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01

General Purpose & Use

The NST-500A is a specialized electrospinning production unit designed for both large-scale production and laboratory research. It can be used for the production, research, and development of nanofiber materials using water-soluble or solvent-soluble polymers.

This machine features a hollow pipe base having a core shell electrode mechanism optimized for continuous roll-to-roll production of nanofibers. Its hexagonal casing and counterbore mechanism provide efficient and uniform production, delivering two to three times higher output compared to conventional mechanisms.

HOLLOW PIPE BASE ELECTROSPINNING MACHINE FOR CONTINUOUS ROLL TO ROLL PRODUCTION OF NANOFIBERS

This pipe base electrode consists of hexagonal casing with a counterbore mounted mechanism which aids in efficient and uniform production of nanofibers leading to at least two to three times more production compared to existing technologies. The machine comprises a base table with main and auxiliary pillars, two hollow pipes with counterbore arrangement, a top frame with sliding capability, and a winding and rewinding mechanism. The process involves adjusting the distance between upper and lower electrodes, feeding a substrate roll, hollow pipes with hexagonal casing having counterbore attached with a flexible pipe providing continuous polymer solution from the tank with pumping arrangement and applying electric fields to generate nanofibres. This mechanism offers enhanced control over fibre morphology and structure with better production efficiency.

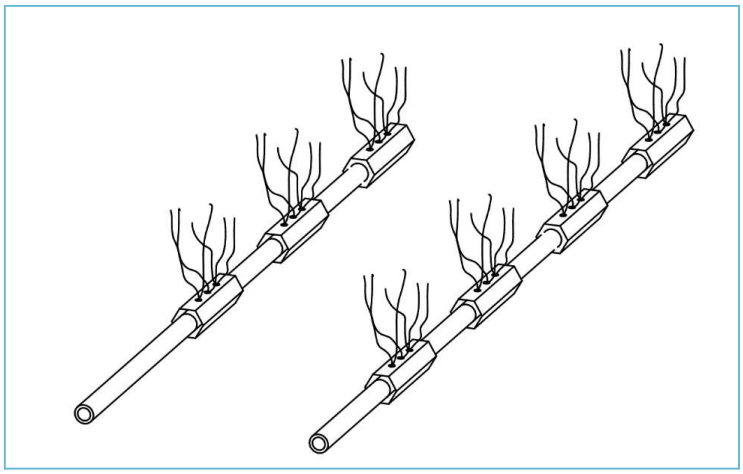


Fig: Working Principle of NanoFiber Generation with NST-500C

02

Product Specification

A. Technical Specification

SR. NO.	PARAMETER	SPECIFICATION
1.	Electrospinning System	Hollow nozzle based spinneret Electrospinning Machine
2.	Operating Mode	• Hollow nozzle base electrode having more than or equal to 50 nozzle opening. • Arrangements for operating single nozzle also provided • Co-axial spinnerets up to 4 customized coaxial nozzles. SHELL(ID: 0.337mm, OD:3.3mm, CORE(ID:0.6414mm, OD:1mm) • Extra Pump to work with core-shell, hollow & bi component nanofibers • External Polymer Tank Reservoir Is Filled With A Polymer Solution Attached With Flexible Pipe To Electrodes For Continuous Supply Of Polymer Solution Into The Reaction Chamber

	Solution Feeding system	• High Precision pump units : Individually connected to the spinnerets depending on the requirement of Nozzle and Coaxial spinneret • Tubeing : Silicon Tube with Chemical Resistance • Flow Rate : 0.35 -7200 ml/hr • Flow Rate Precision : 0.01 ml/h
3.	Effective Width Of Nanofiber Layer	0-500mm (Maximum)
4.	Working Substrate Width	0-600 mm (Maximum)
5.	Run Time Per Batch	Up To 6 Hrs (Depend On Polymer & Process Parameters)
6.	Spinning Electrode & Spinning Chamber	Two electrodes With Casing Mounted Arrangement with temperature and humidity control system displayed on HMI to monitor the process condition Exhaust fan with flexible pipe arrangement provided to remove the harmful vapours. • Provided with 20 Watt illuminating light. • Glass window for real time viewing of spinning operation and inert gas purging arrangement.
7.	Volume Of Solution	250ml To 5ltrs Of (Its Variable As Per Polymer Viscosity)
8.	No. Of Electrode Required	Upto 4 Nos.
9.	Substrate winding Speed (Linear), Collector, Production rate	• Roll to roll collection with conveyor belt and breaking mechanism) • Width of the collector up to 500mm • Substrate winding speed 0.1 M/Min To 10 M/Min • Production rate: 1m/min to 6m/min(depends on polymer and flow rate)
10.	Spinning Voltage	High Voltage Power Supply range Positive 0-60 kV, 5 mA Negative 0-60 kV, 5 mA

