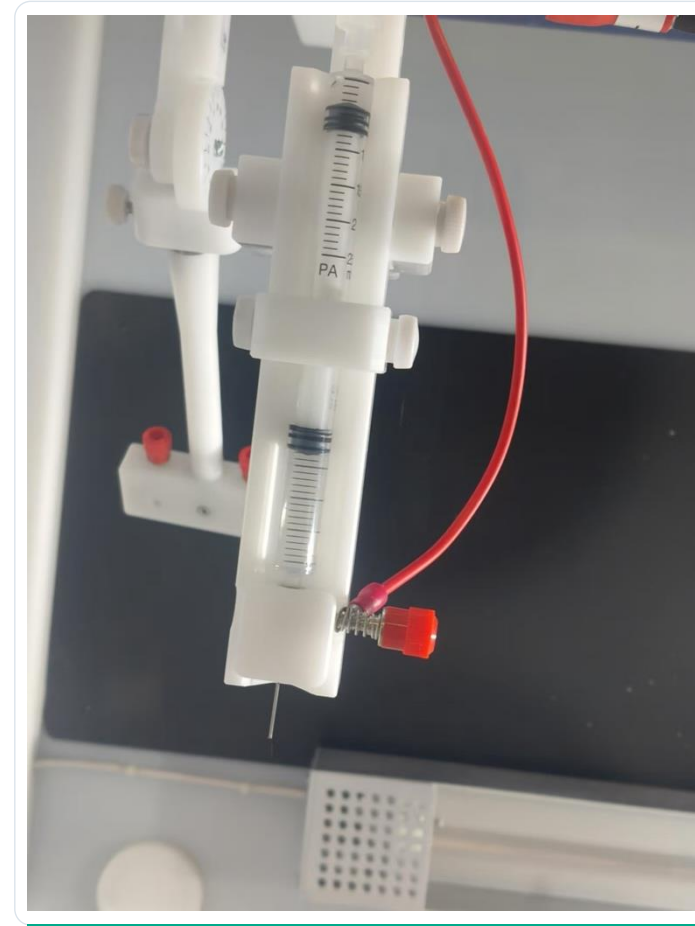
Configurations with 2–4 low-volume spinnerets can operate simultaneously.

Standard configuration

2 tubeless spinnerets

Additional spinnerets

Optional, at extra cost



Coaxial Spinneret

High concentricity for core-shell composite fibers

Five Needle Sets

Different sizes with interchangeable inner and outer needles.

High Concentricity

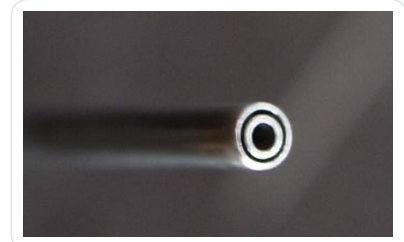
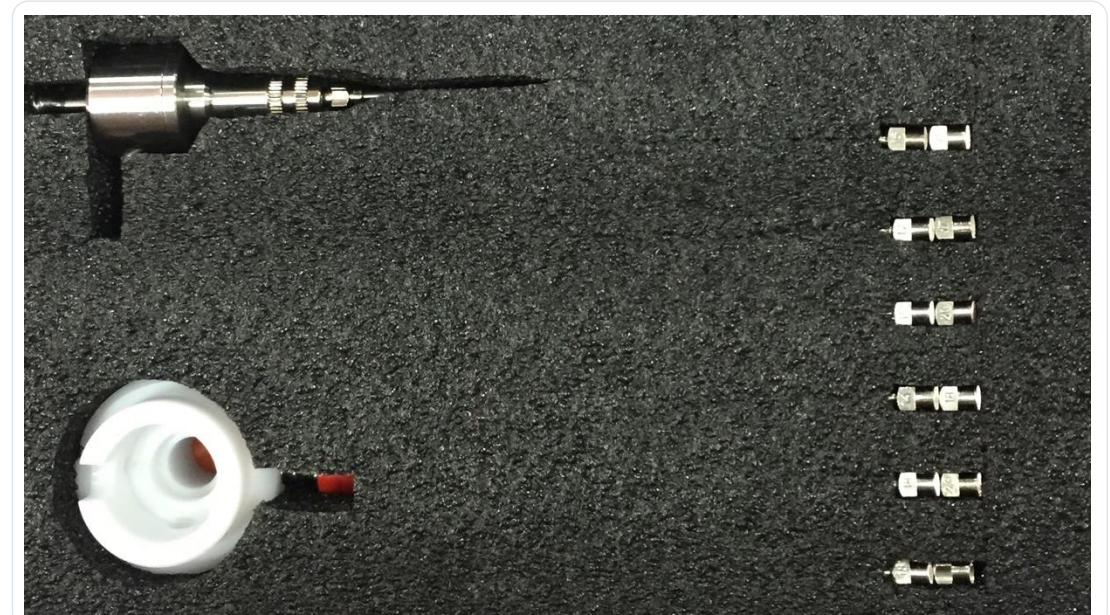
Extended needle geometry reduces the required spinning voltage.

Dual-Channel Delivery

A two-channel syringe pump feeds the inner and outer fluids independently.

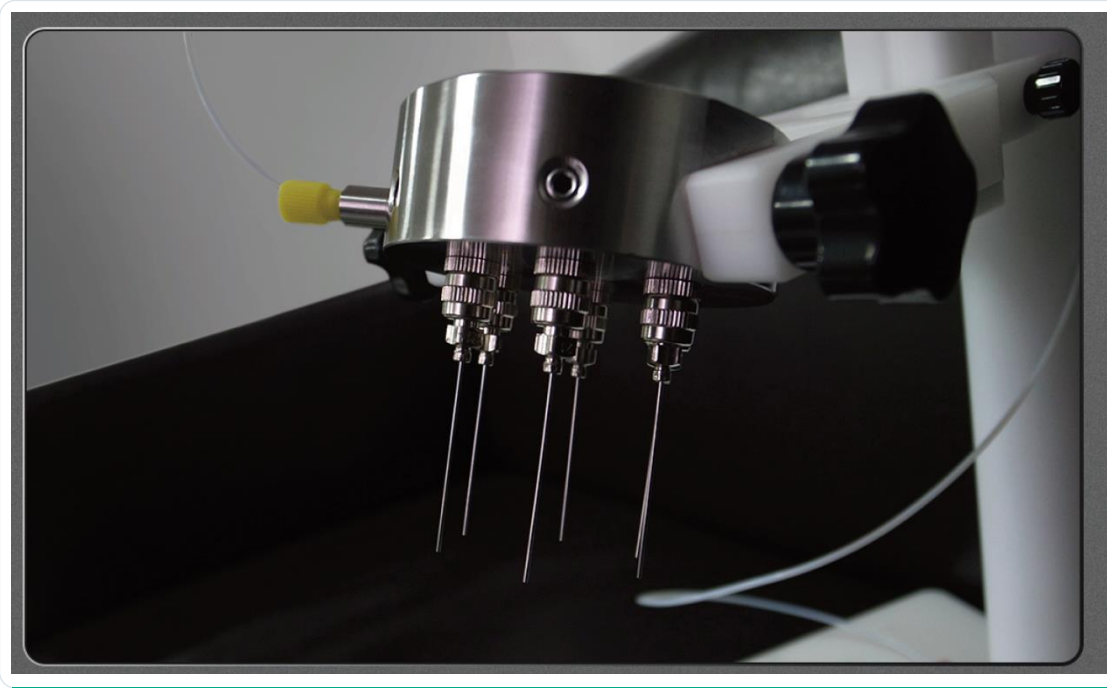
Gas-Assisted Compatibility

Also suitable for gas-assisted spinning.



Coaxial Multi-Needle Arrays

Coaxial delivery in alternative needle arrangements



Circular Coaxial Array



Coaxial Needle Array

Triaxial Spinneret

Three independent fluid channels for multilayer composite fibers

01

Five Needle Sets

Different sizes with interchangeable inner, middle and outer needles.

02

Three Concentric Layers

Extended needle geometry reduces the required spinning voltage.