11.	Electrode Distance Range between nozzles & collector	30-280 mm with automatic distance movement arrangement
13.	Electric Field Intensity (Strength)	Up To 0.55 Kv/Mm
14.	Fiber Diameter	55-500 Nm (Approx.)
15.	Power Supply	Input 230/240 V Ac, 50/60 Hz
16.	Operating Environment	Temperature: 18-30°c, Rh: 10-40%
17.	Winding System	Winder And Unwinder Roll Provided With Maximum Fabric Roll Weight Capacity Of 8 Kgs
18.	Toolkit	Standard Toolkit For The Instrument
19.	Documents/ Manuals	User Manual, Installation & Maintenance Manual, Troubleshoot, Circuit/Block Diagram Etc.
20.	Machine Outer Body	Machine Outer Shell Will Provide Finished Pp/Frp Material And Acrylic Glass Doors 7" Lcd Display Screen For Machine Operation(Spinning distance, Flow Rate, Voltage, Light on/off, Pump On/off)
21.	Polymer Compatibility	PA6, PTFE, TPU, PVDF, PVA, Biopolymers like Chitosan, Sodium Alginate etc
22.	Polymer Viscosity	100-3000 cP for most polymer solutions 100-500 cP for fine nanofibers (~50-500 nm) 500-3000 cP for microfibers (~1-10µm)
23.	Substrate Compatibility	Ideally Flexible porous or non porous materials with thickness ranging between 0.1 mm to 5 mm approximately.

24.	Optimum Polymer Conductivity	0.1–1 mS/cm (millisiemens per cm) Produces uniform nanofibers. (Note: Low Conductivity (<0.1 mS/cm): Leads to bead formation and poor fiber stretching. High Conductivity (>1 mS/cm): Causes jet instability, excessive whipping, or bead defects.)
25.	Control Panel & Safety features	• Emergency Stop with mainON/OFF provision • Exhaust fan speed regulator • Residual Charge discharge Stick • Safety switch to switch off H.V. power supply when door is open • Hazard lamp to indicate H.V power supply ON • Cabin lighting • Exhaust fan ventilation • Emergency button and safety relay arrangement. • Electrical Isolation & Grounded Cabinet • Rubber floor mat.
26.	Electrospinning Enclosure	Electrostatic Painted Sealed Chamber with safety door provision
27.	Accessories	• Samples provided(PSf,PES, PAN or PVDF) • Insulation pad • Chemical resistance tubing • Brass connectors • Allen Key Set • Screw driver set (As per requirement)

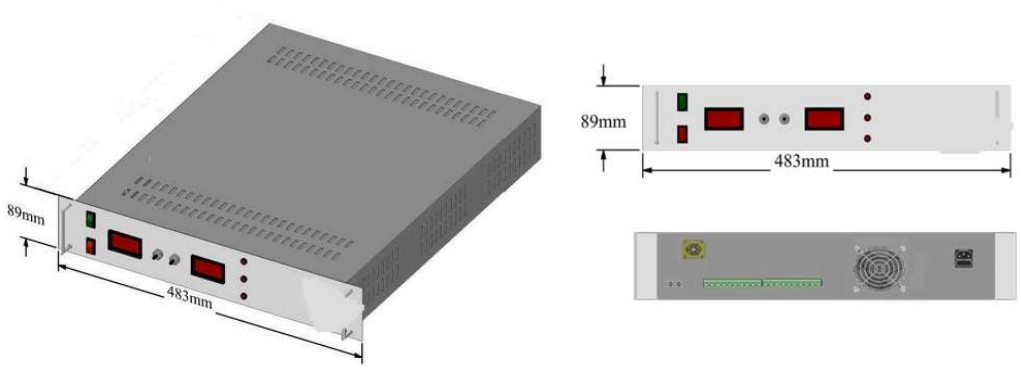
Disclaimer : Fiber morphology varies with composition and viscosity of the polymer.

B. Machine Specification

Parts & Accessories

a. Power Supply

Technical Specifications

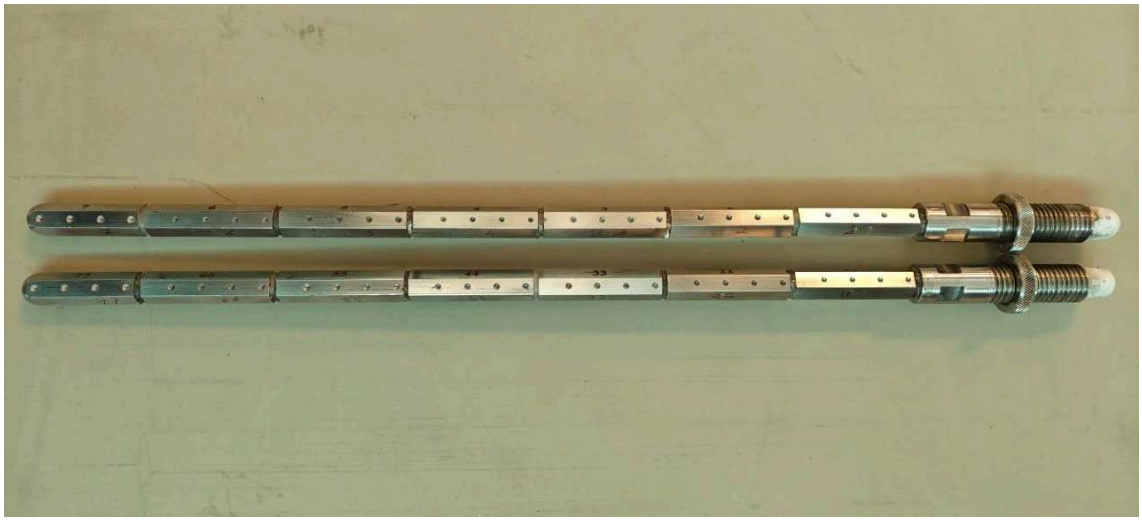


SR. NO.	PARAMETER	SPECIFICATION
1.	Input Voltage	230V ± 10% AC, 50hz, Single Phase
2.	Output Voltage Range*	1kV DC to 60kV DC
3.	Polarity*	Positive/Negative

4.	Line Regulation	≤0.05% for 10% variation in Input Voltage
5.	Load Regulation	≤0.1% for 0 to 100% Load Variation
6.	Ripple	≤0.1% RMS at Full Rating
7.	Stability	Better Than 0.02%/hour after 1 hour warm up
8.	Regulation Mode*	Constant voltage - constant current
9.	Voltage & Current Control*	Local: By 10-turn potentiometers on the front panel Remote: 0-10V DC signals for voltage & current control; OR Control through computer interface
10.	Protections*	Against Overload, Over-Current, Over-Voltage, Short-Circuit etc.
11.	Remote Control & Signals Through Pluggable Connector/D-Connector (External RS-232 Microcontroller Module)*	10V DC reference 10V DC HV enable Signal 0 to 10V DC signal for voltage & current control 0 to 10V DC signal for voltage to current monitoring
12.	Front Panel	AC Power ON/OFF switch with indication HV On/OFF switch with Indication 3½ Digit voltage and current meters 10-turn potentiometers for voltage and current control Constant voltage - constant current mode indication
13.	Back Panel	Socket for main input with 250V, 10A 3 conductor power cord of 1.5m Fuse holder with fuse Terminal for HV output with 10ft of detachable high voltage cable stud for grounding the unit Remote interface connector*

14.	Topology	High Frequency resonant / PWM-controlled switch mode
15.	Switching Device	IGBT
16.	Cabinet	2U/3U, 19" rack, powder coated

b. Spinning Electrode



Material	SS 316L
Compatibility	Water, Solvents & Acids
Description	There are two Spinning electrodes consisting of 7 hexagonal hollow pieces having outer threading on one side and inner threading on the other side. Each piece has 4 counterbore at equal distance from where the polymer solution comes out. All seven pieces are tightly joint with each other. These two electrodes are connected with the positive power supply.