03

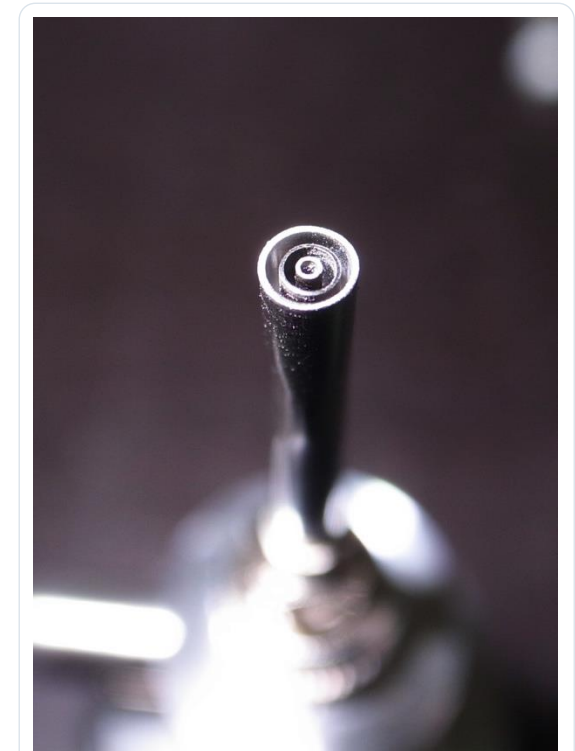
Three Independent Fluid Feeds

Uses a three-channel syringe pump.

04

Gas-Assisted Compatibility

Also suitable for gas-assisted spinning.



Coaxial & Triaxial Needle Sizes

Standard sizes and needle combinations

Coaxial Needle Specifications

Inner needle	Outer needle
20G	14G
14G	10G
21G	15G
15G	11G
22G	16G
16G	12G
23G	17G
17G	13G
24G	18G
18G	14G
26G	19G
19G	15G

Triaxial Needle Combinations

Needle size No. (inner / middle / outer)

4.5	4	4	5	4	7	4.5	6	5	9
9	8	9	9	12	12	12	16	16	20
16	16	16	16	20	20	20	25	25	30



V-Shaped Four-Needle System

Two coordinated process groups improve throughput and membrane uniformity

4-8 V-Arranged Needles

Needles in each group share the same voltage to improve throughput and uniformity.

Two Conjugate Spinning Groups

The two needle groups connect to opposite-polarity HV supplies.

Electrospinning & Electrospaying

The two groups can run different processes simultaneously.

Repeatable Position Settings

Adjust angle and collector distance, with scales to record angle and position.



Conjugate Electrospinning Spinnerets

Opposite-polarity jets reduce residual charge effects

01

Bipolar HV Connections

Two parallel needles connect to positive and negative HV supplies.

02

More Closely Packed Fiber Mats

Neutralizes residual collector charge for denser fiber packing.

03

Two-Material Composite Mats

The two needles can spin different materials.

04

Specialty Fiber Structures

Suitable for nanofiber yarns and other specialty structures.



Multi-Channel Sea-Island Spinneret

Independent fluid feeds for composite fibers with specialty cross-sections

01

Two- or Three-Channel Options

Alternative sea-island spinneret configurations.

02

Multicomponent Fibers

Produces composite fibers containing three or more components.

03

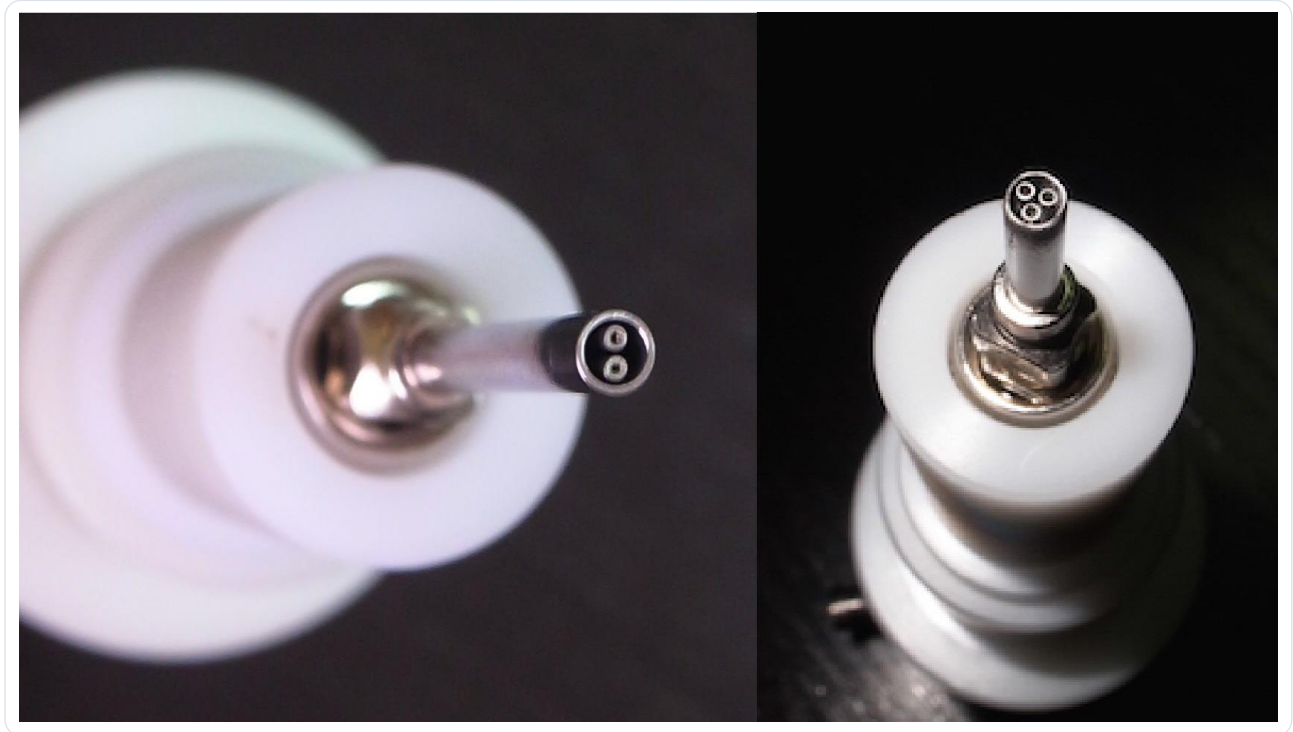
Cable-Like Fiber Structures

Creates sea-island, cable-like and other composite cross-sections.

04

Independent Material Delivery

Each channel can supply a different material.



Side-by-Side Spinneret

Parallel delivery of two materials for bicomponent fibers

01

Two Independent Channels

Produces composite fiber membranes from different materials.

02

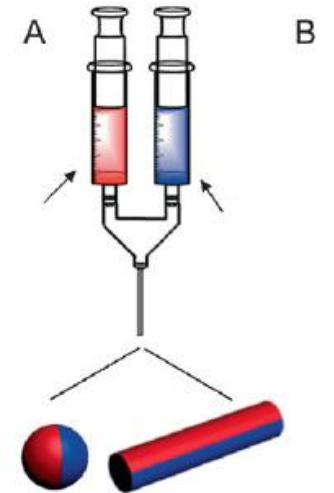
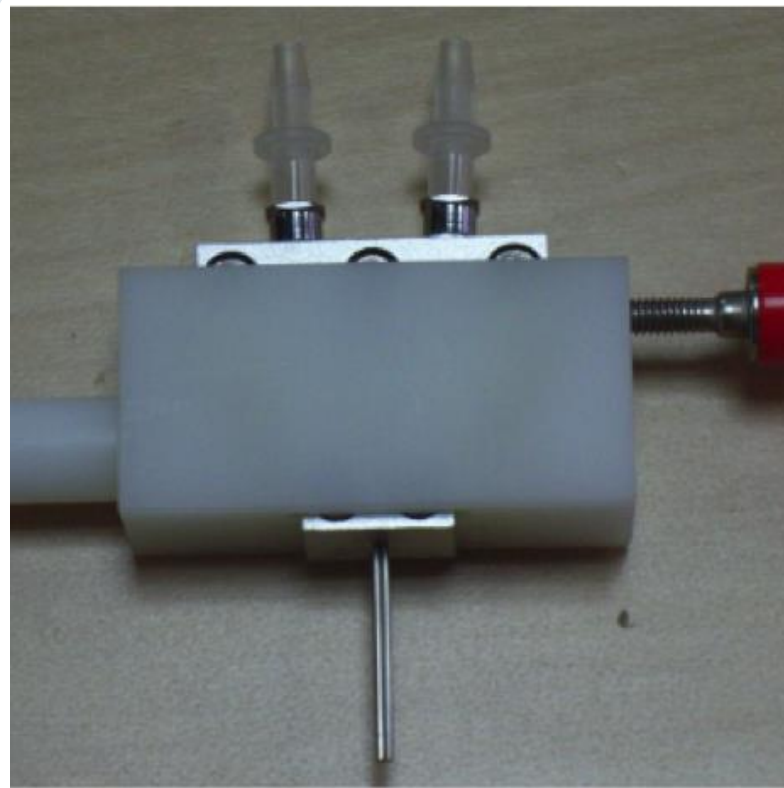
Five Needle Sets

Different sizes to suit the process.