Note	After completion of the work, it is advisable to take off both the electrodes and disassemble all seven pieces and thoroughly clean them with water or acid in order to avoid clogging of the bores. Before using electrodes make sure all seven pieces are tightly joined together.

c. Collecting Electrode

Material	SS 316L
Compatibility	NA
Description	There are two thin solid wires assembled parallel to the main electrodes. These two electrodes act as collectors of the nanofibers and are connected with the negative power supply.
Note	Once the work is done Clean both the collecting electrodes with wet cloth to avoid clogging of polymer on the wires.

d. Polymer Station

i. Pump

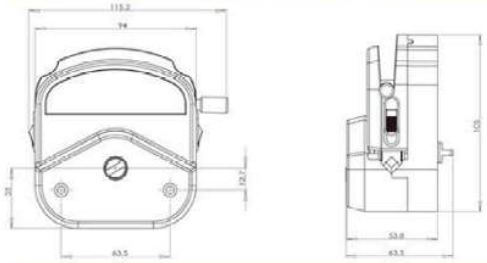
Easy Load Pump Head

YZ1515x,YZ2515x

Product Introduction

Change the tubing easily and rapidly; automatic tubing retention; accept 9 sizes tubing to meet different flow rates requests. Two kinds of material housing for customers' selection. PSF (polysulphone material): white, exquisite appearance, good rigidity, high precision, usually used in research laboratory and supporting analytical device. PPS (polyphenylene sulfide material): black, resist organic solvent corrosion, high precision and rigidity, suitable for industry or other bad working conditions. Rollers assembly with 304 stainless steel material resists corrosion with long lifetime.

Installation Sizes Drawing(Unit: mm)



Mounting several pump heads can increase the flow rates.

Model Number

| YZ1515x,YZ2515x

Typical Application

- Support COD on-line monitor.
- Support anorectal therapeutic instrument.
- Support biofermentation cylinder.

3 rollers 6 rollers

YZ Series pump head has wide application, and is usually used together with many kinds of analytical instruments. According to the different technical requests, it can adopt different motors to drive, such as stepper motor, DC motor, synchronous motor, AC gear motor, etc. Stack up several pump heads can increase the flow rates.

Pump Head	Tubing	ID×Wall thickness(mm)	mL / r	Flow Rate(mL/min) (0.1-600rpm)	Tubing Max.Pressure(Mpa)		Material/Weight(kg)	
					Intermittent	Continuous	PSF	PPS
YZ1515x	13#	0.8×1.6	0.07	0.007~42	0.27	0.17	0.40 (3 rollers)	0.46 (3 rollers)
	14#	1.6×1.6	0.27	0.027~162				
	19#	2.4×1.6	0.55	0.055~330				
	16#	3.1×1.6	0.82	0.082~492				
	25#	4.8×1.6	1.7	0.17~1020	0.24	0.14	0.44 (6 rollers)	0.50 (6 rollers)
	17#	6.4×1.6	2.9	0.29~1740	0.14	0.10		
	18#	7.9×1.6	3.8	0.38~2280	0.10	0.07		
YZ2515x	15#	4.8×2.4	1.7	0.17~1020	0.27	0.17		
	24#	6.4×2.4	2.9	0.29~1740				

Material	NA

Compatibility	Water, Solvents & Acids
Description	High precision pump having silicon tube to transfer the polymer solution from storage tank to the electrodes.
Note	Clean the pump with water /solvent after the work is done.

ii. Motor & Belt

Material	NA
Compatibility	Water, Solvents & Acids
Description	Motor and belt is provided to suck control the flow of the polymer solution from the pump.
Note	NA

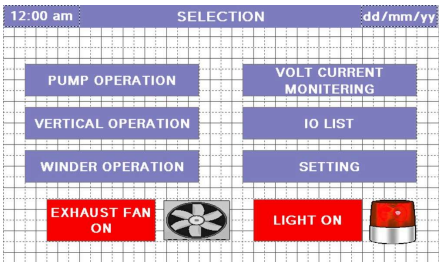
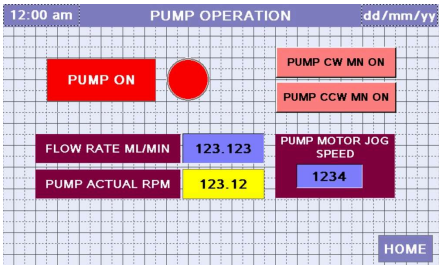
iii. Polymer Storage Tank

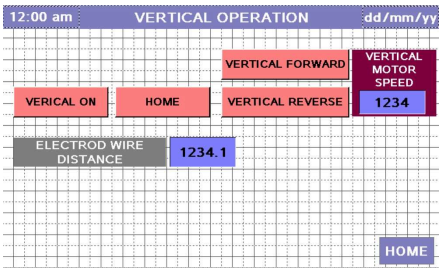
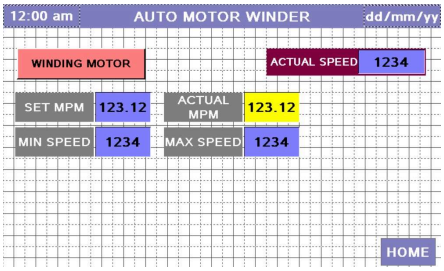
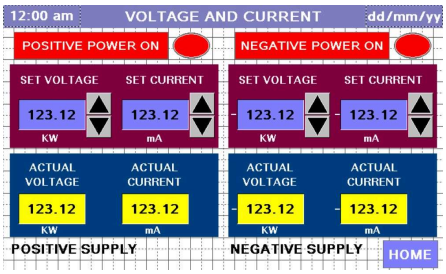
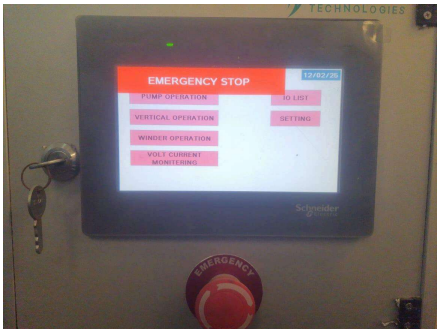
Material	Borosil glass bottle(500ml to 1000ml Capacity)
Compatibility	NA
Description	There are two glass storage bottles provided to store polymer solution.
Note	3 to 4 nos. of bottles can be used.

e. Exhaust Fan

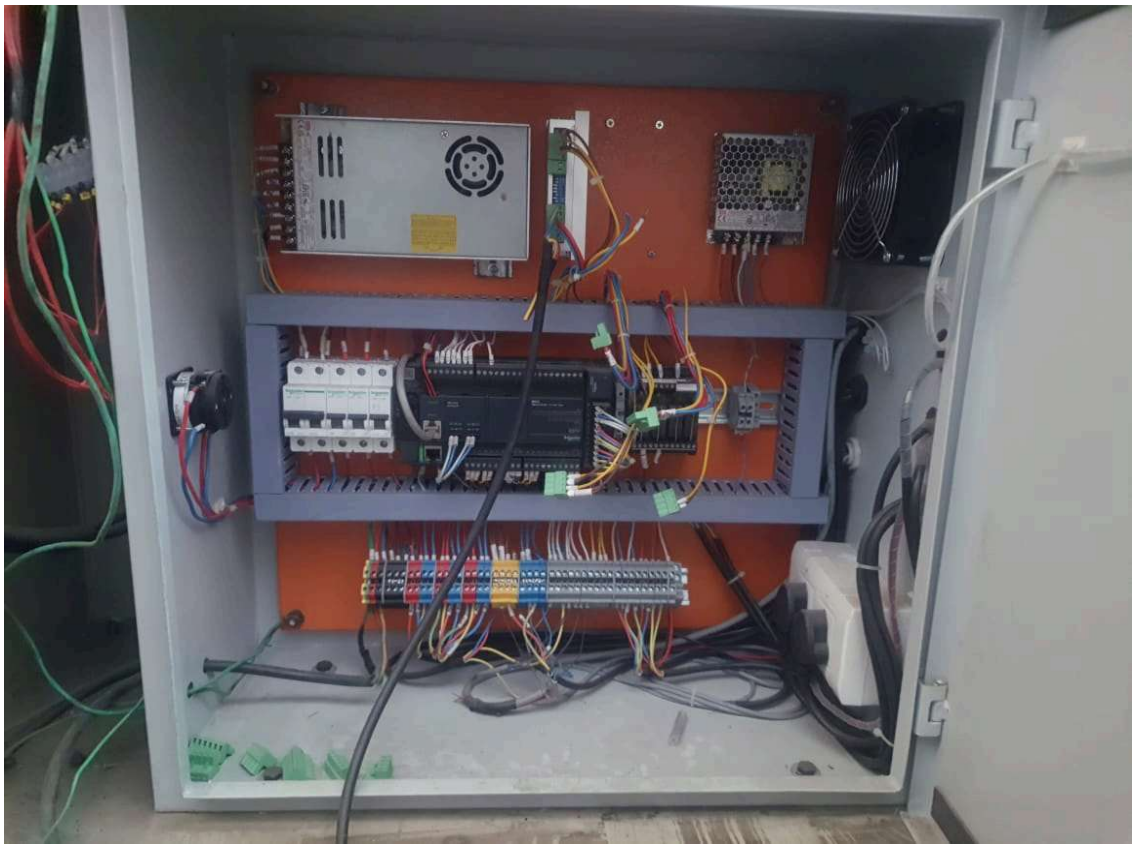
There is an exhaust fan installed in the internal reaction chamber. The main function is to extract all the fumes out from the reaction chamber that is generated during the nanofiber production. Keep the exhaust fan on during the nanofiber production in order to maintain the required atmosphere in the reaction chamber.