03

Self-Crimping Fiber Structures

Differences in elastic modulus can produce spring-like and other fiber shapes.



Multi-Needle Spinneret Arrays

One inlet feeds multiple outlets to increase throughput

Alternative Needle Layouts

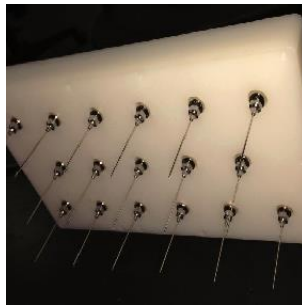
Linear, ring and array configurations available.

Single-Inlet Fluid Distribution

One inlet feeds multiple needles for higher spinning throughput.



Ring Array



Needle Array



Linear Array

Automatic Needle Cleaning

Reduces tip clogging caused by volatile solvents

01

Cleaning During Operation

Cleans the needle tip without interrupting electrospinning.

02

Adjustable Cleaning Frequency

Set the interval for the solvent system and spinning conditions.

03

Wide Spinneret Compatibility

In-process automatic cleaning is available for all spinneret types listed above.



Spinneret Motion System

Axial scanning improves nanofiber membrane uniformity



Motorized X-Axis Scanning

Traverses back and forth along the collector drum axis.



Touchscreen Motion Settings

Access and adjust motion parameters for repeatable experiments.



Manual Y- and Z-Axis Adjustment

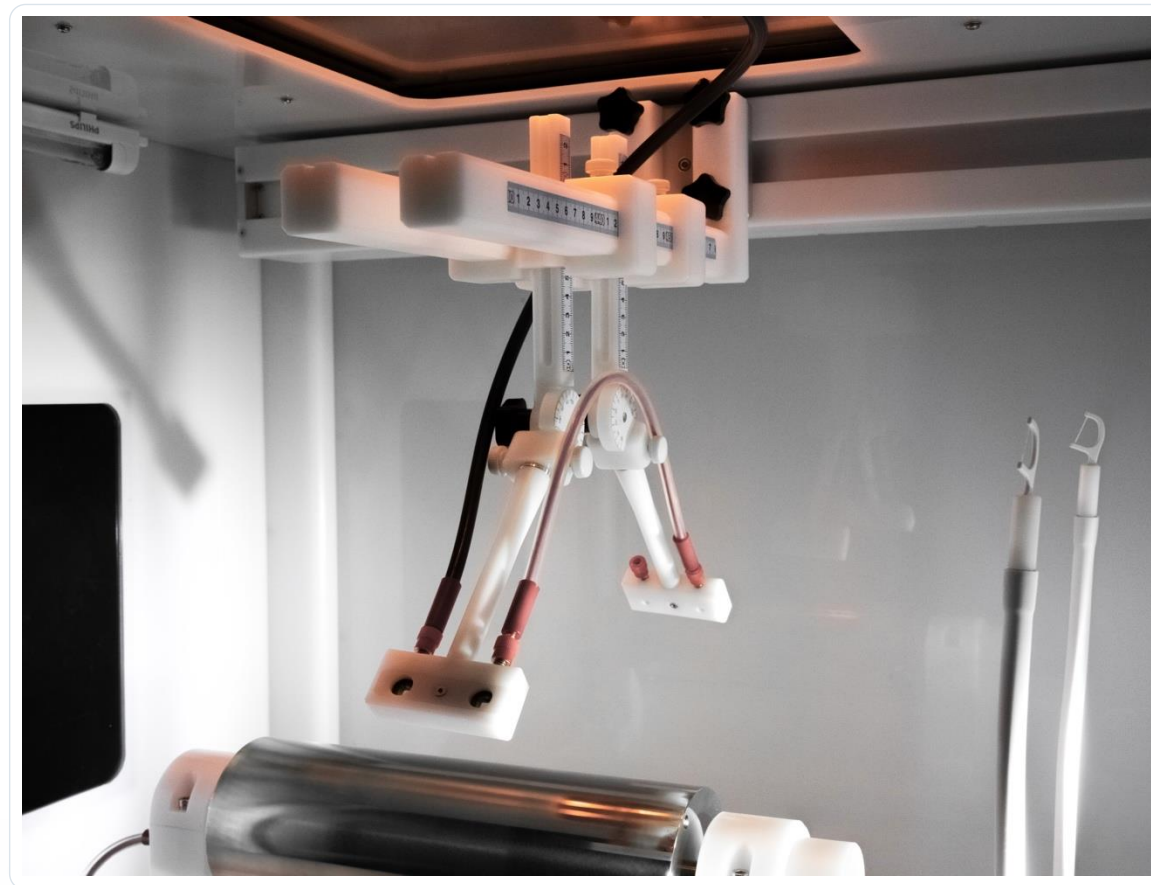
Position scales allow settings to be recorded.

X-axis travel

400 mm

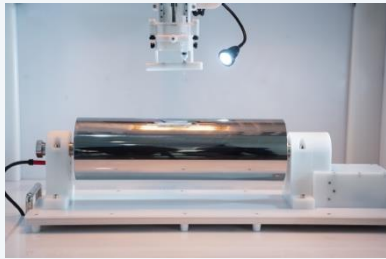
Scan speed

1–40 mm/s

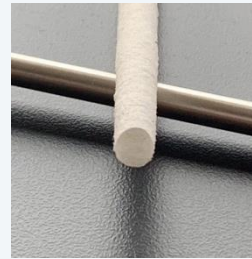


Nanofiber Collection Systems

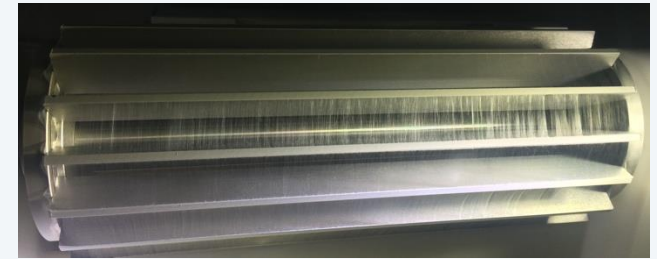
Collectors for flat and tubular membranes and rigid substrates



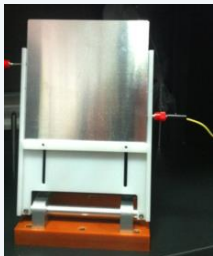
Rotating Drum



Rotating Mandrel



Parallel-Electrode Cage



Flat Plate



Roll-to-Roll



Nanofiber Yarn

30+ collector combinations. Rotating collectors support uniform deposition. Adjustable plates simplify setup.

Rotating Drum Collector

Flat membranes with random or aligned fibers

Uniform Flat-Mat Collection

Rotation supports random or aligned fiber deposition.

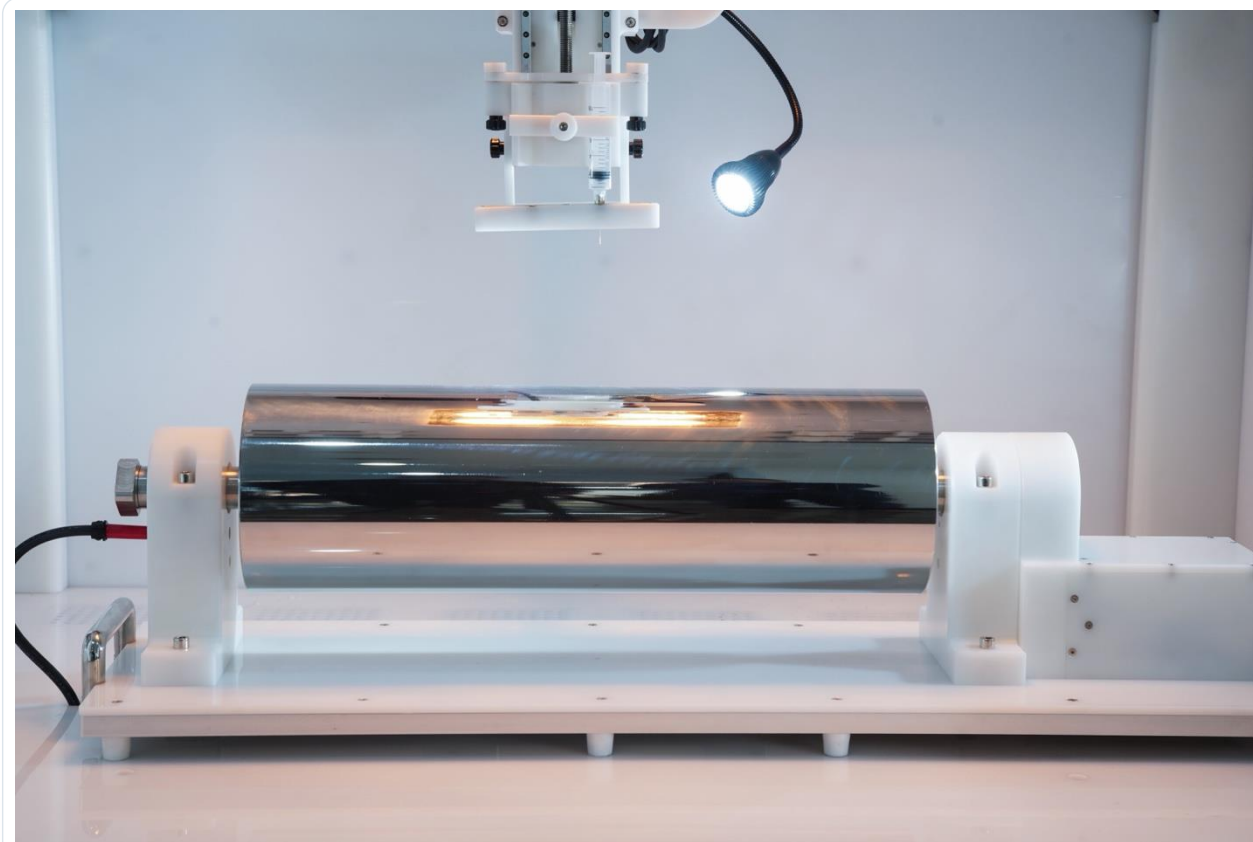
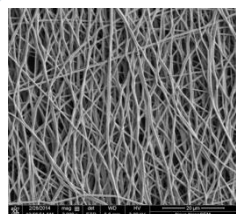
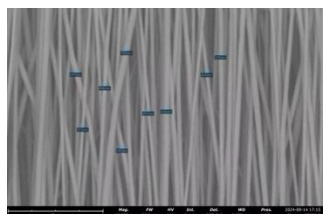
High-Speed Fiber Alignment

High-speed drum rotation produces aligned fiber mats.

Speed / accuracy **1–5000 rpm / ± 1 rpm**

Drum diameter $\times$ length **$\varnothing 100 \times 300$ mm**

Unwrapped mat size **300×314 mm**



Rotating Disc Collector

Highly aligned nanofiber ribbons collected on the disc edge



Edge-Focused Collection

Collects a continuous nanofiber ribbon around the disc edge.



High Fiber Alignment

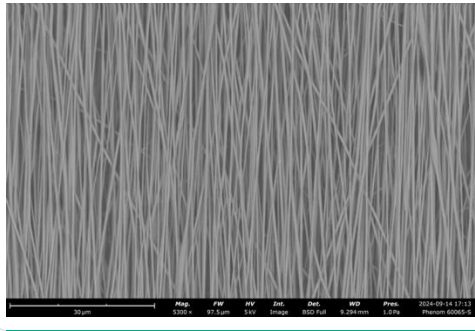
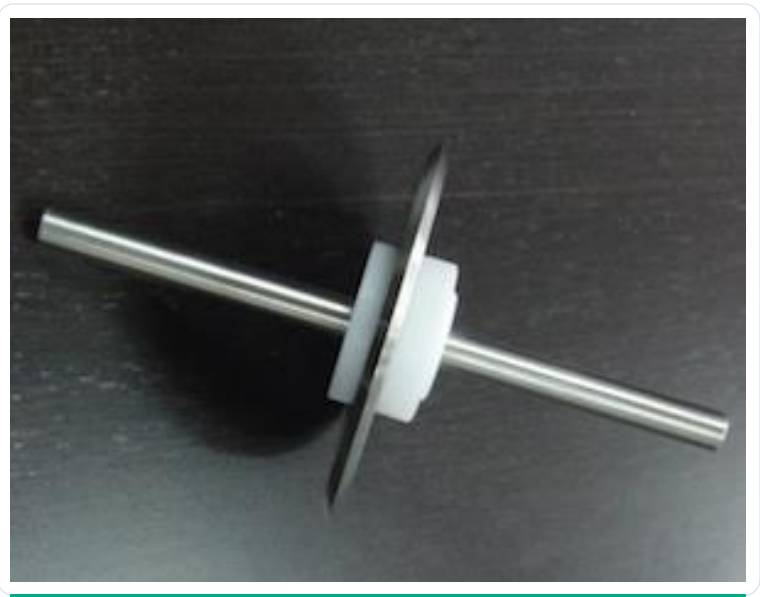
For highly aligned nanofiber ribbons.

Speed / accuracy **1–5000 rpm / ±1 rpm**

Disc diameter **Ø140 mm**

Edge profile **Sharp / flat**

Unwrapped ribbon length **439 mm**



Highly Aligned Fiber Collector

Narrow, flat membranes with high fiber alignment



Narrow-Mat Collection

For narrow membranes with highly aligned fibers.



High-Speed Rotation

High collection speed promotes fiber alignment.

Speed / accuracy **1–5000 rpm / ± 1 rpm**

Drum diameter $\times$ length **$\varnothing 140 \times 50$ mm**

Unwrapped mat size **439×50 mm**



Rotating Mandrel Collector

Hollow tubular membranes for vascular grafts and related structures



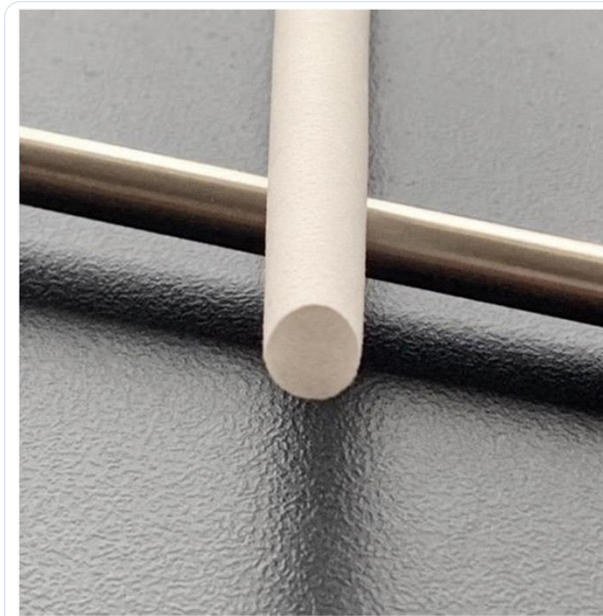
Tubular Fiber Structures

Produces vascular grafts and other tubular structures in various sizes.



Selectable Mandrel Diameters

Mandrel diameters available from 1 to 30 mm.



Mandrel length

300 mm

Tube wall thickness

1 μ m to several mm

Fiber diameter

100 nm to several μ m

Parallel-Electrode Cage Collector

Aligned fibers at low speeds, with easy transfer to other substrates



Low-Speed Fiber Alignment

Low-speed rotation
collects aligned nanofibers.



Thick Fiber Mats

Produces thick mats that lie flat
and uniform after unwrapping.