g.

SR. NO.	SELECTION	WINDOW	DESCRIPTION
1	Main Window		Allows to select operation
a	Pump Operation		To control the flow rate of the polymer coming out from the lower electrodes.

b	Vertical Operation		To increase or decrease the distance collecting and lower electrodes.
c	Winder Operation		To change the winding speed of the installed substrate.
d	Voltage & Current Operation		To increase or decrease the positive and negative high voltage power supply during the operation.
2	Emergency Switch		To stop the machine immediately at any point of time.

h. Control Panel



Technical details & circuit Diagram attached

i. Fire Extinguisher

Description - use the fire extinguisher at the time of accident / fire.

j. Dehumidifier

Description : To control the humidity of the chamber while operating the machine

Specification:

SR. NO.	PARAMETER	DESCRIPTION
1	Moisture Extraction Capacity (Non AC)	@30°C & 80% RH 50 ltrs/day
2	Coverage Area (Without AHU)	400 sqft/4000ft^3/110m^3
3	Moisture Extraction Capacity (AC w/o AHU)	@23°C & 60% RH 25 ltrs/day
4	Coverage Area (AC w/o AHU)	200 sqft/2000ft^3/55m^3
5	Body Material	Special Grade Plastic
6	Humidity Control & Display	Up to 40% Digital
7	Water Collection Tank	8.5 Ltr
8	Refrigerant	R 410a
9	Air Flow	400 m^3/hr
10	Power @35°C Ambient	720 W approx
11	Supply Voltage	220V AC, 50Hz
12	Noise Level	50dB

13	Direct Drain Facility	Yes
14	Prefilter	Yes
15	Castor Wheel	Yes
16	Dimension (in) (LxBxH)	14×18×25
17	Net Weight	26 Kgs

k. Stabilizer

Qauntum Integration V0501 **MODEL: DFC_SERVO**

DFC Servo Controller Setting Parameter List

Sr.	Name	Default Value	Description
1	SoP	220	**Set Output Voltage** [e.x 220 Final Output Voltage]
2	SPA	3	**Correction Span (+/- Voltage)** [e.x. SOP+SPAN=220+3 =223,After 223 Voltage dimmer will be correct in output]
3	Pod	5	**Power On Delay** (e.x After 5 Second Output On, when Mains Power On)
4	IPL	165	**Input Low Voltage** (e.x. Input Volatge Less than 165 than Output Off)
5	IPH	280	**Input High Voltage** (e.x. Input Volatge higher than 280 than Output Off)
6	OPL	205	**Output Low Voltage** (e.x. Output Volatge Less than 205 than Output Off)
7	OPH	255	**Output High Voltage** (e.x. Output Volatge higher than 255 than Output Off)
8	OHD	1	**Output High trip delay** [e.x. When output high,1 sec Wait forOutput Off]
9	IPC	Calibrated	**Input Voltage Calibration** (e.x Match Input Voltage With Your Reference Meter- Default Factory calibrated)
10	OPC	Calibrated	**Output Voltage Calibration** (e.x Match output Voltage With Your Reference Meter- Default Factory calibrated)

l. Winder & Unwinder

Description – 350 mm width of substrate roll with weight of up to 10kgs. Can be installed in this machine.

m. Earthing Rod

Use – To discharge the stored static charge from the machine.

03

Personal Protection & Safety

Safety Guidelines

- Use protective gloves, masks, and safety glasses
- Only authorized personnel should operate the machine
- Beware of high-voltage power supply
- Do not touch polymer tubes & Polymer stations while high voltage power supply is ON.

Fire Extinguisher: Use in case of fire or electrical accident

Dehumidifier: Controls chamber humidity during operation

Stabilizer: Maintains stable power supply.