Diameter × length

Ø110 × 300 mm

Speed / accuracy

1–150 rpm / ±1 rpm

Roll-to-Roll Collector

Continuous collection of long nanofiber membranes



Continuous Membrane Collection

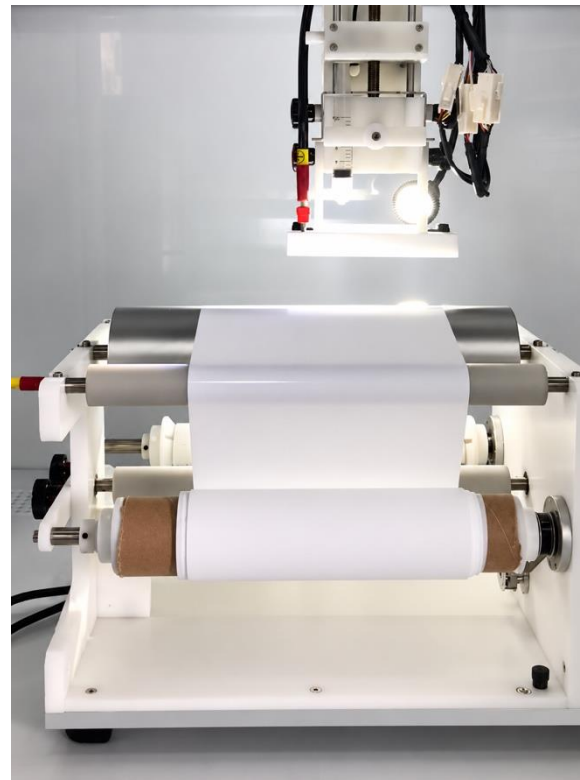
Collects continuous fiber membranes 50–100 m long.



Adjustable Take-Up Speed

Adjust the take-up speed to achieve the target membrane thickness.

Collection width	250 mm
Max. roll diameter	65 mm
Take-up speed	1–40 mm/s
Fixed-length option	Approx. 800 mm long



Flat Plate Collector

Nanofiber deposition on rigid, non-rollable surfaces

Rapid Experimental Setup

Adjustable plate angle simplifies changes in experimental conditions.

For Rigid Substrates

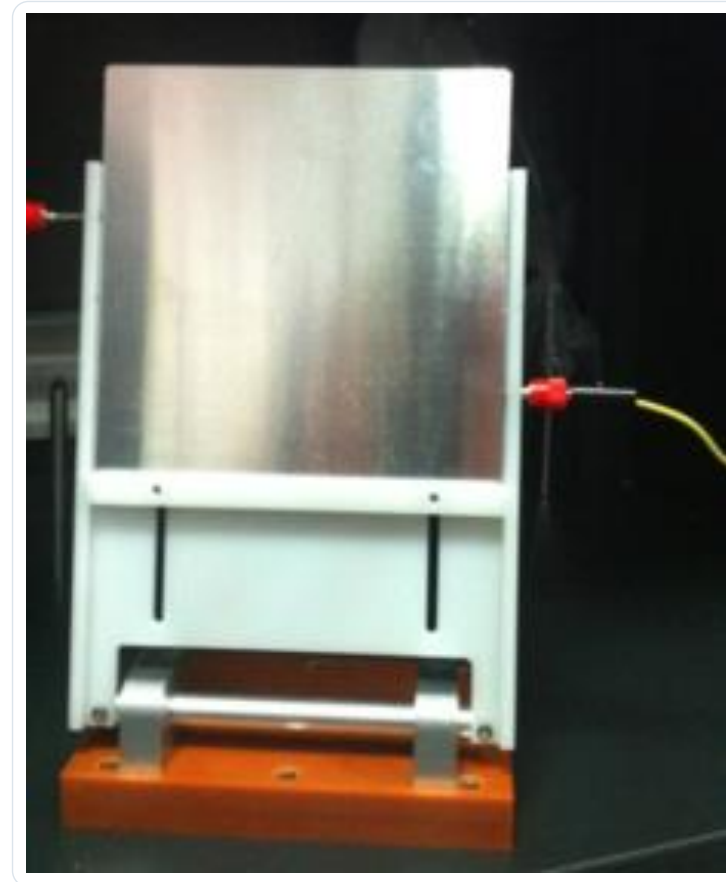
Collects nanofibers directly on surfaces that cannot be rolled.

Optional Motion Stage

Compatible with an optional X-Y motion stage.

Plate size **150 × 150 mm**

Material **Type 316 stainless steel**



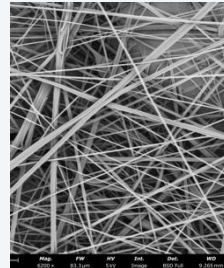
Recommended Options

Additional process modules for a wider range of fiber structures



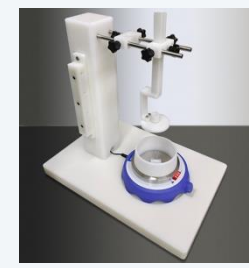
Heated Spinneret

Ambient to 150°C
for heated spinning
and melt electrowriting



Gas-Assisted Spinning

Cotton-like,
three-dimensional
nanofiber structures



Nanoparticle Module

Collects particles
or short fibers
in a water bath



Nanofiber Yarn

Core or coreless yarns
and thick 3D fiber mats



X-Y Motion Stage

Deposition on rigid
substrates that
cannot be rolled



Cross-Aligned Fibers

Builds multilayer
membranes with
orthogonal fibers

These options are already in use at customer sites. Select the configuration to suit your experiments.

Heated Spinneret

Melt electrowriting and heated spinning of small solution volumes



Positive HV Compatibility

Supports thermally assisted electrospinning.



Small-Volume Sample Delivery

Uses a 5 mL glass syringe.

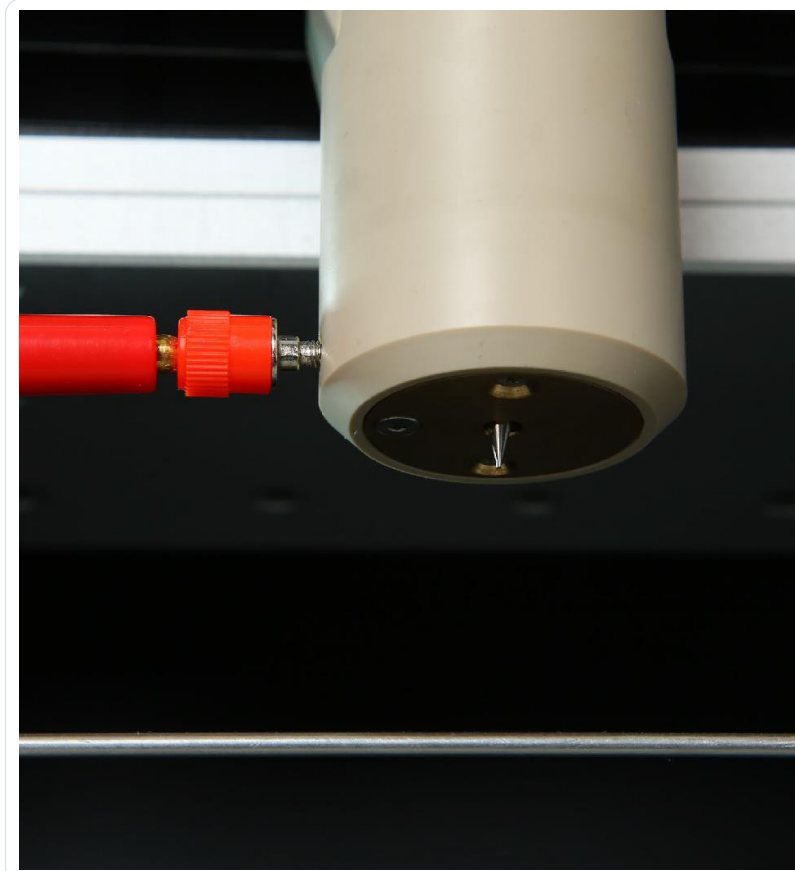


Thermally Assisted Processes

For melt electrowriting and heated electrospinning of small solution volumes.

Temperature range **Ambient to 150°C**

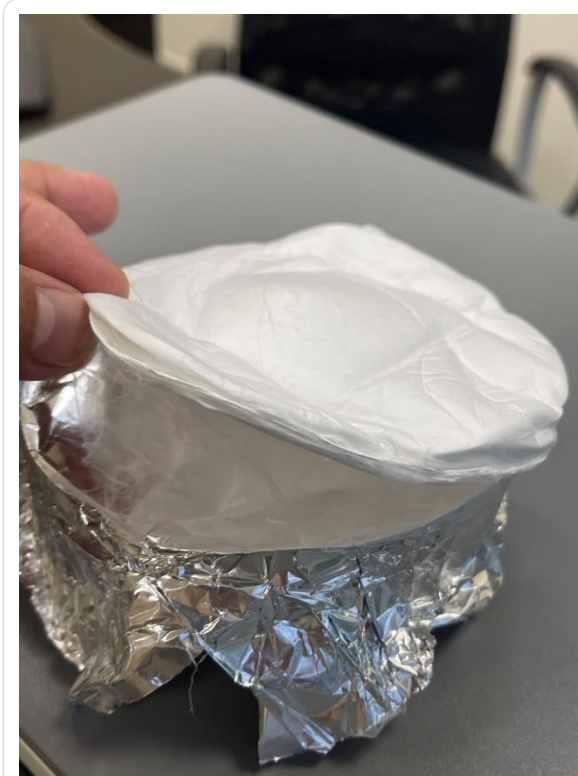
Positive high voltage **≤25 kV**



Spiral Thick-Mat Collector

Thick, porous 3D fiber structures

- 01 Continuous buildup of 3D fiber mats
- 02 Thickness adjusts with spinning time and process settings
- 03 High porosity with a continuous fiber network
- 04 For filtration, adsorption, electrode materials and tissue-scaffold research



Nanoparticle & Microsphere Module

Liquid-bath collection of dispersed spheres, short fibers and related structures



Water-Bath Collection

Collects uniformly dispersed nanospheres, short fibers and other morphologies.

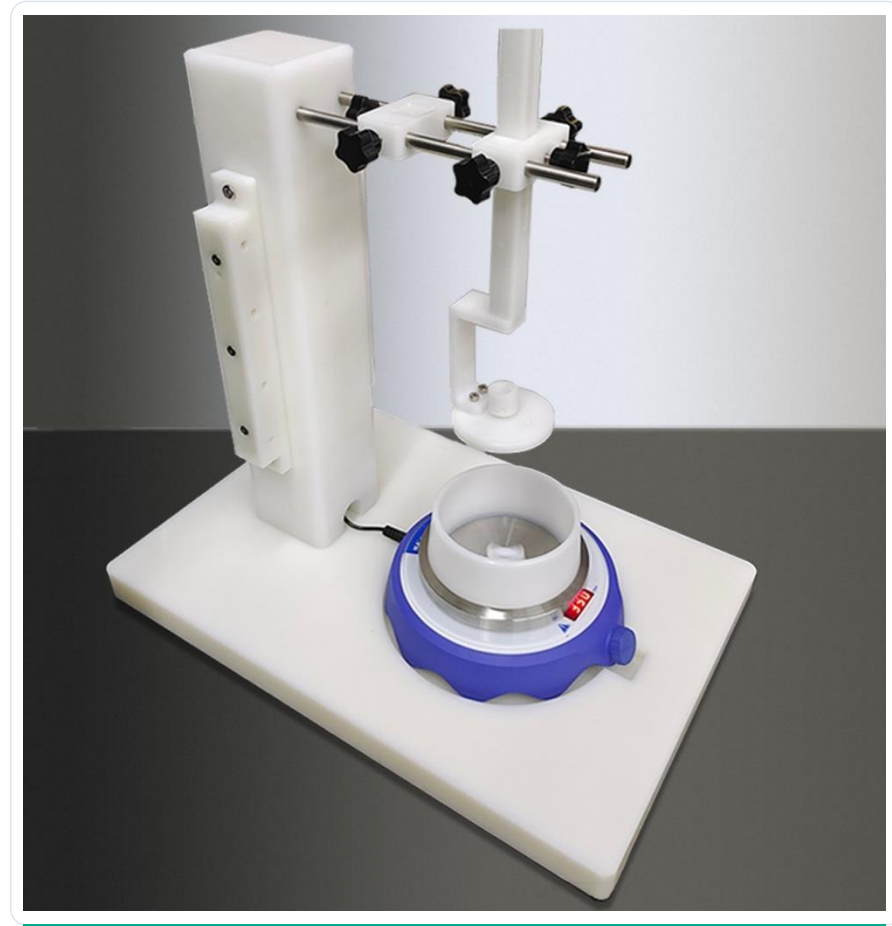


Complete Auxiliary Components

Magnetic stirrer, insulating base, microsphere nozzle and holder, and auxiliary electrode.

Bath diameters (one each) **Ø130 / Ø180 mm**

Bath height **55 mm**



Microwire Coating Collector

Nanofiber membrane coatings on fine wire surfaces



Dual-Motor Drive

Two motors control wire translation and rotation.



Independent Controller

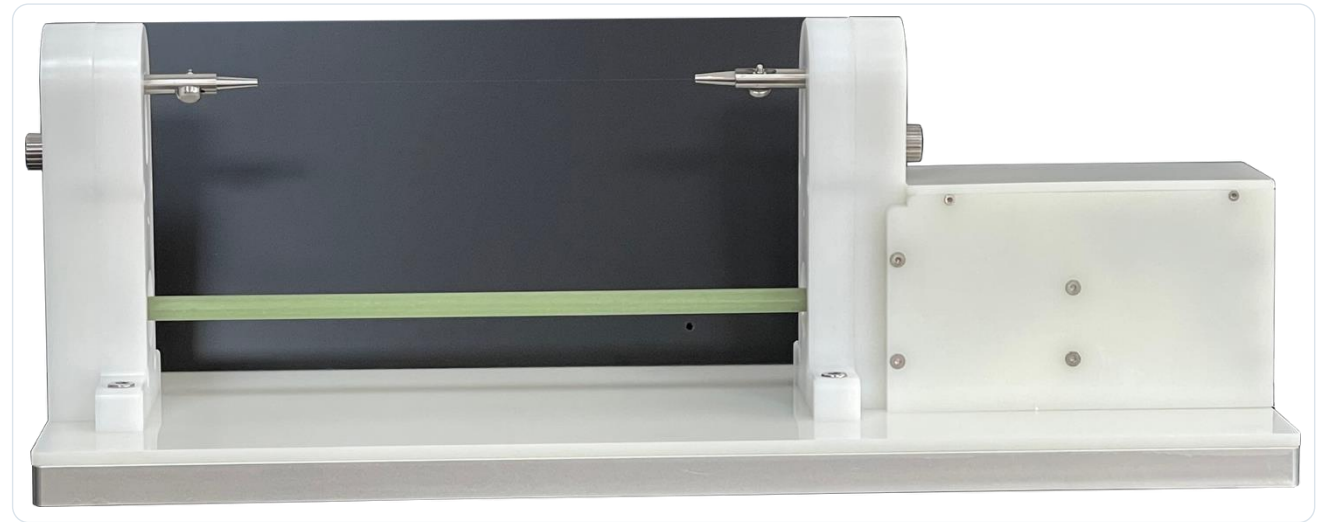
Stepless speed adjustment.

Wire diameter

10–1000 μm

Speed / accuracy

1–5000 rpm / ± 1 rpm



Gas-Assisted Electrospinning

Combined aerodynamic and electrostatic drawing for 3D fiber structures

Gas-Assisted Jet Drawing

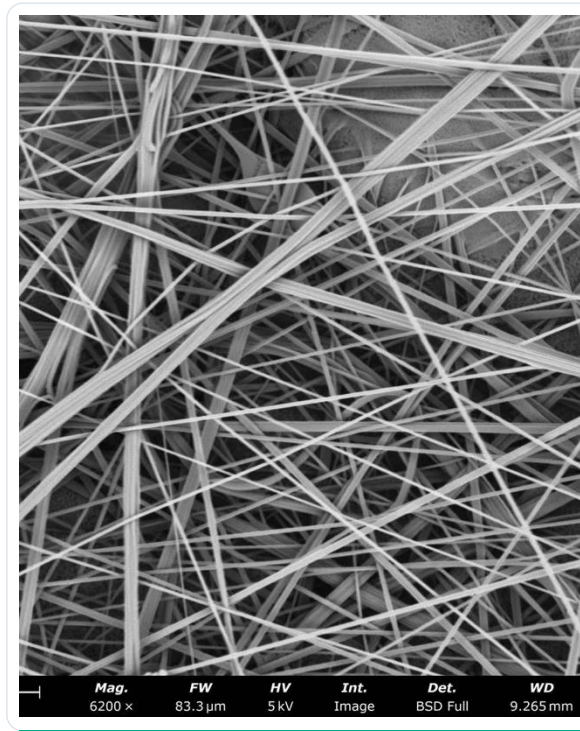
Throughput can reach approximately 20 times that of conventional electrospinning.

Fiber Surface & Morphology

Produces straighter fibers with cleaner surfaces.

Multiple Fiber Structures

Membranes, lofted mats, cotton-like 3D structures and short fibers.



Cross-Aligned Fiber Module

Controlled orthogonal alignment and layer-by-layer deposition

Unidirectional or Cross-Aligned

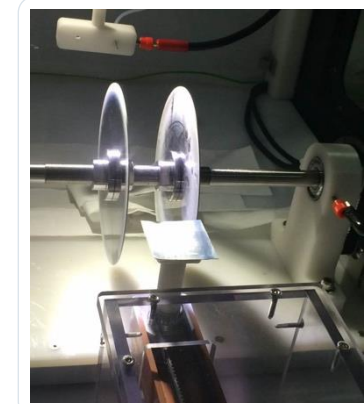
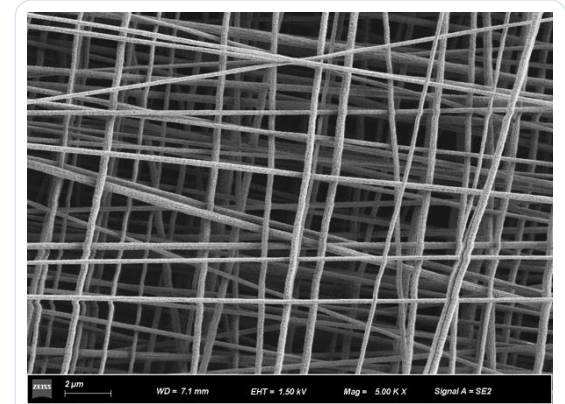
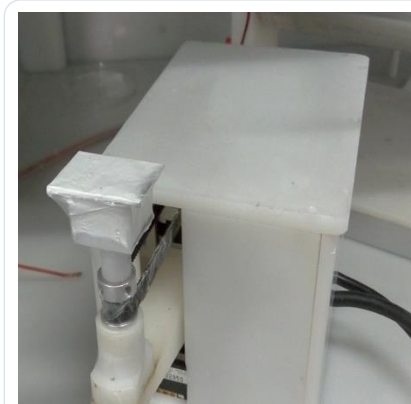
Collects multilayer membranes with parallel or orthogonal fiber alignment.

Dedicated Collection Components

A dedicated spinneret and rotating dual-disc collector.

Independent Digital Controller

Convenient experimental setup and process control.



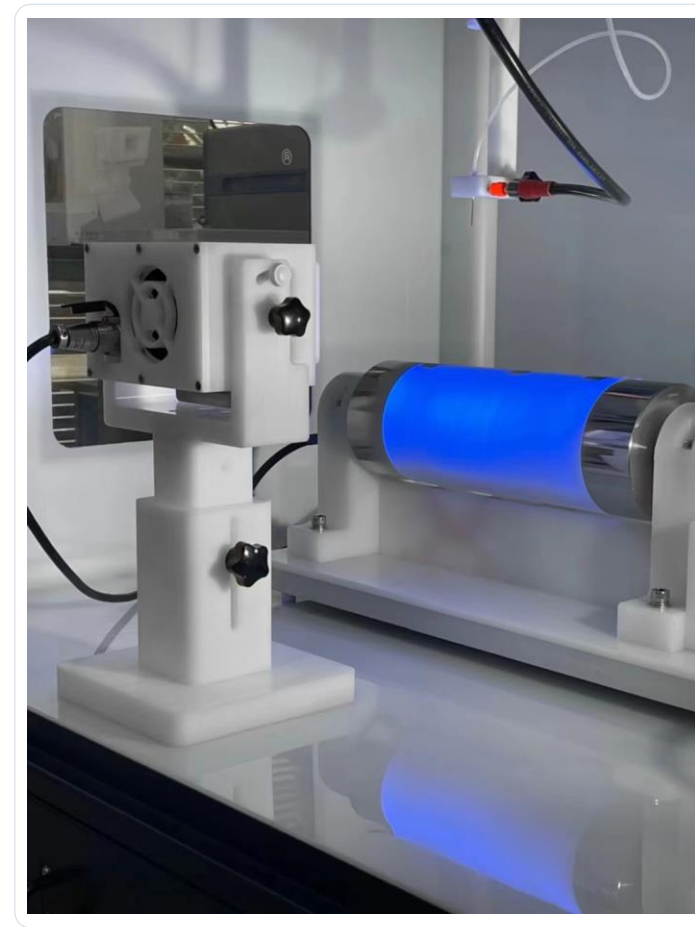
UV Curing Lamp

Automatic in-situ curing without removing the sample

In-Situ UV Curing

Cures the fibers with UV light during electrospinning.

Peak wavelength	365 nm
Emitting area	30 × 25 mm × 2
UV irradiance	≥420 mW/cm²
Lamp / installed power	240 W / 290 W
Cooling	Air cooling



Centrifugal Electrospinning

Centrifugal and electrostatic forces draw the polymer solution into fibers



Combined Drawing Forces

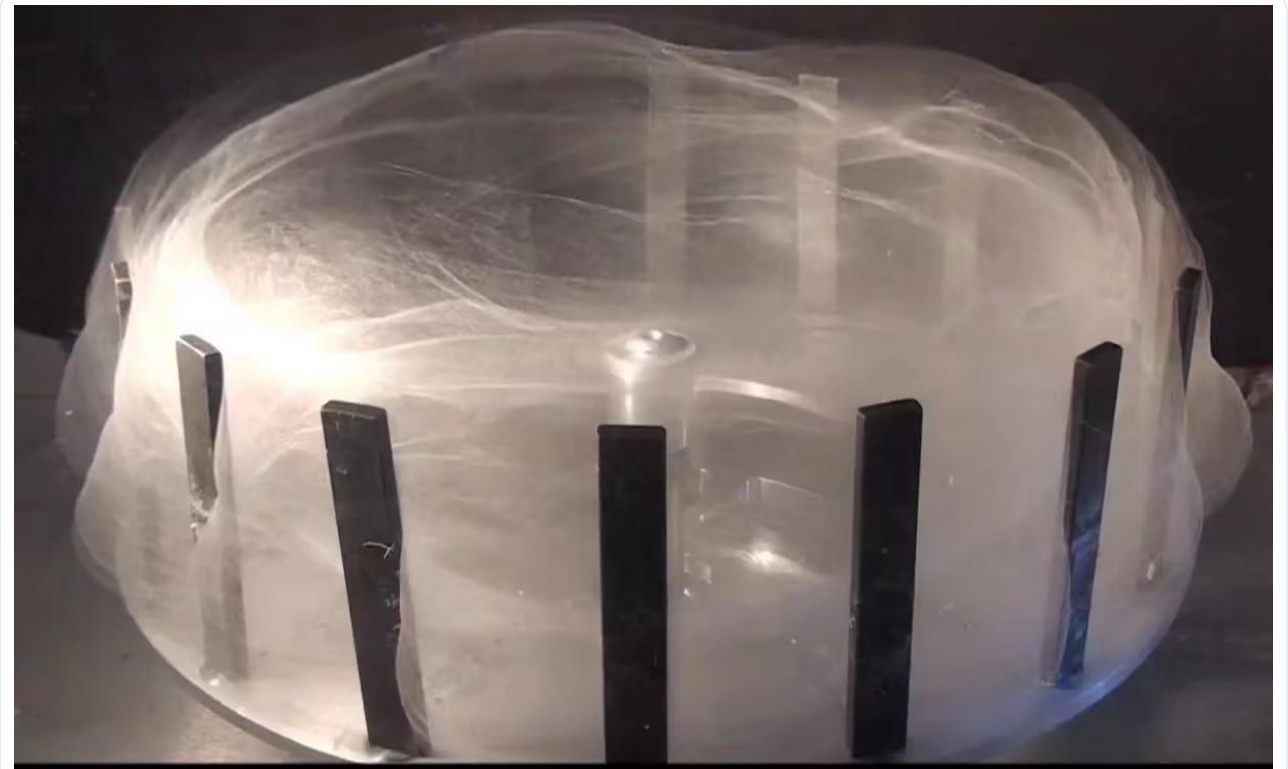
Stretches and ejects the polymer solution from the nozzle.



Nano- and Submicron Fibers

Produces fibers with nanoscale or submicron diameters.

Spinning disc diameter **650 mm**



Rotating Flat Plate Collector

Custom plate angles for random or aligned fiber membranes



Servo Motor Control

High-speed rotation controls fiber alignment.



Aligned Membrane Collection

Collects membranes with a high degree of fiber alignment.



Custom Plate Angle

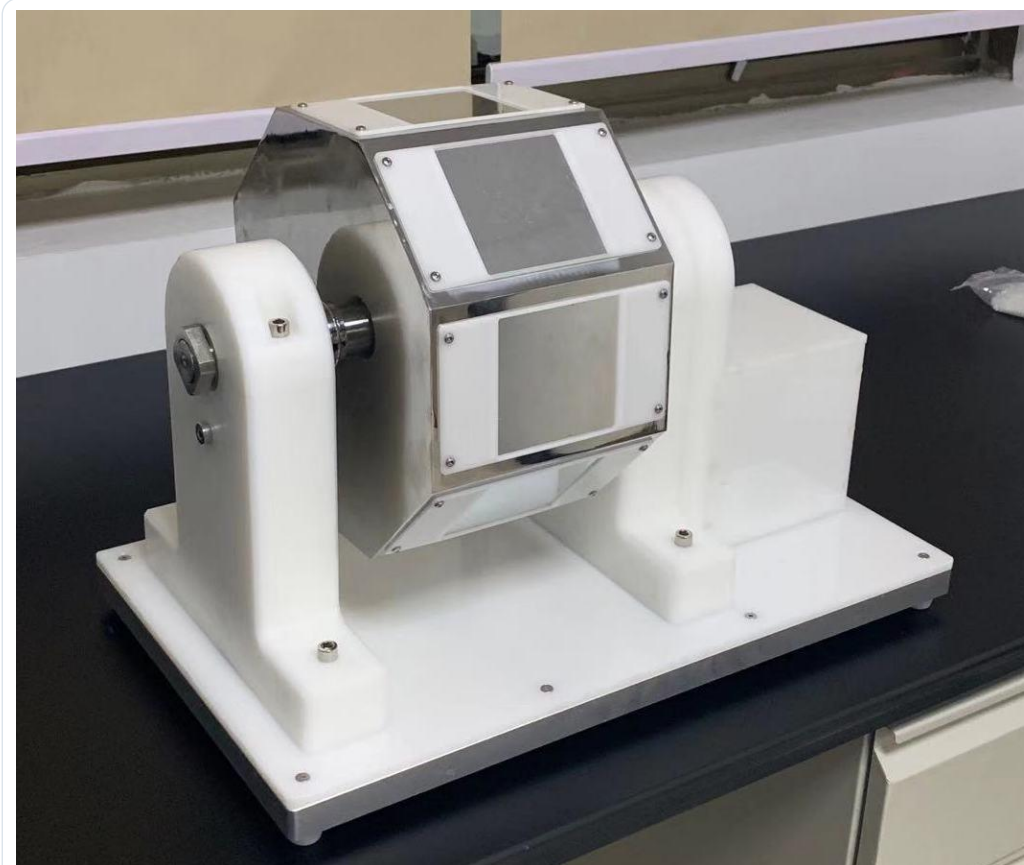
Adjust the plate orientation to suit the application.

Rotation speed

1–5000 rpm

Plate size

80 × 80 × 0.5 mm



X-Y Motion Stage

Controlled fiber deposition paths on a flat plate collector

Path Import & Programming

Supports CAD file import and programmed input.

Handheld Controller & Control Box

Timing-belt transmission with stepper motor drive.

Travel	200 × 200 mm
Repeatability	<50 μm
Speed range	0–30 mm/s
Power supply	220 V, 50/60 Hz
Construction material	Insulating plastic



Ionizing Air Blower

Charge and airflow control for stable electrospinning

Static Charge Neutralization

Reduces fiber adhesion
and static charge buildup.

Improved Fiber Deposition

Improves uniformity and reduces fiber defects.

Auxiliary Environmental Control

Promotes solvent evaporation
and humidity regulation.

Process Stabilization

Reduces instability during electrospinning.



Safety Features

Layered protection for operation, power supply and grounding



01 Emergency Stop

Within easy reach for rapid shutdown in an emergency.



02 Power Protection

Automatic shutdown in the event of overvoltage or overcurrent.



03 Door Interlock

The HV supply switches off automatically when the chamber door opens.



04 Multi-Point Grounding

The enclosure, power supplies, syringe pumps and collectors are grounded.

System Dimensions

Enclosure dimensions and overall installation envelope

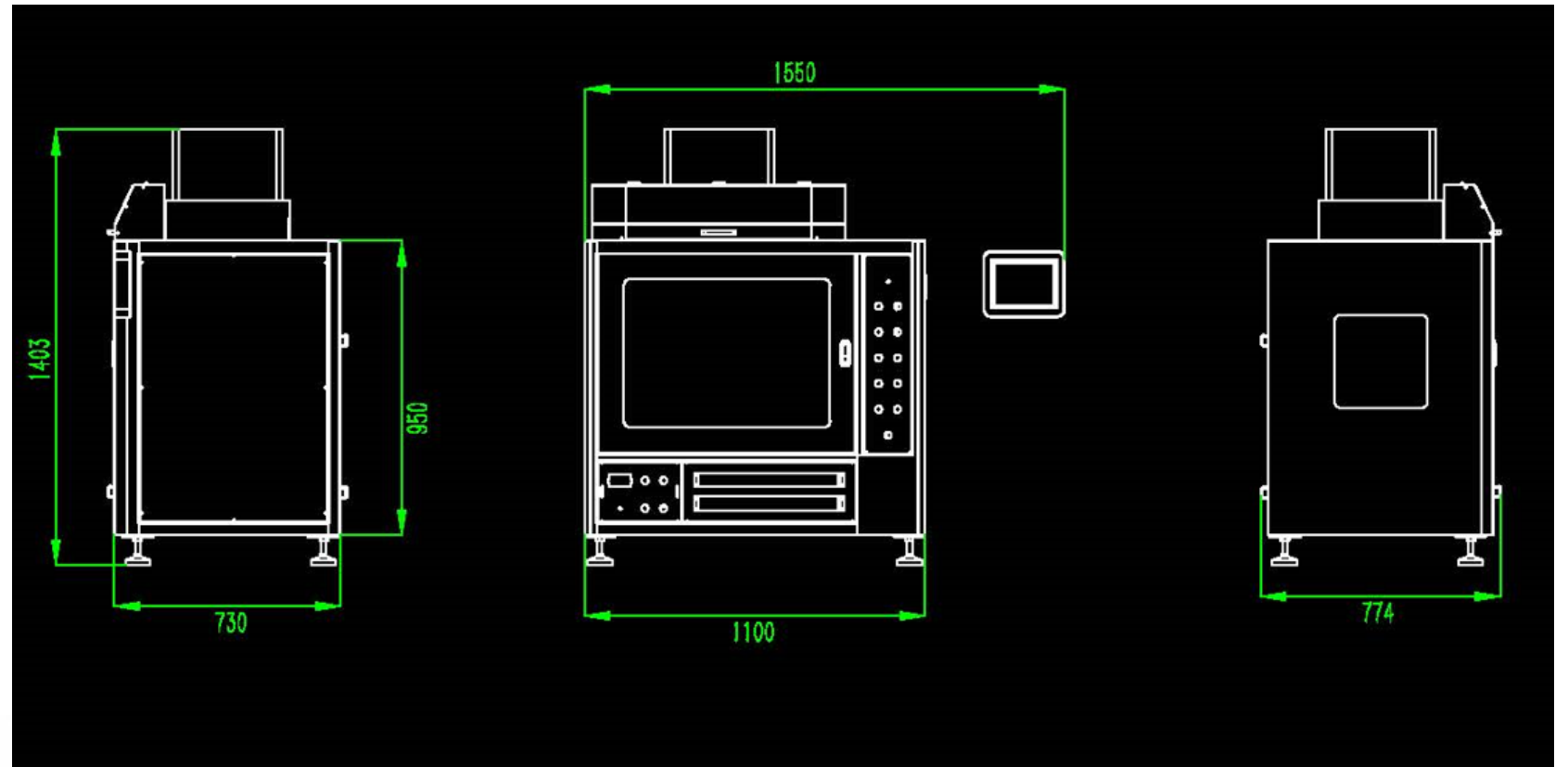
Enclosure Dimensions

Width **1100 mm**

Depth **730 mm**

Enclosure height **950 mm**

Overall height **1403 mm**





TL-Ultra

Micro & Nano Innovation. Endless Possibilities.

Flagship Benchtop Electrospinning Platform



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